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ANALYSIS OF EXPORTS, FUEL IMPORTS, PRODUCTION, AND CONSUMPTION OF CRUDE OIL ON ECONOMIC GROWTH IN 2012-2021 (CASE STUDY: 8 G20 COUNTRIES)

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A B S T R A C T

Economic growth is used to measure the welfare of society. Fluctuations in oil prices have considerable consequences on economic activity. The transmission mechanism through which oil prices impact real economic activity includes both supply and demand channels. World oil production and consumption have increased almost equally. Economic growth is often associated with energy, where energy is one of the various important inputs in the process of production. Energy, especially oil, has an impact on economic activity on a micro or macro scale. This study uses data on economic growth, fuel exports, fuel imports, crude oil production and crude oil consumption in 8 (eight) G20 countries. This study uses secondary observation data with observations of 8 (eight) G20 countries using the Seemingly Unrelated Regression (SUR) method. The results of this study are variables that have a significant effect, namely the variables of Fuel Exports and Crude Oil Production have a negative effect on economic growth, then the variables of Fuel Imports and Crude Oil Consumption have a positive effect on economic growth.

A B S T R A K

Pertumbuhan ekonomi yang digunakan untuk mengukur kesejahteraan masyarakat. Fluktuasi harga minyak memiliki konsekuensi yang cukup besar pada kegiatan ekonomi. Mekanisme transmisi melalui mana harga minyak berdampak pada kegiatan ekonomi riil mencakup saluran penawaran dan permintaan. Produksi dan konsumsi minyak dunia mengalami peningkatan yang hampir sama. Pertumbuhan ekonomi sering dikaitkan dengan energi, dimana energi merupakan salah satu dari berbagai input penting dalam proses suatu produksi. Energi khususnya minyak memberikan dampak terhadap kegiatan ekonomi dalam skala mikro ataupun makro. Penelitian ini

menggunakan data pertumbuhan ekonomi, ekspor bahan bakar, impor bahan bakar, produksi minyak mentah dan konsumsi minyak mentah di 8 (delapan) negara G20. Penelitian ini menggunakan data observasi sekunder dengan observasi 8 (delapan) negara G20 menggunakan metode Seemingly Unrelated Regression (SUR). Hasil penelitian ini adalah variabel yang berpengaruh signifikan yaitu variabel Ekspor Bahan Bakar dan Produksi Minyak Mentah berpengaruh negatif terhadap pertumbuhan ekonomi, lalu variabel Impor Bahan Bakar dan Konsumsi Minyak Mentah berpengaruh positif terhadap pertumbuhan ekonomi.

INTRODUCTION

The welfare of the people of a country has a measuring tool, namely economic growth in managing the long-term and short-term economy. Economic activity will generate more income for the community in a certain period, which is indicated through economic growth. This is made possible by the factors of production to produce an output or return through economic activities that occur due to activity (Cili & Alkhaliq, 2022). The most important macroeconomic indicators such as income and economic growth. Theoretically, the more advanced a country's economy is, the higher its total and per capita national income (assuming a growth rate greater than the population growth rate). One indicator such as Gross Domestic Product (GDP) is used as a proxy to measure a country's economic growth rate (Firdaus, 2012).

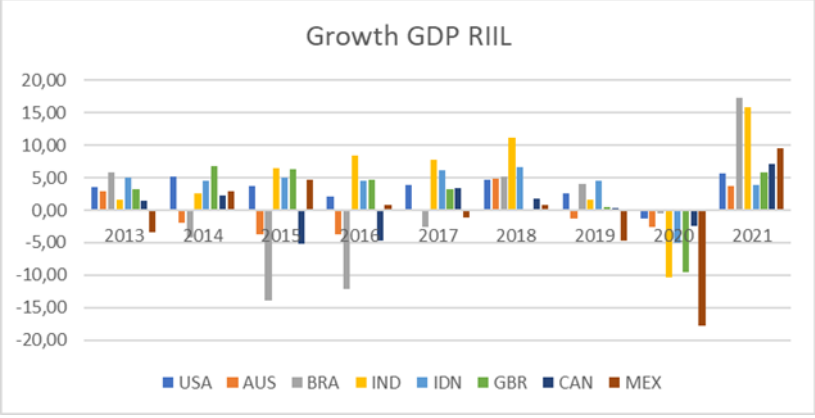

Figure Diagram 1.1, Real GDP Growth Data (processed)

