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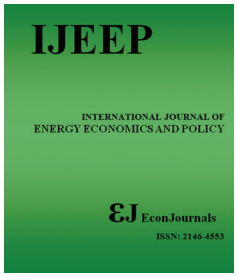

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Econometric Analysis of the Relationships between Growth, Exports and Energy Exports in Azerbaijan

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ABSTRACT

The place of exports in the economic development of a country has a very important share. Whether in developed or developing countries, energy demand makes energy exports important in exports. The aim of this study is to determine the relationship between Azerbaijan's economic growth, total export amount and energy export. After Azerbaijan's independence, the "Contract of the Century" agreement in 1994 has a very important role in the release of its energy resources to the international markets. In this context, the data subject to analysis were included in the analysis starting from 1994 to 2018. After taking the logarithmic values of the raw data, the data were made stationary, suitable lag lengths were found and then subjected to the Granger causality test. Then, correlation relationships were also examined to measure the strength of the relationship between the data. In the correlation evaluation, it was concluded that there is a strong relationship between exports and economic growth. In other words, the country's development, growth and strong foreign exchange resources are possible with a strong export. However, as a result of Granger analysis, no causal relationship was found between growth and energy exports. The main reason for this is the country's export of energy products to international markets in the form of raw materials. As a result of the study, it was found that importing processed energy products later causes more costly energy use for the country, and this leads to meaningless results in causality. Higher imports create difficulties in achieving the desired growth rate. At the same time, despite the high share of oil and natural gas in energy exports, the high level of electrical energy in imports causes a low relationship between economic growth and electrical energy exports. In the following process, the country's ready launch of energy products to be exported will be the beginning of self-development and great successes to be achieved.

Keywords: GDP, Export, Energy, GDP, Granger, VAR
JEL Classifications: F1, O4, Q4, C5

1. INTRODUCTION

Energy is a very important production factor for economic growth. A country's high exports are important in terms of providing foreign currency inflows to that country and influencing the production sectors in the country to work more. Energy is required to combine factors of production and produce output. Energy demand and supply differ in terms of countries. Energy consumption raises not only economic growth but also living standards. There is always an energy demand for the realization of almost any direct and indirect generation. The excess in energy demand causes the expansion of energy markets. A country should not only have energy and export it, but also obtain the energy cheaply and minimize the damage it causes to the environment while obtaining it.

On the determination of the relationship between energy exports and growth, the USA (Kraft and Kratft, 1978; Abosedra and Baghestani, 1989), South Korea (Oh and Lee, 2004), Turkey (Altinay and Karagöl, 2005; Şengül and Tuncer, 2006; Mucuk,2009 and Sugözü, 2011;

Gövdere and Can, 2015; Usta, 2016; Aslan, 2006), Sub-Saharan African region (Kahsai, 2012; Dogan, 2014) and ve Cameroon

(Wandji, 2013) studies have been conducted in countries such as. In addition, studies covering Asian countries (Masih and Masih, 1996), Commonwealth of Independent States (Ballı et al., 2018 ; Syzdykova, 2020) and developing countries (Razzaqi and Sherbaz, 2011; Chontanawat, 2008; Ahmet, 2013) were also conducted. As it can be seen, although there are studies on whether there is a relationship between energy exports and growth in other countries, there are hardly any studies on Azerbaijan on this subject. From this point of view, this study was made.

Azerbaijan's economy is generally based on imports. The existence of petroleum resources shows that an oil-based export is maintained in its export. Exporting domestically exported products, especially petroleum products, as raw materials and returning them to the country as ready-made products causes the country's economy to grow less than it should. For this reason, as it can be understood from the researches, even if exports and especially oil exports are high, the desired growth cannot be achieved. The aim of this study is to reveal the interaction between the economic growth of Azerbaijan and its exports and energy exports.

2. LITERATURE REVIEW

Two variables are used to measure energy use by countries. The first of these is energy consumption per capita, and the other is the amount of energy consumed to produce one unit of GDP. While scanning the literature, it is possible to see that there are many studies related to the three variables. This also shows us how important economic growth, exports and energy trade are. Kraft and Kratft (1978) conducted research on whether energy exports are important to achieve economic growth in the USA. As a result of the study carried out to cover the 1947-1974 period, a unilateral causality relationship was found between growth and energy trade.

Yu and Choi (1985) tried to find the causality between economic growth and energy in their study. In line with the data obtained, no causal relationship was found between economic growth and energy. In the study of Bakirtas et al. (2000) on Turkey, the electricity demand in the country was analyzed in terms of econometrics. According to the results obtained, when analyzed in the long-term framework, it has been confirmed that there is a relationship between income, electricity consumption and economic growth.

