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Effects of Oil Prices on Capacity Usage: Panel Data Analysis for G-7 Countries

Petrol Fiyatlarının Kapasite Kullanımı Üzerindeki Etkileri: G-7 Ülkeleri İçin Panel Veri Analizi

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Abstract: The fact that energy has become an indispensable part of human life is an important part of economic development and it is accepted by all. The high demand for oil by many countries, especially for social development and industrialization efforts, reveals the strong link between energy and development. As a result of the rapid increase in the dependence on oil, which has an important place among the primary energy sources, the world economy has been hit hard by the oil crises. In this respect, the dependence of the countries that want to continue their economic development and achieve their industrialization targets on energy consumption has played an important role. Increasing energy costs have hampered the economic growth of countries. Economic stagnations following the oil shocks in the 1970s led to studies on the relationship between oil prices and many macroeconomic variables such as economic growth, inflation and employment. In this respect, this study analyses the effects of imported crude oil prices, economic growth, unemployment and capital accumulation usage on capacity utilization using panel data analysis considering horizontal cross-sectional dependence by using annual data of G-7 countries (Canada, France, Germany, Italy, Japan, UK and USA) for 1999-2017 period. Stability of the series was examined by Bootstrap test which is one of the second-generation unit root tests which take horizontal dependence into account. The existence of cointegration relationship was examined by Westerlung-Edgerton LM bootstrap test and AMG 2009 (Augmented Mean Group estimator) method was used to estimate long-term coefficients. The results of the study show that while economic growth has positive effects on capacity utilization, imported crude oil prices, unemployment and capital use have negative and statistically significant effects.

Structured Abstract: Petroleum, which is one of the main energy sources, is among the most important raw materials of the modern economy. Therefore, almost every sector in the economy becomes directly or indirectly dependent on oil. Changes in oil prices affect macroeconomic variables, lead to changes in input costs and create an inflationary environment. The increase in oil prices narrows the countries' economy through exports, increases the foreign trade deficit and adversely affects economic growth. There are various mechanisms that will reveal the negative effects of oil prices on economic activity.

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The rise in the price of oil affects economic activity as it leads to a decline in potential output in production. As a result of rising oil prices, the increase in production costs reduces efficiency and growth of output. The rise in oil prices has an impact on economic activity due to the deterioration in the foreign trade balance of oil importing countries. Due to the effect of real balancing, an increase in oil prices will cause an increase in money demand. The increase in interest rates as a result of the inability of the money authority to meet the demand for money will cause a decrease in economic activity. Increase in oil prices will create inflation. The increase in inflation will cause the price-wage increase spiral to start. Consumption may decrease due to lower disposable income and higher costs of investments. The permanent increase in price increases will lead to a decrease in employment.

Some recent developments that negatively affect oil prices are as follows:

- Violent incidents such as the interruption of Iraq's oil exports due to war and sabotage of pipelines raise concerns in the oil markets,
- Concerns about the weakness of crude oil supply and the expectation of a new political instability in the Middle East,
- The halt in production due to political instability in Venezuela and the disaster events including storms, cyclones and flooding in the US,
- The increasing dependency of developed countries and developing countries on oil, especially USA, China and India.

Changes in oil prices create uncertainty and this uncertainty environment causes investments to be postponed and the economies are lead to stagnation. In this context, it is important to estimate the possible effects of increases and decreases in oil prices on macroeconomic balances. In this respect, this study analyses the effects of imported crude oil prices, economic growth, unemployment and capital accumulation usage on capacity utilization. The data of G-7 countries covering 1999-2017 were examined within the context of the study. The variables are collected from IEA and World Bank databases.

First the Delta test developed by Pesaran and Yamagata (2008) was used in the study. Subsequently, the dependence between the horizontal sections forming the panel was determined by Pesaran et al. (2008) CDLMadj (Adjusted Cross-sectional Dependence Lagrange Multiplier) test. The stability of the series was examined by Smith et al. Bootstrap (2004) test which is one of the second generation unit root tests which takes into account the horizontal cross-sectional dependence and common factors. The existence of cointegration relationship was examined by Westerlung-Edgerton (2007) LM bootstrap test. After cointegration analysis, AMG (Augmented Mean Group estimator) method was used to estimate long term coefficients.

The results of the study show that economic growth has a positive; imported crude oil prices, unemployment and capital use have negative but statistically significant impact on capacity utilization. When the cointegration coefficients estimated for the panel data are analyzed, a 5 percent increase in the crude oil prices imported by countries reduces capacity utilization by -0.0008 units.