Source: World Bank

Based on economic growth through Real GDP data in the form of percent units, it states that. In the highest economic growth or the country experienced an economic increase in 2021 which was dominated by these 8 (eight) countries, and the lowest or unstable economic growth turmoil in 2020 experienced by these 8 (eight) countries. It was found that the cause of the economic decline was caused by a plague or pandemic that attacked all over the world including the 8 (eight) countries,

and one of the strong reasons for the Covid-19 pandemic (Ntshingila, 2023).

The G20 countries account for 85 percent of the gross world product, two-thirds of the world's population and three-quarters of global trade. Reforms at the national and multinational levels are influenced and assisted in realizing its decisions. Like the G7, the Group of 20 or G20 is an informal forum. International activities and forums contribute in very significant ways to enhancing a country's image and credibility. With this participation, it is expected that a country can increase its contribution in various sectors, such as economy, health, trade, politics, and all kinds of other programs among fellow members of the G20 forum. The importance of participation, many countries around the world are involved in various forums, such as the G20 Forum, where the forum consists of countries with the largest economic levels. International trade is one of the media for a country to advance its economy which is created due to differences in absolute advantages possessed in each country. Each country is required to develop the potential of its natural and human resources in order to compete in the global economy and build its country's economy towards a better direction in the future, reflected through the level of economic growth that always increases. The level of economic growth in a country often fluctuates due to the number of exports and the number of imports carried out including from the export and import trade of crude oil.

Considerable consequences on economic activity result from fluctuations in oil prices. Differences between oil importing countries and oil exporting countries are expected to have different consequences. Good news in oil exporting countries when oil prices rise should be regarded as good news and for oil importing countries as bad news, the opposite should be expected when oil prices fall. The transmission mechanism through which oil prices impact real economic activity includes both supply and demand channels. World oil production and consumption have increased almost equally. Energy and economic growth are often associated with each other, where the process of production requires energy which is one of the important inputs. Energy, especially oil, has an impact on economic activity on a micro or macro scale.

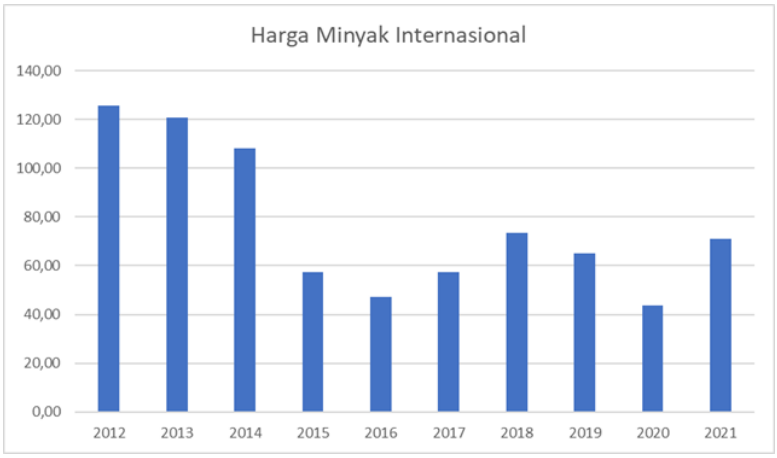

Figure Diagram 1. 2, Price Oil Data (processed)

Source: Britsh Petroleum (BP)

The approach to the value of oil price fluctuations can be observed through international oil prices by following the 2021 exchange rate. According to Britsh Petroleum (BP) data, the fluctuations in the rise and fall of international oil prices are quite significant. The highest oil price data of all data is in 2011 which is very visible in the diagram above reaching 128.01 US Dollars Per Barrel. The lowest oil price data from the data was in 1998 which reached 20.19 US Dollars Per Barrel. This can happen because the availability of crude oil is so abundant and the strength of the currency value is strong, so the event can affect fluctuations in international oil prices. A value of petroleum can be observed, one of which is to function as a vehicle or engine fuel commonly referred to as gasoline or fuel oil.