According to the findings obtained from the studies conducted by Nondo and Jahsai (2009), the relationship between energy consumption and economic growth affects unilaterally from energy to growth. Apergis and Payne (2010) found a one-way causality relationship as a result of their analysis. According to the result, there is a causal relationship from energy consumption to economic growth, that is, there is an effect of energy on economic growth.

In the study conducted by Karagöl et al. in 2007, a short-term positive relationship was found between electricity consumption and economic growth, and a negative relationship was found when examined in the long-term framework. Akarca and Long (1979) tried to find a link between energy consumption and employment in their study. However, according to the results obtained, no causal relationship was found between energy consumption and employment. In 2003, Soytas and Sarı conducted research on G-7 and 10 developing countries. The aim of the study was to determine the relationship between energy consumption and economic growth. According to the data obtained as a result of the research, although it varies in terms of countries, it has been concluded that there is a causality between economic growth and energy consumption in general.

Erdoğan (2014) revealed in his research that more energy should be used in order to achieve more growth. Kar and Kınık (2008) analyzed the relationship between electricity consumption types and economic growth in Turkey. The study conducted for the 1975-2005 period was examined with the help of Granger causality test. As a result of the analysis, significant causal relationships were found. Sica and Şentürk (2016) energy and growth predict that the relationship between these two will be from growth to energy consumption.

Aydın (2010) analyzed the relationship between energy consumption and economic growth in Turkey. As a result of the study, a relationship was determined, albeit at a very low level. In the analyzes made by Mucuk and Uysal (2009), it was determined that there is a causal relationship between the increases in energy consumption and economic growth. Yanar and Kerimoğlu (2011) analyzed the relations between energy consumption, economic growth and current account deficit in Turkey for the period 1975-2009. It has been determined that there is a cointegration relationship between the data, that is, they act together in the long run.

In the study conducted by Ballı et al. (2018), no causal relationship was found between economic growth and energy consumption. In other words, they state that the effect of energy saving policies on economic growth is insignificant. The researchers analyzed the relationship between energy consumption and economic growth in the Commonwealth of Independent States, consisting of Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Belarus, Russia, Turkmenistan, Tajikistan, Ukraine and Uzbekistan, using the 1992-2013 period data. The result of this research revealed that there is a two-way causality relationship between energy consumption and economic growth. In another study conducted by Göçer (2013), it is stated that a large part of the natural gas used by Turkey is imported, which causes no meaningful results among the data. Uzun et al. (2013) analyzed the interaction between economic growth and energy consumption in Turkey for the period 1980-2010 using the VECM method. As a result of the analysis, they stated that producing and consuming more electrical energy in Turkey will positively affect economic growth.

Çağlar et al. (2017) analyzed the effects of changes in the amount of energy consumption per capita in the Turkish economy on real national income per capita for the period 1960-2014. In the study, cointegration was determined between energy consumption and national income. Sica and Şentürk (2016) examined the relationship between economic growth and energy use using frequency domain causality test for Turkey and Italy using the 1961-2012 period data and determined that there is no causality

relationship between electricity consumption and economic growth in Turkey in the short run. They have revealed that there will be a long-term relationship. When examined in terms of Italy, it has been seen that there are causal relationships between these variables in the short, medium and long term. Korkmaz and Güngör (2016) analyzed the relationships between energy consumption and economic growth in Turkey with the Granger causality test for the period 1970-2014. As a result of the study, a one-way causality relationship was determined.

Gövdere and Can (2015) examined the relationship between economic growth and energy consumption in Turkey with the help of Engle and Granger cointegration test for the period 1970-2014 and revealed that these series act together in the long run. Usta (2016) examined the relationship between energy consumption and economic growth in Turkey for the period 2004-201. As a result of the analysis, it was stated that energy consumption in Turkey has a positive effect on economic growth.

In the Neoclassical Growth Model developed by Solow (1956), economic growth is explained by labor and capital, and technology is considered exogenous. Razzaqi and Sherbaz (2011) analyzed the relationships between energy consumption and economic growth in 8 developing countries, including Turkey. Using the 1980-2007 period data, the study was analyzed with the help of the Granger causality test, and no significant relationship could be found between these variables in the short-term or long-term in countries other than Indonesia. Wandji (2013) obtained significant results between the data and the relationship between energy consumption and economic growth in Cameroon for the period 1971-2009 with the help of the VECM model.

