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THE RELATION BETWEEN NATURAL GAS CONSUMPTION AND ECONOMIC GROWTH: OECD COUNTRIES

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ABSTRACT

In this study the relation between natural gas consumption and economic growth was analyzed for 20 OECD countries in such a way that covers the years between 1982 and 2012. First of all, cross sectional dependency between the countries was examined. By the findings obtained, as a result of cross sectional dependency unit root test and cointegration tests are required to be second generation tests. Therefore, second generation unit root test (Pesaran CADF (2007)) and cointegration test (Westerlund Durbin-H (2008)) were used. In the results revealed a cointegration relation between natural gas consumption and economic growth was found. And in the last stage of the study the estimation of the long term cointegration coefficients was predicted by the help of Common Correlated Effect (CCE). In the results acquired natural gas consumption affects economic growth positively.

Keywords: Panel Data Analysis, Economic Growth, Natural Gas, OECD.

1. INTRODUCTION

The historical process of natural gas consumption goes back to very old times. It is recorded that in Sichuan China at A.C. 150 in the process of precipitation of salt, natural gas coming out of the underground reserves were carried by bamboo pipes. Marco Polo found the unblinking natural gas flames in Zoroastrian fire temple in Baku. Natural gas discovered in England in 1659 became common in Europe in 1790. The first usage areas of natural gas in Europe were in the illumination of streets and houses, in the operation of internal combustion engines. In 1920s as this pipe line transportation became widespread, natural gas consumption increased. Since Second World War until today, its usage continued incrementally (Chamber of Mechanical Engineers, 2006).

Besides China and Middle East being the main regions increasing the global natural gas demand, they limited their cycles in electricity sector as new regulations step in in the USA. Thus, it is forecasted that natural gas shall increase to first level of fuel in the OECD energy component in 2030s. While natural gas consumption, even though Europe forms an exception, increases in all but every region in contrast to petrol, almost 60% of the growth in global supply is constituted by unconventional natural gas (World Energy Outlook, 2014).

Natural gas ranks third after petrol and coal in the energy resources consumed in the world. Because of factors such as less production cost than petrol, less pollution to the environment natural gas consumption increases incrementally. Consumption of coal whose production is cheaper compared to natural gas decreases gradually because of its damage to the environment.

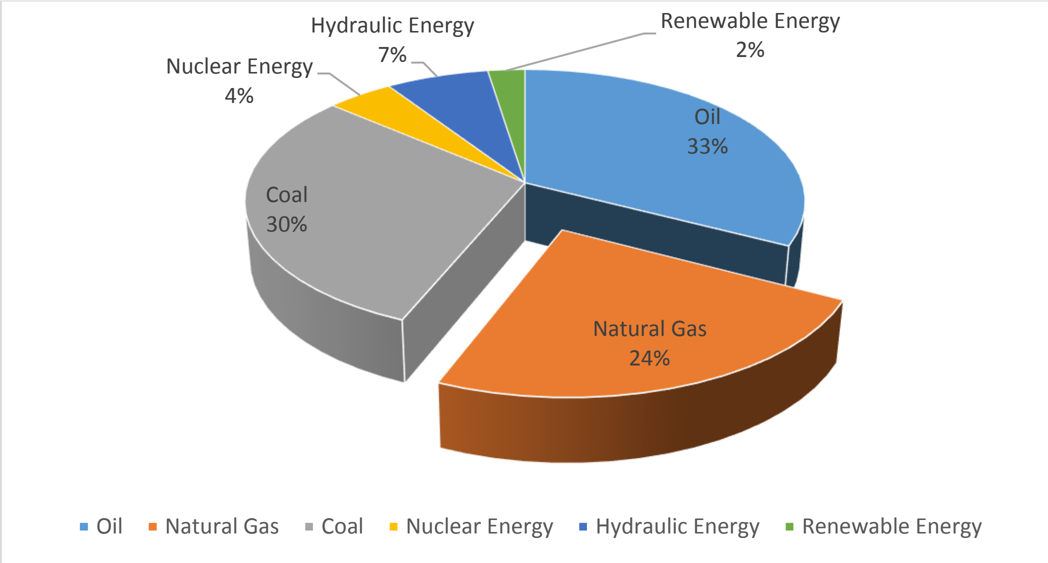
This study consists of five sections. In the study the first section is introduction, and in the second section information about natural gas consumption in Turkey and OECD countries was given, in the third section literature summary was submitted, in the fourth section methods used and empirical findings were given place and in the fifth section the findings acquired were evaluated and suggestions were made.