Keywords: Economic Growth, Unemployment, Oil Prices, Capital Accumulation, Capacity Utilization

Öz: Enerjinin insan yaşamının vazgeçilmez bir parçası haline gelmesi, ekonomik kalkınmanın önemli bir parçasıdır ve herkes tarafından kabul edilmektedir. Birçok ülkenin, özellikle sosyal kalkınma ve sanayileşme çabalarına yönelik yüksek petrol talebi, enerji ve kalkınma arasındaki güçlü bağı ortaya koymaktadır. Petrol birincil enerji kaynakları arasında önemli bir yere sahip olduğu ve petrole olan bağımlılık son dönemde hızla arttığından dolayı dünya ekonomisi karşılaşılan petrol krizlerinden fazlaca etkilenmiştir. Bu gelişmede ülkelerin ekonomik gelişme ve sanayileşme hedeflerini sürdürme amacıyla enerji tüketimine bağımlı olmaları ön plana çıkmaktadır. Enerji maliyetlerinin artması ise bu ülkelerin ekonomik büyüme hızlarını yavaşlatmıştır. 1970'li yıllardaki petrol şoklarını takip eden dönemde görülen ekonomik durgunluk dönemleri, petrol fiyatları ile ekonomik büyüme, enflasyon, istihdam gibi birçok makroekonomik değişken arasındaki ilişkileri araştıran çalışmaların yapılmasına neden olmuştur. Bu çerçevede, bu çalışma, G-7 ülkeleri (Kanada, Fransa, Almanya, İtalya, Japonya, İngiltere ve ABD) için ithal edilen ham petrol fiyatları, ekonomik büyüme, işsizlik ve sermaye birikimi kullanımının kapasite kullanımı üzerindeki etkilerini 1999-2017 dönemine ait yıllık veriler kullanılarak yatay kesit bağımlılığını göz önünde bulunduran panel veri analizi yöntemiyle analiz etmektedir. Serilerin durağanlığı; yatay kesit bağımlılığını dikkate alan ikinci kuşak birim kök testlerinden Bootstrap

testiyle incelenmiştir. Eşbütünleşme ilişkisinin varlığı ise Westerlung-Edgerton LM Bootstrap testiyle incelenmiş ve uzun dönem katsayılarını tahmin etmek için AMG 2009 (Arttırılmış Ortalama Grup tahmincisi) yöntemi kullanılmıştır. Çalışma sonuçları ekonomik büyümenin kapasite kullanımı üzerinde pozitif etkileri bulunurken ithal edilen ham petrol fiyatları, işsizlik ve sermaye kullanımının ise negatif ve istatistiki olarak anlamlı etkilerinin bulunduğunu göstermektedir.

Anahtar Kelimeler: Ekonomik Büyüme, İşsizlik, Petrol Fiyatları, Sermaye Birikimi, Kapasite Kullanımı

Introduction

With the rapidly increasing population and developing technology, the need for energy is increasing all over the world. Energy, which has affected all of our lives, provides comfort to humanity, but also raises many problems due to the limited resources. World energy production and consumption is increasing every year and consumption rates are considered as a development indicator for countries. In this respect, today's economic policies mostly focus on energy resources (Şener & Savrul, 2009: 58).

Energy plays a decisive role in the economic and political decision-making mechanisms of countries. The scarcity of resources in fossil fuels and technological deficiencies have increased the importance of energy, especially oil, in the economy (Gökçe, 2014: 144). No energy source has ever been involved in human life as much as oil. Oil is used in the production of almost everything we use in daily life, from polyester to plastic, from pharmaceutical raw materials to make-up materials, from agriculture to computer chips. In addition, petroleum products obtained from the processing of crude oil in refineries constitute an energy source that humanity cannot give up for today and the alternative of oil is still not available (Müsiad, 2006: 8).

Increases in the price of oil in recent years have caused legitimate concerns, especially for oil importing countries and consumers. A wide range of analyzes and scenarios are produced for the future course of oil prices. Since energy security has become an inseparable element of economic security and national security, the future of oil prices is of great interest to everyone (DPT, 2007: 72). In this respect, the aim of this study is to reveal the effects of imported crude oil prices, economic growth, unemployment and capital accumulation usage on capacity utilization using panel data analysis.

1. Oil as an Energy Source

Oil has been decisive in the foreign and national security policies of the states since its commercial use. Until the middle of the 19th century, oil production was continued with primitive methods and produced and used as asphalt, crude oil and oil. After World War I, oil gained importance in the world, with the expansion of automobiles and other motor vehicles, the need for oil has gradually increased. In 1960, the Organization of Petroleum Exporting Countries (OPEC), the world's most important producer organization, was established. In the world and in the EU countries, until the first oil crisis in 1973, inconsistent behaviour in energy consumption and an extremely dependent structure on imports were observed, with the oil crisis, countries have realized that there is a need for strategies to balance energy supply and demand, which are highly affected by speculative events and highly sensitive to political and economic developments. In the 1980s, the interest in the environment as a new phenomenon, especially in the EU, brought about the rational use of oil and its products and accelerated the search for alternative products. With the Gulf crisis, the world started to look for new oil resources. With the disintegration of the former Soviet Union, oil deposits around the Caspian Sea became open. Oil resources in the Caspian region are one of the most researched places in the world and giant oil companies operate here (DPT, 2007: 71).