Altinay and Karagöl (2005), in their study, tried to find causality between income and electricity consumption in Turkey for 50 years. According to the data obtained, there is a relationship between economic growth and energy consumption in Turkey between the years 1950-2000. Masih and Masih (1996) in their study on selected Asian countries, concluded that there is a causal relationship between energy consumption and income. In their study on the USA, Abosedra and Baghestani (1989) determined that there is a one-way causality relationship between economic growth and energy consumption. According to the results of the research, economic growth affects energy consumption. Şengül and Tuncer (2006) found in their study on Turkey that there is a one-way causality relationship from energy consumption to growth Mucuk (2009) and Sugözü (2011) conducted research on Turkey and measured the effect of electricity consumption on economic growth on a sectoral basis. According to the results obtained, the increase in electricity consumption in the field of transportation does not affect the economic growth.

Oh and Lee (2004) analyzed the period of 1981-2004 in their study on South Korea. According to the results obtained, there is no short-term relationship between economic growth and energy. They revealed that if the relationship process is analyzed over a long period of time, a unilateral causality result will be obtained. In the study conducted by Erdoğan and Gürbüz in 2014, a unidirectional causality relationship was found between energy consumption and economic growth. According to the result, energy consumption has a positive effect on economic growth. In the research conducted by Erol and Yu in 1987, countries from different continents were taken and examined. Different results were obtained for each country. Results such as two-way causality between some countries, one-way causality in some countries, and no causality in some countries were obtained.

3. DATA AND METHODOLOGY

3.1. Data Set

The data set used for the analysis was obtained from the Azerbaijan Statistical Committee. Our data set covers annualy data from 1994 to 2018.

3.2. Econometric Method

In the study, time series approach was used as econometric method. In order to perform a cointegration test (cointegration), the stationarity of the data was first checked. The stationarity of the variables was tested using the Augmented Dickey-Fuller (ADF) unit root test. Appropriate lag lengths were found after stationarity. Then, the direction of the relationship between the variables was tried to be determined by using the Granger causality test.

Granger-Causality Tests in the Framework of Co-Integration Analysis Economic time series are often not stationary when considered as levels. Regression analyzes using non-stationary time series can cause false or misleading regression relationships. This causes the estimated regression equation to have a high coefficient of determination (R2) but a low Durbin-Watson statistic. In this regression, the error terms are not stationary and the apparently high explanatory power of the regression equation cannot be trusted.

If the non-stationarity of the time series is due to the deterministic time trend of the related series, then de-trending of these series can make the series stationary. However, if the time series contains a random trend, they will need to be differentiated until they become stationary. The number of times a series with a random trend needs to be differentiated until it becomes stationary is called the degree of integration of that series. For example, if the first difference ($Xt - Xt\text{-}1$) of a non-stationary variable X is stationary, it is said that the variable X is integrated of the first order and is denoted by $X \sim I(1)$.

Let's assume that the variable Y also follows the I(1) process. In order for a regression between X and Y to not be a spurious regression, the error terms of the regression must be stationary. In other words, if $X \sim I(1)$ and $Y \sim I(1)$, and the error term of the regression $Yt = \alpha + \beta Xt + \varepsilon t$ is $\varepsilon t = Yt - \alpha - \beta Xt \sim I(0)$, there is a spurious range between X and Y There is no relationship. This property is defined as X and Y variables are cointegrated. Stationary processes have fixed means and limited variances. Therefore, co-integration of two or more I(1) random variables requires that these variables move together in the long run and that the variance of the difference between them never goes to infinity. This feature brings with it an error correction mechanism. In other words, it is possible to correct a non-equilibrium situation

that may occur in the short term for any reason in the long term. This is because the difference (z) between X and Y is stationary in the long run, because the z term shows how much the system deviates from the long run equilibrium.

Granger (1988) shows the expression of a cointegrated system as an error correction model in the following figure. In the cointegration example given above, let $zt = \varepsilon t = Yt - \alpha - \beta Xt$.

$$\Delta Yt = \Sigma\delta 1,i\ \Delta Yt\text{-}1 + \Sigma\ \beta 1,i\ \Delta Xt\text{-}1 + \gamma 1\ zt\text{-}1 + \mu 1t \quad (1)$$

$$\Delta Xt = \Sigma\delta 2,i\ \Delta Yt\text{-}1 + \Sigma\ \beta 2,i\ \Delta Xt\text{-}1 + \gamma 2\ zt\text{-}1 + \mu 2t \quad (2)$$

The cointegration of X and Y variables requires that at least one of γ1 and γ2 be nonzero in models (1) and (2). Therefore, changes in the dependent variable in the error correction model are partially determined by the lagged value of z. However, since zt-1 includes Xt-1 and Yt-1, this leads to the conclusion that the cointegration relationship requires at least one variable to be the Granger-cause of the other, as Granger (1986) showed.