2. NATURAL GAS CONSUMPTION IN TURKEY AND OECD COUNTRIES

Since 1990s while a fall in the increase rate of energy demand of developed countries

is observed, especially the rate of increase in demand of developing countries continues. Therefore, in the forthcoming 30-year period of time energy demand increases by nearly 17% in OECD countries, and in non-OECD countries it is anticipated to increase by approximately 90%. As the economy of China and India that are non-OECD countries grows rapidly, energy consumption as well increases promptly in parallel to this. Hence, it shall cause an increase in the demand of Asia continent for energy sources (Yılmaz, 2012:34).

Figure 1. Distribution of Energy Consumption in the World According to Resources (Mteb, 2014, %)



Source: BP Statistical Review

On Figure 1 distribution of energy consumption in the world in 2014 according to resources is introduced. 33% of the energy consumed in the world. This is followed by coal by 30% and natural gas follows that by 24%. The rate of consumption of nonrenewable energy sources such as oil, coal and natural gas over the energy consumption of the world is 87%. This number is an indicator that in case sufficient importance is not given to the renewable energy in the coming years, there may occur energy crises.

Table 1. Natural Gas Production Cost and Sales Price ($ per Million Btu, 1949-2011)

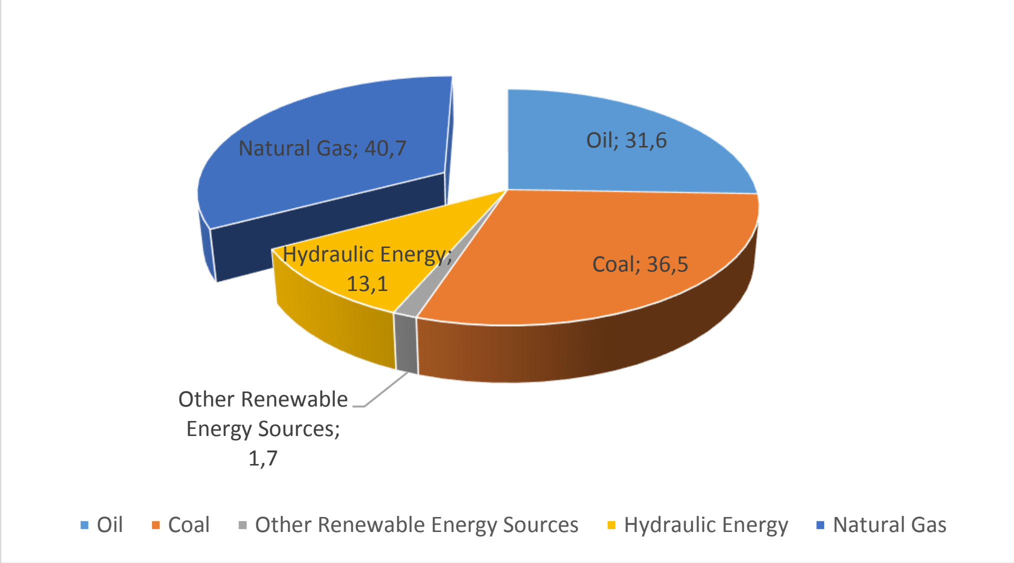
Year		1949	1950	1960	1970	1980	1990	2000	2005	2006	2007	2008	2009	2010	2011
Natural Gas	Production Cost	0.37	0.43	0.68	0.63	3.03	2.14	3.75	6.64	5.61	5.34	6.67	3.04	3.68	3.18
	Sales Prices	1.02	3.00	9.61	15.31	67.14	44	83.77	138.74	120.15	118.83	154.96	72.4	90.42	84.22

Note: Production cost and sales price are by fixed prices of the year 2005.
Source: EIA (U.S. Energy Information Administration)

Natural gas production cost and sales price are given on Table 1. In 1949, production cost of natural gas is very low compared to other years. As a result of the petrol crises experienced in 1970s, sudden increases happened in the production cost and sales prices of fossil energy resources. From 1949 through 2011, natural gas has been a fossil energy resource whose both production cost and sales prices changed most. Production cost of natural gas increased almost nine-fold, sales price increased more or less twenty-fold. In 2008 it is seen that sales price of natural gas hit the ceiling because of the worldwide crisis.