Today, oil is one of the determinants of economic development and is one of the main inputs in terms of both economic and social factors. Oil is considered as an indispensable resource for

fulfilling economic factors such as industrialization, economic growth and increasing per capita income level for the realization of economic development (Karagöl et al, 2007: 72). As of 2017 data, oil met 34.2% of the world's energy demand and 23.4% of the natural gas. To date, according to various projections by international institutions and organizations such as the International Energy Agency and the US Energy Information, oil and natural gas are expected to maintain their share in primary energy consumption in the long run (Türkiye Petrolleri, 2019: 4).

Petroleum is the main energy source of the transport sector and has the largest share of primary energy consumption in the world. As of the end of 2015, 33% of the world's energy demand was met by oil and 52.8% of this was demanded by the transportation sector. Oil demand is expected to rise by 21% by 2035, oil use in transportation is expected to decline from 94% to 89.4%, while the energy used for transportation is expected to decrease from 18% to 17% (Aykırı, 2018: 50).

Today, global energy policies are predominantly determined by oil and natural gas. The regions that form the basis of these policies are the Middle East, Central Asia and the Caspian regions, which have the largest share in reserves. There is significant competition in the exploration, production and transportation of oil and natural gas to international markets (Bayraç, 2009: 115). Proven oil reserves as of 2017 are shown in the figure below;

Figure 1. Map of countries with proven oil reserves 2017 (Million Barrels of Oil)

Resource: Energy Information Administration (EIA), 2019.

As of 2017, world oil reserves amounted to 1.65 trillion barrels. The region where the industry is most active is still North America. Oil reserves in the US continue to increase. When the global oil reserves are evaluated, it is seen that the Middle East region has 47.6% of the world oil reserves. The Middle East is followed by Central and South America with a reserve of 19.5% and North America with a reserve of 13.3%. In addition, Eurasia 8.5%, Africa has a share of 7.5%, Asia Pacific 2.8% and Europe 0.8% in global oil reserves (Türkiye Petrolleri, 2019: 6).

Proven extractable oil reserves are largely in Saudi Arabia, Iran and Iraq, and natural gas reserves are in Russia, Iran and Qatar. When we examine the distribution of oil in the world, a very

irregular distribution is observed, and this irregular distribution is more effective in terms of world energy policies rather than scarcity or abundance of oil resources.

2. Development of Oil Prices

Oil is one of the most advanced energy sources and has an advanced distribution network. However, oil and natural gas prices, which are facing more intense demand, are increasing day by day. Oil has a share of 40% and natural gas has a share of 23% in the world's primary energy consumption and it is considered to be the most limited energy sources with today's speed of use. According to the data of the World Energy Organization, 47% of the oil reserves so far have been depleted. In addition, two-thirds of the oil produced in 2005 has been the subject of trade between different countries and one of the determinants of today's global economic policies is oil. These fuels, which are in the group of consumable energy sources, also known as capital energies, are the main conventional sources of today and are in danger of being exhausted for the future with their known limited reserves (Şimşek, 1998: 15).

The controversy over the future of oil and the oil economy is on the world agenda after September 11, 2001, for three main reasons. First, America is occupied by Afghanistan, a gas corridor, and Iraq, which is home to the world's leading oil reserves. Second, it is about whether there is intimidation and speculative movements in this topic. Since the beginning of 2004, the Royal Dutch / Shell group has revised their work four times and eventually reduced proven oil and gas reserves in the world by a quarter. In addition, Conophillip explained that the reserves they added in 2004 could cover approximately 60-65% of the oil produced in the same year. Shortly thereafter, ChevronTexaco 2004, the second largest oil company in the United States, declared a low reserve coverage ratio and finally Shell declared that the ratio of reserve production coverage was 45-55% as expected. All these developments have aroused suspicions that the signs of the lack of easy oil in the oil world are coming. Last, Matt Simmons, US energy adviser to Bush and one of the world's largest energy investment bankers, claims that Saudi Arabia's oil reserves will run out sooner than expected (Müsiad, 2006: 6-7).

Based on these facts, ensuring the continuity of oil resources is one of the most important factors affecting the economic and political balances of the modern world. First Oil Crisis in the oil supply, which was abundant and cheap before the 1970s, with the military intervention initiated by Syria and Egypt against Israel in 1974 (when crude oil prices rose from 2.5-3 dollars to 11-12 dollars) and The Iranian Revolution (the rise in crude oil prices up to \$ 30-35) and the Second Oil Crisis in 1979 showed that economies were absolutely dependent on oil. The reflection of these developments on oil prices is shown in the graph below.

Figure 2. Development of World Oil Prices, 1860-2019

Resource: BP, 2019: 24.