If the Granger causality test was carried out within the framework of a model consisting of only the first differences of the X and Y variables, without considering the cointegration feature, it would be as follows

$$\Delta Yt = \Sigma\delta^*1,i\ \Delta Yt\text{-}1 + \Sigma\ \beta^*1,i\ \Delta Xt\text{-}1 + \mu^*1t \quad (1^*)$$

$$\Delta Xt = \Sigma\delta^*2,i\ \Delta Yt\text{-}1 + \Sigma\ \beta^*2,i\ \Delta Xt\text{-}1 + \mu^*2t \quad (2^*)$$

Correlation analysis was performed to measure the strength of the relationship between the data.

The purpose of the correlation analysis is to determine how the dependent variables change when the independent variable changes. The correlation coefficient is shown with (r) and the values it can take vary between −1 and +1. The interpretation of the resulting values is as follows (Kalaycı, 2005):

- 0.00-0.25 Very weak correlation
- 0.26-0.49 Weak correlation
- 0.50-0.69 Moderate relationship
- 0.70-0.89 High correlation
- 0.90-1.00 Very high level of correlation.

4. ANALYSIS AND FINDINGS

While making the analysis, it was measured whether there is a relationship between the economic growth of Azerbaijan and its exports and energy exports. In order for the data to give statistically significant results, the stationarity test was first performed with the help of the ADF (Augmented Dickey-Fuller) unit root test, and the results are presented in Table 1:

When we examine the data, we see that all three probability values are greater than 0.05 (GDP/P = 0.6552≥0.05, Export/P = 0.6394≥0.05, Energy export/P = 0.8687≥0.05). In this case, it is seen that the null hypothesis cannot be rejected. Also, for the t statistical value growth series, |−1.202568|< test critical values |−3.752946|, |−2.998064|, |−2.638752|. T statistics value for export series, |−1.238630|< Test critical values |−3.752946|, |−2.998064| |−2.638752|. T statistics value for energy export series, |−0.522973|<Test critical values |−3.769597|, |−3.004861|, |−2.642242|. In general, for the growth, export and energy export series, the fact that the t statistical values are smaller than the test critical values at all significance levels indicates that the growth, export and energy export series are not stationary. For this reason, it was 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 for the 1994-2018 periods are stationary at the second differences (p≤ 0.05). We can examine the stationarity of each series as follows.

For T statistics value growth series |−4.711715|>Test critical values |−3.769597|, |−3.004861|, |−2.642242|. T statistical value when we evaluate it for export |6.701323|>Test critical values |−3.788030|, |−3.012363|, |−2.646119| is happening. T statistics value for energy export series |−4.841326|>Test critical values |−3.808546|, |−3.020686|, |−2.650413|.

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. Since the second difference of all the data was stationary, the cointegration test was started. Since the cointegration test of the variables will be done first, 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 for determining the appropriate lag length are presented in Table 3:

hen we examine the table, we see that the appropriate lag length is realized at the second level. After finding the appropriate lag length, the transition to Granger randomness analysis was performed.

According to Table 4, total growth, exports and energy exports in Azerbaijan are not the cause of each other (p ≥0.05). So the series are not granger causes of each other. In this case, we accept the H_0 hypothesis and reject the H_1 hypothesis. Rejection of the H_1 hypothesis is valid for these possibilities.

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:

When Table 5 is examined, a positive and very strong relationship was found between the given growth and oil exports. There is a weak positive correlation between the growth in the country and energy exports. The relationship between total exports and energy exports is weak. When we look at it in general, it is seen that there is a positive correlation between the variables.