While the most consumable energy matter in Turkey is coal in the recent years, after 2007 natural gas took the place on top. The reason for this is that the energy consumed in sectors is natural gas-indexed. Consumption of natural gas that is an energy cheaper than petrol increased by years in Turkey.

Figure 2. Distribution of Energy Consumption in Turkey According to Resources (Mteb, 2014)



Source: BP Statistical Review

Distribution of energy resources consumed in 2014 in Turkey is displayed on Figure 2. Natural gas consumption is the most consumed energy resource by 40, 7 Mteb. This is followed by coal by 36,5 Mteb and Petrol follows that by 31,6 Mteb. Hydraulic energy which is a clean and renewable energy ranks fourth with 13,1 Mteb.

3. LITERATURE REVIEW

Energy plays a crucial role for growing and developing countries. Even though in the literature there are a great number of studies analyzing the relation between energy consumption and economic growth, the number of studies analyzing the relation between natural gas consumption and economic growth is relatively low.

Kraft and Kraft (1978) that is the first study analyzing the relation between energy consumption and economic growth empirically, used energy consumption and GDP data for the period between 1947 and 1974. In the results obtained they determined a one way causality relationship towards energy consumption.

In the literature there are studies carried out for one country and for many countries. Studies carried out for one country: Khan and Ahmad (2008), Hu and Lin (2008) Ighodaro (2010), Payne (2011), Lim and Yoo (2012), Shahbaz et al. (2013), Saboori and Sulaiman (2013), Shahbaz et al. (2014), Ferhani vd. (2014), Solarin and Shahbaz (2015), Rafindadi and Ozturk (2015), Abid and Mrahihi (2015).

Some of the studies carried out for one country are as follows: Balitskiy et al (2016) that is one of the studies carried out for many countries analyzed the relation between economic growth and natural gas consumption of 26 EU countries for the period between 1977 and 2011. As a result of the analyzes performed by the help of Panel Cointegration Test (Pedroni) and VECM Granger Causality Test cointegration relation was found and bi-directional causality relation was determined between natural gas consumption and economic growth. Kum et al (2012) analyzed G-7 countries for the period between 1970-2008. Hacker and Hatemi (2006) in the findings obtained by the help of Bootstrap Causality Test there is a bi-directional causality relationship between natural gas consumption and economic growth in France, Germany and USA, in Italy causality relationship from natural gas consumption to economic growth and in England causality relationship from economic growth to natural gas consumption were determined. Apergis and Payne (2010) examined 67 countries for the period between 1992 and 2005. In the study that used Panel Cointegration Test (Pedroni), Panel FMOLS and VECM Granger Causality Test, cointegration relationship between natural gas consumption and economic growth was determined. Coefficient of elasticity of natural gas is found to be 0,652 and a bi-directional causality relation between natural gas consumption and economic growth.

Bildirici and Bakirtas (2014) analyzed BRICTS countries (Brazil, Russia, India, China, Turkey and South Africa) for the period between 1980 and 2011. In the results acquired by using ARDL and Panel Granger Causality Test, bi-directional causality test in Brazil, Turkey and Russia was ascertained. Solarin and Ozturk (2016) analyzed the relation between natural gas consumption and economic growth of the OPEC countries for the period between 1980 and 2012. In the findings obtained by the help of Panel Granger Causality Test natural gas consumption is the causative of economic growth in Iraq, Kuwait, Libya, Nigeria and Saudi Arabia. And in Morocco, Iran, United Arab Emirates and Venezuela economic growth is the causative of natural gas consumption. In Ecuador bi-directional causality relation between economic growth and natural gas consumption was identified.

Studies using panel data econometrics are generally realized for developed countries. In the light of the findings acquired in the literature, the conclusion of a positive relation between natural gas consumption and economic growth is reached.

4. DATA SET AND METHOD

In this study Real GDP (constant 2005 US$) and natural gas consumption ((billion cubic feet) data in 20 OECD countries[1] were used. By taking the logarithms of the series they are included in the model. Real GDP data are obtained from World Bank (World Bank Indicator), and natural gas consumption data were obtained from EIA (U.S. Energy Information Administration).