As it can be seen in the graph, the last jump in oil prices was in the early 2010s. The main factor behind the decline in oil prices towards the end of 2014 was the deceleration in oil demand, whereas the increase in oil supply was much higher than the increase in demand. Since 2010, the high political tension in the Middle East and North Africa, considered the centre of oil production, has raised concerns that oil supply may be disrupted at any moment. When the risk perception is high, the slightest political development has caused uneasiness in the markets. This caused prices to remain above the \$ 100/b level. However, since the beginning of 2014, the increase in global oil production, in which the US has contributed greatly, has reached a level that can easily replace the possible production cuts in the areas that are politically risky. However, global oil demand slowed down in 2014 due to the slowdown in growth, especially in Asia (Türkiye Petrolleri, 2019: 17).

Theoretical dimension of the subject argues that there is a significant and negative relationship between oil consumption and oil prices. When oil prices increase, oil consumption decreases. In addition, the rise in production costs as a result of rising oil prices reduces productivity and output growth. The rise in oil prices disrupts the foreign trade balance of oil importing countries and causes the transfer of wealth from oil importing countries to oil exporting countries. This will reduce the purchasing power of firms and households and will lead to an increase in the demand for money. Interest rates will increase as the monetary authority fails to meet the increase in money demand.

Inflation will emerge due to the increase in oil prices. The increase in inflation will cause price-wage increases. An increase in oil prices may have a negative impact on consumption, investment and stock prices. Consumption may decrease due to lower disposable income and higher costs of investments. The permanent increase in oil price increases will lead to a decrease in employment. Oil prices may have negative effects on the economy through these mechanisms (İşcan, 2010: 611).

3. Literature Review

When the economic literature is analyzed, there are many empirical studies examining the relationship between oil prices and macroeconomic variables.

In his study Hooker (1996) analysed the US economy between 1948 and 1994 period and observed that a 10% increase in oil prices for the period 1948-1972 reduced growth for the third and fourth quarters after shock by 0.6%. In the study, for the period 1973-1994, economic growth cannot be predicted with oil price levels, although economic growth can sometimes be predicted by volatility in oil prices.

Papapetrou (2001) examines the dynamic relationship between oil prices and interest rate, employment, real stock prices and economic activities for the Greek economy in the period 1989-1999. As a result of the analysis using a multivariable vector auto regression approach, the movement in oil prices affects industrial production and employment.

Cunado and Graciab (2005) studied the effect of the changes in oil price on economic activity and consumer price indexes using the data of six Asian countries covering 1975Q1–2002Q2 period. The results of the study showed that although the impact is limited to the short run, oil price changes have a significant impact on both economic activity and price indexes. They also found asymmetries between the oil prices and macroeconomic relationship for some of the Asian countries.

Ewing and Thompson (2007) tried to find some empirical relationship between oil prices and some fundamental macroeconomic variables. They examined the cyclical co-movements of crude oil prices, unemployment, consumer prices and stock prices. Using the stationary cyclical components of the time series to make inference about the degree to which oil prices move with the cycle they made cross-correlation estimates. The results of their study proved that crude oil prices are procyclical and lag industrial production and oil prices lead consumer prices.

Doğrul and Soytaş (2010) are interested in the linkage between oil price changes, economic activity and employment in developing economies and examined the causality between unemployment and crude oil prices and real interest rate in Turkey for the period 2005:01–2009:08. They examined the variables using the Toda-Yamamoto method and found that the real price of oil and interest rate improve the forecasts of unemployment in the long run.

Sodeyfi and Katircioglu (2016) researched the empirical relationship between crude oil prices and business conditions using panel data analysis. The results of their study showed that economic activity and industrial value added have a long-term relationship with the changes in oil price and GDP and real income are significantly affected by oil prices worldwide. They also found that business activities are affected from oil price negatively in some countries.

Karhan and Aydın (2018) investigated the relationship between crude oil price and stock price for 2009-2018 periods. According to the results obtained from the frequency domain causality test, it is found that there is only a short-term causality from oil prices to stock price. However, the results of the asymmetric causality test showed that there is no causal relationship between oil prices and stocks.

4. Data and Method

The effects of crude oil prices, economic growth, unemployment and capital accumulation usage on capacity utilization for Canada, France, Germany, Italy, Japan, UK and USA (G-7 countries) were examined by using panel data analysis with annual data for 1999-2017 period. The variables used in the analysis are imported crude oil prices Capacity utilization, unemployment, capital accumulation usage and Economic growth data. Imported crude oil prices were compiled from IEA database, capacity utilization, unemployment, capital accumulation usage and Economic

growth data were compiled from World Bank database. Economic growth, capital accumulation uses and capacity utilization variables were analyzed using their logarithmic forms.