Table 1: Level values of series

t-statistics	GDP		Export		Energy export	
	Possibility	t-statistics	Possibility	t-statistics	Possibility	
ADF testing statistics	−1.202568	0.6552	−1.238630	0.6394	−0.522973	0.8687
Test critical values						
%1	−3.752946		−3.752946		−3.769597	
%5	−2.998064		−2.998064		−3.004861	
%10	−−2.638752		−2.638752		−2.642242	
t-statistics	**GDP**		**Export**		**Energy Export**	
	Possibility	**t-statistics**	**possibility**	**t-statistics**	**possibility**	
ADF testing statistics	−1.202568	0.6552	−1.238630	0.6394	−0.522973	0.8687
Test Critical Values						
%1	−3.752946		−3.752946		−3.769597	
%5	−2.998064		−2.998064		−3.004861	
%10	−2.638752		−2.638752		−2.642242	

Vertical-Fuller unit root test results regarding the levels of unit root variables in the series are shown with error margins of one percent, five percent, and ten percent. (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)

Table 2: Second difference values of series

t-statistics	GDP		Export		Energy Export	
	Possibility	t-statistics	Possibility	t-statistics	Possibility	
ADF testing statistics	−4.711715	0.0012	−6.701323	0.0000	−4.841326	0.0011
Test Critical Values						
%1	−3.769597		−3.788030		−3.808546	
%5	−3.004861		−3.012363		−3.020686	
%10	−2.642242		−2.646119		−2.650413	

Table 3: Appropriate delay length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	−56.52958	NA	0.058196	5.669484	5.818701	5.701868
1	−18.81545	61.06097*	0.003831	2.934805	3.531675*	3.064341
2	−8.300515	14.01991	0.003540*	2.790525*	3.835048	3.017213*
3	−0.910422	7.742001	0.004899	2.943850	4.436025	3.267690
4	8.619882	7.261184	0.006780	2.893345	4.833172	3.314337

*indicates the appropriate lag length for the relevant test

Table 4: Granger causality test

H0 Zero Hypothesis	F-value	Probability value (p)	Decision at 5% significance level
The amount of exports made is not the reason for growth.	4.883019	0.2995	Reject
Energy export is not the cause of growth.	7.815142	0.0986	Reject
Growth is not the cause of exports.	7.881587	0.0960	Reject
The increase in energy exports does not cause an increase in the amount of exports.	5.231965	0.2643	Reject
Growth is not the cause of energy exports.	1.677617	0.7948	Reject
The increase in exports is not the reason for the increase in energy exports.	1.278526	0.8650	Reject

Table 5: Correlation relationship

	GDP	Export	Energy Export
GDP	1	0.968408	0.480493
Export	0.968408	1	0.421594
Energy Export	0.480493	0.421594	1

Regression analysis was performed using the least squares method. GDP was determined as the dependent variable, and total exports and energy exports were determined as the independent variables. It was concluded that there is a significant relationship between exports and GDP. Probability values are less than 0.05 (Table 6). That is, the H_0 hypothesis is rejected, the H_1 hypothesis is accepted. A significant result could not be reached between energy exports and GDP. The probability value obtained is greater than 0.05. That is, the H_0 hypothesis is accepted, the H_1 hypothesis is rejected. Our R^2 values are high. We look at the F-statistics for the significance of the model. Since this time probability value is less than 0.05, H_0 rejection, H_1 are accepted. Our model gives meaningful results.

Table 6: Regression analysis

Variable	Coefficient	Std. Error	t-statistic	Prob.
LOGEXPORT	0.817235	0.048752	16.76319	0.0000
LOGENERGY	0.167936	0.106238	1.580748	0.1282
C	2.313946	1.002184	2.308902	0.0307

5. CONCLUSION

Like every country, exports are of great importance for Azerbaijan. The availability of energy resources is very important in terms of supporting the economic development of the country. However, the export of the energy resources exported in the country, generally in

the form of raw materials, and the fact that they import more than export, prevent the desired success in terms of economic growth. At the same time, the fact that the share of oil and natural gas in energy exports is higher, the import of electrical energy is high, causes the relationship between economic growth and electrical energy exports to be low.

Azerbaijan, like every other country, must act in a planned manner in order to realize economical energy consumption and to achieve economic growth. The reason why no meaningful results could be obtained within the framework of granger as a result of the analysis can be shown as the reason why energy exports and consumption are not made within the framework of necessary plans.

In the correlation evaluation, it was concluded that there is a strong relationship between exports and economic growth. This means that if the country can implement a good policy, it can implement export-led growth. The reason why the relationship between energy exports and economic growth is weak can be shown as the country's imports in terms of energy more than exports. At the same time, the high import share of electrical energy can be cited as a reason. What is the source of the energy to be exported, how it is obtained, the level of sustainability and the diversity of resources are of great importance.

As a result of the study, it is suggested to encourage energy export for the Azerbaijan economy. It is important not only to ensure energy exports, but also to ensure the security of energy supply, which will make this energy export permanent.

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