4.1 Cross Sectional Dependency Tests

In the study, in order to identify the selection of unit root tests to be used, cross sectional dependency is required to be tested. If there is no cross sectional dependency in the panel data, first generational panel unit root tests, if there is cross sectional dependency, second generation panel unit root tests should be used. Methods used to test cross sectional dependency in panel data sets are Breusch-Pagan (1980) $CDLM_1$ test, Pesaran et al (2004) $CDLM_2$ test and Pesaran et al. (2008) Bias Adjusted CD test.

H0: There is no cross sectional dependency.

H1: There is cross sectional dependency.

In the results to be obtained from the Breusch-Pagan (1980) $CDLM_1$ test, Pesaran et al (2004) $CDLM_2$ test and Pesaran et al. (2008) Bias Adjusted CD test, when the probability values are less than 0.05 then H0 is rejected in the 5% significance level and the hypothesis that states there is cross sectional dependency between the units establishing the panel is accepted.

$$LM_1 = T\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}^2 \qquad (1)$$

$\hat{\rho}_{ij}$: shows the estimates of cross sectional correlations between residuals.

$$\hat{\rho}_{ij} = \hat{\rho}_{ji} = \frac{\sum_{t=1}^{T}\hat{v}_{it}\hat{v}_{jt}}{(\sum_{t=1}^{T}\hat{v}_{it})^{1/2}(\sum_{t=1}^{T}\hat{v}_{jt})^{1/2}} \qquad (2)$$

There is no cross sectional dependency under H_0 hypothesis. Under H_0 hypothesis N is fixed and T goes $\rightarrow\infty$. There is Statistical N(N-1)/2 degrees of freedom and Chi-square asymptotic distribution. LM_1 test is used when time dimension is greater than the cross sectional dimension (T>N).

$$CD_{LM2} = \left(\frac{1}{N(N-1)}\right)^{1/2}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}(T\hat{\rho}_{ij}^2 - 1) \qquad (3)$$

CD_{LM2} statistics Pesaran (2004) has standard normal distribution under H_0 hypothesis and in cases of $T\rightarrow\infty$ and $N\rightarrow\infty$. CD_{LM2} test is used when time dimension is greater than the cross sectional dimension (T>N).

$$\text{Bias adjusted CD test} = \left(\frac{2}{N(N-1)}\right)^{1/2}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}^2\,\frac{(T-K-1)\hat{\rho}_{ij}-\hat{\mu}_{Tij}}{v_{Tij}} \sim N(0,1) \qquad (4)$$

In the equation $\hat{\mu}_{Tij}$ signifies mean, v_{Tij} signifies variance and the test statistic to be obtained shall have asymptotic standard normal distribution. Bias adjusted CD test is used when cross sectional dimension is greater than time dimension (N>T) (Pesaran et al., 2008).

[1] Australia, Austria, Belgium, Canada, Finland, France, Germany, Ireland, Italy, Japan, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Spain, Switzerland, Turkey, United Kingdom, United States.

Table 2. Cross Sectional Dependency Tests Results for OECD Countries

Regression Model: $LGDP_t = \alpha_0 + \alpha_1 LDGT_t + \varepsilon_t$ **Tests**	**LGDP**	**LDGT**	**Panel**
CDLM₁ (Breusch ve Pagan, 1980)	430,030 [0,000]	465,743 [0,000]	1.012,138 [0,000]
CDLM₂ (Pesaran, 2004 CDLM)	12,313 [0,000]	14,145 [0,000]	42,175 [0,000]
Bias-adjusted CD test (Peseran vd., 2008)	8,586 [0,000]	2,292 [0,011]	162,030 [0,000]

Note: Table values give CD test statistics, parenthetical probability values.

On Table 2 cross sectional dependency results are given. As the time dimension is greater than cross section (31>20), CDLM1 (Breusch and Pagan, 1980) and CDLM2 (Pesaran, 2004 CDLM) are the tests that require to be applied. According to the results acquired, H0 hypothesis is rejected and H1 hypothesis that stating there is cross sectional dependency is accepted. Since the cross sectional dependency is determined, both unit root test and cointegration test should be of second generation tests. Therefore second generation unit root tests CADF and CIPS unit root tests and Westerlund Durbin Hausman (2008) Panel Cointegration Test were used.