4.1. Model

Lngdp lnfdi and rde are descriptive variables, HDI is dependent variable. In this context, the following equation is estimated;

$$\text{Lncapacity}_{it} = d_0 + d_1 \text{pricet} + d_2 \text{lngdpt} + d_3 \text{unemployt} + d_4 \text{lncapital} + u_{it} \quad (1)$$

Incapacity: capacity utilization

Price: crude oil import prices

IGDP: economic growth

unemployed

Incapital: the use of capital accumulation

Table 1: Descriptive Statistics

	Incapacity	price	lnGDP	unemploy	Incapital
Mean	27.88591	28.87236	27.29613	61.00226	7.040015
Median	27.04212	28.62448	27.10556	54.30000	6.999000
Maximum	32.14911	30.48453	28.92679	114.8000	12.68300
Minimum	26.44174	27.87525	26.23931	17.10000	2.800000
Std. Dev.	1.726811	0.704294	0.737269	31.09589	2.277520
Observation	133	133	133	133	133

Table shows the variables used and descriptive statistics. Section size is 7 units and time size is 19 years. In total, there are 133 observations for all variables.

The graphs show the effects of imported crude oil prices of G-7 countries on economic growth, unemployment and capital accumulation usage on capacity utilization both individually and on human development.

4.2. Method

In the study, Delta test developed by Pesaran and Yamagata (2008) was used. Subsequently, the dependence between the horizontal sections forming the panel was determined by Pesaran et al. (2008) CDLMadj (Adjusted Cross-sectional Dependence Lagrange Multiplier) test. The stability of the series was examined by Smith et al. Bootstrap (2004) test which is one of the second-generation unit root tests which considers the horizontal cross-sectional dependence and common factors. The existence of cointegration relationship was examined by Westerlung-Edgerton (2007) LM bootstrap test. After cointegration analysis, AMG (Augmented Mean Group estimator) method was used to estimate long term coefficients. In addition to considering the common factors and common dynamic effects in the variables, this method can calculate a different coefficient for each horizontal section. That is, the method is used when the panel is heterogeneous and calculates the individual coefficients and the group average from the weighted averages of these coefficients.

4.2.1. Testing the Homogeneity of Slope Coefficients

The homogeneity or heterogeneity test should be applied to the established model before the panel data application. Pesaran and Yamagata (2008) put forward the delta test by looking at the fixed term slope coefficients of homogeneous or heterogeneous inferences can be revealed. For this purpose, Delta tests which are introduced by Pesaran and Yamagata (2008) should be applied to the variables first. Delta test statistics are calculated as follows (Pesaran & Yamagata, 2008:56);

$$\tilde{\Delta} = \sqrt{N} \frac{N^{-1}\tilde{S}-k}{\sqrt{2k}} \quad (1)$$

$$\tilde{\Delta}_{adj} = \frac{\sqrt{N}N^{-1}\tilde{S}-k}{\sqrt{Var(T,k)}} \quad (2)$$

$\tilde{\Delta}$: Delta test statistics for small samples,

$\tilde{\Delta}_{adj}$: Adapted delta test statistics for large samples

In equations 1 and 2, N is the number of observations, (S) is the Swamy test statistic, k is the number of explanatory variables and $Var(T, k)$ is the variance. The null hypothesis and alternative hypotheses of the Delta test are as follows (Pesaran and Yamagata, 2008: 57-58).

$H_0: \beta_1 = \beta_2 = \dots = \beta_n = \beta$ (for all β_i)

$H_1: \beta_1 = \beta_2 = \dots \neq \beta_n = \beta$ (for at least one i)

Table 2: Homogeneity Test of Pesaran and Yamagata (2008)

Variable	Test statistics	Probability Value
Delta_tilde	1.423	0.041**
Adjusted_delta_tilde	1.685	0.036**

** indicates that the null hypothesis was rejected at 5% significance level.

According to the table, the null hypothesis that the slope coefficients of homogeneous slope coefficients at the 0.05 significance level of the delta and corrected delta test statistics of the models to be estimated is rejected. In other words, the model is heterogeneous.

4.2.2. Checking Horizontal Section Dependency

Applications made by considering the dependence between the cross-sections of the series significantly affect the achievement of real results (Breusch & Pagan, 1980; Pesaran, 2004).

Therefore, it is necessary to test the existence of horizontal cross-sectional dependence of series equation before model analysis. This situation should be taken into consideration in the preference of the planned causality, cointegration and unit root tests. Failure to do so may result in incorrect results. Therefore, before starting panel data analysis, inter-cross-sectional dependence or independence test is required in the series. Breusch-Pagan (1980) LM test is used when the time dimension is much larger than the horizontal section dimension and Pesaran (2004) CDlm test can be used in conditions where the time dimension is greater than the horizontal cross-sectional dimension but the difference between the two dimensions is less (Breusch & Pagan, 1980).

LM (Breusch-Pagan) statistics are calculated as follows:

$$LM_{BP} = T \cdot \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij}^2 \sim \chi_{N(N-1)/2}^2 \quad (3)$$

LM (Pesaran) statistics are calculated as follows:

$$CD_{LM} = \sqrt{\frac{1}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^N (T \hat{\rho}_{ij}^2 - 1) \sim N(0,1) \quad (4)$$

The $\hat{\rho}_{ij}$ in the statistics represents the correlation coefficient between OLS and the residues obtained from each regression. Hypothesis of the test;

H0: No cross-section dependence.