4.2 Panel Unit Root Test

In order to analyze the unit root existence of time series data heterogeneous panel unit root test developed by Im, Pesaran and Shin (IPS) can be used. This test is based on extended Dickey-Fuller (ADF) regression.

$$\Delta x_{it} = z_{it}'\gamma + \rho_i x_{it-1} + \sum_{j=1}^{k_i} \phi_{ij}\Delta x_{it-j} + \varepsilon_{it} \quad (5)$$

Here, k_i is lag length, z_{it} is characteristic terms and ρ_i is first degree autoregressive parameters specific to the section.

Standard IPS test may cause fake inferences in cases of external economies or shocks. Therefore, cross sectional extended IPS test suggested by Pesaran (2007) is used. This test is ADF regression that is extended with cross sectional average of lag levels and the first difference of indivdual series (Herzer, 2014). Accordingly, cross sectional extended ADF (CADF) regression;

$$\Delta x_{it} = z_{it}'\gamma + \rho_i x_{it-1} + \sum_{j=1}^{k_i} \phi_{ij}\Delta x_{it-j} + \alpha_i \bar{x}_{t-1} + \sum_{j=0}^{k_i} \eta_{ij}\Delta \bar{x}_{t-j} + \nu_{it} \quad (6)$$

Here $\bar{x}_t$ is cross sectional average of x_{it} and $\bar{x}_t = N^{-1}\sum_{i=1}^{n} x_{it}$. By taking the arithmetic average of CADF statistics calculated for each section, it is decided that there is unit root throughout the panel.

$$CIPS = t - bar = N^{-1}\sum_{i=1}^{N_i} t_i \quad (7)$$

Here t_i is EKK t- rate of ρ_i in equation 11. The critical value is compared with the table values in Pesaran (2007) (Direkci and Govdeli, 2015:386-387).

Table 3: CIPS Unit Root Test Results

	Constant				**Constant and trend**			
	lngdp	**lndgt**	**Δlngdp**	**Δlndgt**	**lngdp**	**lndgt**	**Δlngdp**	**Δlndgt**
	cadf stat	**cadf stat**	**cadf stat**	**cadf stat**	**cadf stat**	**cadf stat**	**cadf stat**	**cadf stat**
CIPS	**-1.933**	**-1.964**	**-2,841**	**-3,727**	**-2.300**	**-2,036**	**-2,835**	**-3,741**

Note: for CIPS for the critical table values N=49 T=33, on pg. 280 on Table IIb constant is -2,23 at 1% and 2,11 at 5%, and pg. 281 on Table IIc trend is -2,73 at 1% and -2,61 at 5%. Maximum lag length is taken as 3 and optimum lag lengths are determined according to Schwarz information crtieria.

On Table 3 results of constant CIPS Unit Root Test are presented. In the results acquired it is found that that in both constant and constant and trend the level of series is unit rooted, and in the first differences the series are stable. After determining that the series I (1) are stable in I (1) level, homogenous test for the cointegration coefficients was applied.

4.3. Results of Homogenous Test for the Cointegration Coefficients

it is considered quite important In panel data method to select cointegration test method accurately regarding the significance of analyses. Swamy (1970) identified the homogenous of slope coefficients in cointegration equations in his study. By the help of delta Test developed by Pesaran and Yamagata (2008) it is tested whether the long term parameters are homogenous or not. In this test:

In a general cointegration equation as such, it is tested whether β_i slope coefficients are different or not between cross sections. The hypotheses of the test are:

$$Y_{it} = \alpha + \beta_i X_{it} + \varepsilon_{it} \qquad (8)$$

H_0: $\beta_i = \beta$ Slope coefficients are homogenous.

H_1: $\beta_i \neq \beta$ Slope coefficients are heterogeneous.

Estimation is realized firstly by panel EKK (Ordinary Least Squares) and then by Weighted Fixed Effect Model and the required test statistics are formed. Pesaran and Yamagata (2008) developed two different test statistics in order to be able to test the hypotheses.

For big samples: $\tilde{\Delta} = \sqrt{N}\frac{N^{-1}\tilde{S}-k}{\sqrt{2k}}$ (9)

For small samples: $\tilde{\Delta}_{adj} = \sqrt{N}\frac{N^{-1}\tilde{S}-k}{\sqrt{Var(t,k)}}$ (10)

Here N indicates cross section number, S indicates Swamy test statistics, k shows explanatory variable number, and Var(t,k) indicates standard error. When the probability values obtained is smaller than 0.05, H_0 hypothesis is rejected in the 5% significance level, H_1 hypothesis is accepted. Therefore it is decided that the cointegration coefficients are not homogenous (Pesaran and Yamagata, 2008).

Table 4. Homogenous Test Results for OECD Countries

	Test stat	p-value
$\tilde{\Delta}$	57,719	0,000
$\tilde{\Delta}_{adj}$	60,631	0,000

Table 4 shows the homogenous test results. In the results acquired H0 is rejected and the alternative hypothesis is accepted. Thus it is concluded that the slope coefficients are heterogeneous. As a result of the slope coefficients to be heterogeneous Durbin-H Cointegration Test was applied.

4.4. Durbin-H Cointegration Test

Durbin-H Cointegration Test enables panel cointegration analysis provided that dependent variable is I (1) and in case of the independent variables are I(1) or I(0), and it considers the common factors (Westerlund, 2008).

Westerlund (2008) analyzed the existence of cointegration relation in Durbin-H Cointegration Test method by two tests. One of them is Durbin-H panel test, and the second one is Durbin-H group test. Westerlund (2008) allows for the differentiation of autoregressive parameter between sections in Durbin-H group test. In this test H0 hypothesis expresses that there is no cointegration and H1 hypothesis expresses the existence of cointegration relation for the least number of sections. Westerlund (2008) accepts that the Durbin-H panel test autoregressive parameter is the same for all sections. H0 hypothesis is that there is no cointegration and H1 hypothesis indicates that there is a cointegration relation for the entire panel.

Panel data model is accepted as follows:

$$y_{it} = \alpha_i + \beta_i x_{it} + z_{it} \qquad (11)$$

$$x_{it} = \delta x_{it-1} + w_{it} \qquad (12)$$

z_{it} distribution enables common factors. It is assumed that it is compatible with the equation set which allows for cross sectional dependency stated below.

$$z_{it} = \lambda_i' F_t + e_{it} \qquad (13)$$

$$F_{jt} = p_j F_{jt-1} + u_{jt} \qquad (14)$$

$$e_{it} = \phi_i e_{it-1} + v_{it} \qquad (15)$$

For every j, $p_j < 1$.

Hereby F_t is k-dimensional common factor vector with F_{jt} (j=1…k). And λ_i is the coherent vector of factor loads.

In order to form Durbin-H test primarily the difference of the equation number 15 is taken.

$$\Delta z_{it} = \lambda_i' \Delta F_t + \Delta e_{it} \quad (16)$$

If Δz_{it} is known, λ_i and ΔF_t can be estimated. However Δz_{it} is unknown. Therefore, in place of the EKK estimate written on equation 15, basic components analysis is required to be applied.

$$\Delta \hat{z}_{it} = \Delta y_{it} - \hat{\beta}_i \Delta x_{it} \quad (17)$$

ΔF_t, the main component of F_t is obtained by calculating $\sqrt{T-1}$ times the eigenvector compatible with the greatest eigenvalue of the (T-1)x(T-1) dimensional $\Delta\hat{z}\Delta\hat{z}'$ matrix. Hereby, $\hat{\lambda}$ is calculated by $\hat{\lambda} = \frac{\Delta\hat{F}'\Delta z}{T-1}$.

First difference of the residuals (resid) can be stated as follows.

By calculating $\widehat{\Delta F}$ and $\hat{\lambda}_i$, the difference of the residuals can be calculated as below:

$$\Delta \hat{e}_{it} = \Delta \hat{z}_{it} - \lambda_i' \Delta \hat{F}_t \quad (18)$$

$$\hat{e}_{it} = \sum_{j=2}^{t} \Delta \hat{e}_{ij}$$

H_0 hypothesis stating there is no cointegration is asymptotic equivalent by testing whether $\phi_i = 1$ or not.

$$\hat{e}_{it} = \phi_i \hat{e}_{it-1} + error\ term \quad (19)$$

In order to form Durbin-H test, another required estimator is Kernel estimator.