H1: Horizontal cross-section dependence.

Table 3: Horizontal Section Dependency Test Results

CD Test	Variable	Stationary level Test Statistics	Stationary level and has trend Test statistics	1.difference level Test statistics	1.difference level and has trend Test statistics
LM (Breusch, Pagan 1980)	lncapacity	28.092	35.322 **	34.056**	32.457 *
CDlm(Pesaran 2004)	lncapacity	1.094	2.210 **	2.015 **	1.768 **
LM (Breusch, Pagan 1980)	price	108.196 ***	89.452 ***	109.858***	122.537 ***
CDlm(Pesaran 2004)	price	13.455***	10.562***	13.711***	15.667 ***
LM (Breusch, Pagan 1980)	lngdp	44.511***	48.070***	47.162***	54.085***
CDlm(Pesaran 2004)	lngdp	3.628***	4.177***	4.037***	5.105***
LM (Breusch, Pagan 1980)	unemploy	39.181***	39.562***	37.058**	40.466***
CDlm(Pesaran 2004)	unemploy	2.805***	2.864***	2.478***	3.004***
LM (Breusch, Pagan 1980)	lncapital	36.041**	43.729***	45.829***	45.128***
CDlm(Pesaran 2004)	lncapital	2.321**	3.507***	3.831***	3.723***

***, ** and * indicate that the null hypothesis was rejected at 1%, 5% and 10% significance levels, respectively.

When the results of the horizontal cross-sectional dependence (YKB) tests were examined, it was concluded that the probability value was rejected at 1, 5% and 10% significance level in all tests performed for YKB. Therefore, the hypothesis that there is no dependence between sections is rejected. There is a horizontal cross-section dependence between all the sections forming the panel.

In other words, it is concluded that the shocks that may occur in imported crude oil prices, economic growth, unemployment and capital accumulation usage may affect capacity utilization.

4.2.3. Panel Unit Root Test

Since the variables and the model have inter-cross-sectional dependency properties, revealing the stationarity properties of the variables and causality relationships, make it compulsory to use second generation tests that take into account cross-sectional dependence or horizontal cross-sectional dependence. Hence, Smith et al. (2004) unit root test was applied in the study, in order to investigate the stationary properties of variables. Horizontal section dependence is modelled by bootstrap approach and t statistics are obtained by means of individual ADF statistics. Smith et al. (2004) test is based on the unit root test developed methodically by Im et al. (2003). The standardized t statistic is obtained as shown in the following equation. The hypotheses tested under the model are as follows;

H_0 = Has unit root

$$t^* = N^{-1} \sum_{i=1}^N t_i \quad (5)$$

H_1 = Doesn't have unit root

$$\bar{t}_s = \frac{\sqrt{N}\{\bar{t} - E(t_i)\}}{\sqrt{Var(t_i)}} \quad (6)$$

Table 4: Smith Panel Unit Root Test Results

Variables Test statistics	Lncapacity		price	
Lncapacity-price	level	1.difference	level	1.difference
Constant	-2.158	-3.661*	-9.367**	-4.251***
Stationary and trend	1.494	-2.123**	-2.190	-4.094**
Variables	lngdp		unemploy	
Lngdp-unemploy	level	1.fark	level	1.fark
Constant	-1.211	-3.974**	-2.534**	-6.632 **
Stationary and trend	-2.324	-2.976 **	-2.802	-2.544*
Variable	Incapital			
Incapital	level		1.difference	
Constant	-2.037		-1.843	
Stationary and trend	-2.110		-2.791*	

***, **, * indicate statistical significance at 1%, 5% and 10% levels.

As can be seen in the table, variable dependent capacity utilization, economic growth and capital accumulation usage variables became static when the first differences were taken. Crude oil prices and unemployment are static at their levels. Based on this result, there is a long-term relationship between capacity utilization and crude oil prices, economic growth, unemployment and capital use.

4.2.4. Carrion-i Silvestre Unit Root Test

In this study, structural breaks are examined according to Panel KPSS units developed by Carrion-i-Silvestre et al. (2005). Panel KPSS unit root test considers the presence of structural breaks

in the mean and trends of the series. The stationarity of the series is calculated separately for the panel-wide and horizontal cross-sectional units forming the panel at different dates and numbers (up to five), allowing structural breaks as follows:

$$Y_{i,t} = \alpha_{i,t} + \beta_{i,t} + \varepsilon_{i,t}, i = 1, 2, \dots, N \text{ and } t = 1, 2, \dots, T$$