Kernel estimator can be defined as below:

$$\widehat{\omega}_i^2 = \frac{1}{T-1} \sum_{j=M_i}^{M_i} \left(1 - \frac{j}{M_i+1}\right) \sum_{t=j+1}^{T} \hat{\mu}_{it} \hat{\mu}_{it-1} \quad (20)$$

EKK residuals obtained from equation 20 is $\hat{\mu}_{it}$. M_i is band width parameter. The value of $\widehat{\omega}_i^2$is compatible with the estimate of $\widehat{\omega}_i^2$ that is long term variance of $\hat{\mu}_{it}$. The corresponding Simultaneous variance estimate can be stated as $\hat{\sigma}_i^2$. After making these estimates two variance rates can be calculated:

$$\hat{S}_i = \frac{w_i^2}{\sigma_i^4} \text{ve} \hat{S}_n = \frac{w_n^2}{(\sigma_n^2)^2} \quad (21)$$

Here;

$$\widehat{\omega}_i^2 = \frac{1}{n} \sum_{i=1}^{n} \widehat{\omega}_i^2 \text{ve} \hat{\sigma}_i^2 = \frac{1}{n} \sum_{i=1}^{n} \hat{\sigma}_i^2\text{'dir.} \quad (22)$$

After making these calculations, Durbin-H tests can be estimated from the following formulations:

$$DH_G = \sum_{i=1}^{n} \hat{S}_i \left(\tilde{\phi}_i - \hat{\phi}_i\right)^2 \sum_{t=2}^{T} e_{it-1}^2; \quad (23)$$

$$DH_p = \hat{S}_n \left(\tilde{\phi}_i - \hat{\phi}_i\right)^2 \sum_{i=1}^{n} \sum_{t=2}^{T} e_{it-1}^2. \quad (24)$$

The results of Durbin-H Panel Cointegration Test that considers the dependency of cross section and heterogeneousness of cross sectional slope parameters are given below.

Table 5. The results of Durbin-H Panel Cointegration Test for OECD countries

Testler	Panel
Durbin-H Goup Statistic	2,186
	[0,014]
Durbin-H Panel Statistic	3,061
	[0,001]

Note: Table values give test statistics, parenthetical probability values.

On Table 5 panel cointegration relations of the OECD countries are given. As is seen on the Table as well H_0 hypothesis that there is no cointegration relation in Durbin-H Group Statistics and Durbin-H Panel Statistics is rejected. According to this, there is I(1) cointegration relation in OECD countries.

4. 5. Estimation of Long Term Cointegration Coefficients

After applying Durbin-H Cointegration Test, in order estimate the final unbiased coefficients of this relation, Panel CCE estimator was used. The findings acquired are given below.

Table 6. The Results of Cointegration Coefficient Estimation for OECD Countries

	Cointegration Coefficient	Test Statistic
PANEL	0,062**	1,92

Note: *, ** state significance levels at 1%, 5% respectively.

Table 6 gives the Cointegration Coefficient Estimation results for OECD Countries. In the findings obtained elasticity coefficient was estimated as 0,062 and it is statistically significant at 5% level. The findings obtained are compatible with our expectations and Balitskiy et al. (2016) and Kum et al. (2012).

5. CONCLUSION

In the study the relation between natural gas consumption and economic growth is analyzed. In this respect, it is analyzed for 20 OECD countries covering the years between 1982 and 2012. Primarily, cross sectional dependency of the series and panel are tested. Cross sectional dependency tests are applied by Breusch-Pagan (1980) $CDLM_1$ test, Pesaran et al. (2004) $CDLM_2$ test and Pesaran et al. (2008) Bias Adjusted CD test. In the results obtained it is determined that there is cross sectional dependency in both between the series and panel wide. Therefore, it is required that the unit root rest and cointegration test to be used are second generation tests. By the help of Pesaran CADF(2007) test which is one of the second generational unit root tests the stagnation of the series are analyzed. It is determined that the series contain unit root in the level, and as result of taking their first differences they become stagnant.

After the series become stagnant in the first difference, long term relations of the series are examined with cointegration test. By the help of Westerlund (2008) Durbin-H cointegration test which is one of the second generation cointegration tests, cointegration analysis is made between variables. In the findings obtained, it is concluded that the series shall move together in the long term.

After finding cointegration relation, the estimate of long term cointegration coefficients is studied with Common Correlated Effect (CCE). According to the results obtained elasticity coefficient is estimated as 0,062 and it is statistically significant at 5% level.

According to the findings obtained, the importance of natural gas consumption in OECD countries continue increasingly. As political suggestions; usage of natural gas reserves more cheaply and more efficiently by developing new technologies, reduction of usage of fossil fuels by giving weight to energy efficiency, increasing the importance given to renewable energy resources, direction of countries that are poor in fossil fuels as Turkey to alternative energy resources are required.

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