Here, the terms (α_i, t) and (β_i, t) are as follows:

$$\alpha_{i,t} = \sum_{k=1}^{m1} \theta_{i,k} DM1_{i,t} + \sum_{k=1}^{m1} \gamma_{i,k} DM2_{i,t} + \alpha_{i,t-1} + \mu_{i,t} \quad (7)$$

$$\beta_{i,t} = \sum_{k=1}^{n1} \delta_{i,k} DM1_{i,t} + \sum_{k=1}^{n1} \varphi_{i,k} DM2_{i,t} + \beta_{i,t-1} + \epsilon_{i,t} \quad (8)$$

(DM1) and (DM2) are dummy variables and defined for the second horizontal section as follows;

$DM1 = 1 = TB + 1$, and 0 for other cases

$DM2 = 1 > TB + 1$, and 0 for other cases

In these equations, the term (TB) refers to the breaking points, and in the fixed term (m) for the grain train (n) grain breakage is permitted. In panel KPSS unit root test, the structural breakage dates in the series are determined as the points where the sum of error frames is minimized (Carrion-i-Silvestre et al., 2005: 159). In the panel KPSS unit root test, the stationarity of the series is examined by comparing the test statistical values calculated for panel-wide and horizontal cross-section units with the critical values calculated by bootstrap. At the end of the test, the basic hypothesis (serial is stationary) is accepted if the test statistical values calculated for panel-wide and horizontal section units are smaller than the critical values, and the alternative hypothesis (serial is not stationary) is rejected for the unit-panel overall.

Table 5: Panel KPSS Structural Breaks by Units

	Variables														
	Lncapacity			Price			Lngdp			Unemploy			Lncapital		
Countries	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Canada	-	-	2010	-	-	2014	-	-	2008	-	2002	2008	-	2008	2010
France	-	-	2014	-	-	2014	-	-	2008	2001	-	2008	-	-	2015
Germany	-	-	2011	-	-	2014	-	-	-	2000	2002	2006	-	2008	2008
Italy	-	-	2011	-	-	2014	-	2008	2010	-	-	2007	-	2009	2014
Japan	-	-	2012	-	-	2014	-	2007	2009	-	2007	2008	-	-	2009
England	-	2008	2008	-	-	2014	2006	2007	2008	2000	2004	2008	-	2006	2008
USA	-	-	2009	-	-	2014	2000	2004	2008	2001	2003	2008	2001	2004	2008

4.2.5. Panel Cointegration Test

Westerlund and Edgerton (2007) cointegration test is based on the Langrage test multiplier put forward by McCoskey and Kao (1998). In this cointegration test, cross-sectional dependence or horizontal cross-sectional dependence is considered. In addition, Westerlund and Edgerton (2007) showed that the cointegration test revealed more accurate findings in small samples. In this test, the acceptance of H_0 hypothesis, ie the absence of rejection, reveals the existence of cointegration relationship for all horizontal sections. The relationship between the variables is obtained from the following model (Westerlund & Edgerton, 2007: 186);

$$y_{it} = \alpha_i + \sum_{t=1}^T \beta_i + \varepsilon_{it} \quad (8)$$

The indices $t = 1 \dots T$ and $i = 1, \dots, N$ refer to the time series and horizontal section units, respectively. ε_{it} indicates the error term.

Westerlund and Edgerton (2007) hypotheses in the cointegration test are as follows:

H_{0i} : $\Theta_i = 0$ for all i (cointegration exists)

H_{1i} : $\Theta_i > 0$ for some i (cointegration doesn't exist)

The LM test statistic is calculated as follows:

$$LM_N^+ = \frac{1}{NT^2} \sum_{i=1}^N \sum_{t=1}^T \hat{w}_i^2 S_{it}^2 \quad (9)$$

The term S_{it} represents the sum of the partial error terms and $\hat{w}_i$ shows the long-term variance of u_{it} .

Table 6: Westerlund and Edgerton (2007) LM Bootstrap Panel Cointegration Test Results

Test Statistics	Bootstrap prob. value
1.685	0.425

According to Westerlund and Edgerton (2007) Lm bootstrap cointegration test results, "there is no co integrated relationship between the horizontal cross-sectional units and the null hypothesis" is rejected. Since the model has cross-section dependence and heterogeneous state, lm boots rapt is used which considers the cross-section dependence. In this case, the series move together in the long term and the level values of these series will not be confronted with spurious regression problems.

4.2.6. Estimation of Long-Term Co-integration Coefficients

Pesaran (2006) CCE (Common Correlated Effects) method is the first estimator developed for estimating cointegration coefficients when cross-sectional dependence occurs. This method makes the estimation of the individual cointegration coefficients first and then the cointegration coefficient covering the whole panel, in the CCMGE (Common Correlated Mean Group Effects) method calculates the arithmetic mean of individual coefficients. However, according to the variations in the economic size of the countries, the impact of each country on the overall panel is different. In the Panel AMG method developed by Eberhardt and Bond (2009), the average group effect is calculated by weighting the overall panel results and individual coefficients and taking into account the interdependence between the cross-sections. In this respect, AMG is more reliable than CCE (Eberhardt & Bond, 2009: 1). The panel AMG method can also produce effective results in unbalanced panels and can be used in the presence of the internal problem associated with the error term, taking into account the common factors and common dynamic effects in the series. When estimating in this method, variables are parsed as follows:

$$\begin{aligned} y_{it} &= \beta_i' x_{it} + u_{it}; u_{it} = \alpha_i + \lambda_i' f_t + \varepsilon_{it} \\ x_{mit} &= \pi_{mi} + \delta_{mi}' g_{mt} + \rho_{1mi} f_{1mt} + \dots + \rho_{nmi} f_{nmt} + v_{mit} \\ f_t &= \varphi' f_{t-1} + \varepsilon_{it} \text{ and } g_t = \aleph' g_{t-1} + \omega_t \end{aligned} \quad (10)$$

It refers to common factors and country-specific factor loadings that cannot be observed here. In this study, cointegration coefficients were estimated by Panel AMG method and the obtained results are presented in Table 7 below.

Table 7: Long Term Co-integration Coefficients

Countries	price Test statistics	lngdp Test statistics	Unemploy Test statistics	Lncapital Test statistics
Canada	-0.0000157	0.0043583	-0.0614282***	0.2904705
France	-0.0012768***	2.101241***	-0.0135184	-1.02682***
Germany	0.0000429	3.231123***	-0.0016712	-1.288662***
Italy	-0.0014228***	3.458661***	0.0131749*	-0.6579912**
Japan	-0.0022634***	2.188623	0.0495477	0.0760297
England	-0.0005102	1.434186***	0.004789	-0.203405
USA	-0.0003332	2.781212**	-0.0459431	-2.209962***
PANEL	-0.0008256**	2.171344***	-0.0078642**	-0.7171914**

Note: In the calculation of t statistic; Newey-West variance standard error was used. ***, **, * represent 1%, 5% and 10% significance levels, respectively.

As it can be seen in the table, while economic growth has a positive effect on capacity utilization, imported crude oil prices, unemployment and capital use have negative but statistically significant effects on it. When the cointegration coefficients estimated for the panel are analyzed, the 5 percent increase in the crude oil prices imported by the countries reduces the capacity utilization by -0.0008 units. When the effects of economic growth are analyzed, 1 percent increase in growth increases the capacity utilization by 2.17 units. When the effects of unemployment are analyzed, the 5 percent increase in unemployment decreases capacity utilization by -0.0078 units. The 5 percent increase in capital usage decreases the capacity use by -0.71 units.

When the results are analyzed by countries; In France, Italy and Japan, the 1-percent increase in imported crude oil prices had a downward impact on capacity utilization. The 1-percent increase in economic growth increased capacity utilization by 1 unit in France, Germany, Italy, England and 5 units in the USA. 1 unit increase in unemployment in Canada and 10 units in Italy showed a reducing effect on capacity utilization. 1-percent increase in capital accumulation usage in France, Germany and the United States and 5 percent increase in Italy has had a reducing effect on capacity utilization.

5. Conclusion

Oil is the most important input of the manufacturing industry in the national economies. On the other hand, it raises the problem of high cost in the supply of petroleum energy for some countries where this energy is scarce. There have been periods in which oil prices have risen to three times the normal price due to international problems. In addition to national economic problems, the fact that oil prices may cause global economic crises as in the 1970s oil shocks and rising energy costs adversely affect the economies provide the basis for examining the effects of oil prices on macroeconomic balances.

In this study, the effects of imported crude oil prices, economic growth, unemployment and capital use variables on capacity utilization were examined. The results of the study show that economic growth has a positive; imported crude oil prices, unemployment and capital use have negative but statistically significant impact on capacity utilization. When the cointegration coefficients estimated for the panel data are analyzed, a 5 percent increase in the crude oil prices imported by countries reduces capacity utilization by -0.0008 units.

The change in oil prices causes an immediate reaction in the national economies. This reaction also has a negative impact on the growth, production and employment of countries. The increase in oil prices increases the costs and therefore decreases production. Capacity utilization rate is also negatively affected by oil price increases since it is a percentage of the production capacity used in the economy. When the effects of economic growth are analyzed, it is seen that 1 percent increase in capacity increased the capacity utilization by 2.17 units. 5 percent increase in unemployment reduces capacity utilization by -0.0078 units. And finally, 5 percent increase in capital usage decreases the capacity use by -0.71 units.

On a country-by-country basis, 1-percent increase in imported crude oil prices in France, Italy and Japan had a downward impact on capacity utilization. 1 percent increase in economic growth increased the capacity utilization 1 percent in the United Kingdom, France, Germany and Italy and 5 percent in the USA. In terms of unemployment, 1-percent increase in Canada and 10-percent increase in Italy had a reducing effect on capacity utilization. When the effects of capital accumulation use on capacity utilization are examined, 1 percent increase in France, Germany and USA and 5 percent increase in Italy has a reducing effect on capacity utilization

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