Improving economic growth performance over time requires a strong supply of energy resources. It is relevant that a large part of their national income from energy export-related revenues for energy-exporting countries is generated. Recently concluded that economic growth rates in oil-exporting countries are positively influenced by fuel mining exports. However, in the international energy market can also be considered to slow the momentum of economic growth due to a sharp decline in demand and fuel prices, reducing the possibility of achieving sustainable economic growth such undesirable macroeconomic shocks can also affect (Murshed, 2022).

Problem Formulation

Based on the background and explanation above, the following problems can be formulated:

1. Does the Fuel Export variable have a relationship with Economic Growth?
2. Does the Fuel Import variable have a relationship with Economic Growth?

3. Does the variable Crude Oil Production have a relationship with Economic Growth?
4. Does the variable Crude Oil Consumption have a relationship with Economic Growth?

Research Objectives

Based on the problems in the research, the objectives of this study are formulated as follows:

1. To determine the relationship of the Fuel Export variable has a relationship with Economic Growth.
2. To determine the relationship of the Fuel Import variable with Economic Growth.
3. To determine the relationship between the Crude Oil Production variable and Economic Growth.
4. To determine the relationship of Crude Oil Consumption variable with Economic Growth.

Research Benefits

This research is expected to provide benefits to various parties, including:

1. Practical uses, this research is expected to provide information and as basic evaluation material for government considerations, especially the Ministry of Energy and Mineral Resources, the Ministry of Finance, and the Ministry of Trade in determining policies in the 8 (eight) countries.
2. Theoretically, this research is expected to be a reference in the study of energy use, especially the fuel oil sector.

LITERATURE REVIEW AND HYPOTHESIS FORMULATION

Natural Resource Output Growth Theory (Adam Smith)

The book "An Inquiry into the Nature and Causes of the Wealth of Nations" created by Adam Smith in 1776 analyzes the reasons or how the economy of a country can grow. The aspect of output growth has variables that determine the production process of a country to produce total output, one of which is the variable of Natural Resources. According to Adam Smith (1776), natural resources are the main composition of all production activities in the economy with a limited amount. Through the production process to meet human economic needs in the sense that the economic growth process will run in the long term through the availability of existing natural resources. However, when natural resources touch low availability or run out,

it results in the production process being stopped with concomitant economic growth also stopped. This means that natural resources are the peak limit for economic growth from this situation will be known as the Stationary state (Abdul, 2002: 64).

Resource Dependence explains economic growth in a country or within the scope of a region that is highly dependent on the existence of natural resources owned by the country or region. These natural resources can be sourced through natural gas mines, minerals, petroleum, forest products, agricultural products, and so on. Countries with high resource dependency are likely to be affected by fluctuations in global commodity prices and changes in global demand for these resources. Resource dependence in economic growth has a positive or negative impact depending on how the country manages and utilizes its natural resources. If the country can manage these natural resources well, it can make a major contribution to the country's economic growth and also be useful for the country's development. Meanwhile, if the country is focused and overly dependent on natural resource exports and the country ignores economic diversification, then the country is very vulnerable to global market turmoil and it is very difficult to create sustainable economic growth. The Resource Dependence Theory states that countries can use their natural resources to promote economic growth. By selling oil on the international market, countries can generate significant revenues that can be used for investment and infrastructure development.

Economic Growth

Economic growth in a country refers to a long-term increase in the level of production and national income. Economic growth occurs when a country can increase productivity levels such as the ability of a country to produce more goods and services by utilizing available resources as efficiently as possible (Azwar, 2016). Real GDP is a measure of the production of goods and services in the economy or real GDP can be an ideal measure of economic growth for researchers. According to Mankiw (2006) real Gross Domestic Product or real GDP is used because real GDP is not affected by price changes, and changes in real GDP only describe a change in the amount of goods and services produced (Mankiw, 2006: 23).

Exports Fuel

Fuel export is an activity of sending or selling fuel from a country to another country that needs the fuel. Fuel exports are one of the vital elements of international trade in the global economy, which is useful as foreign exchange earnings for exporting countries (Deva et al., 2015). According to the Harrod-Domar theory, exports are a component of aggregate expenditure, which means that even if investment declines but exports develop, aggregate expenditure can still create a situation where the increase in capital capacity as a result of previous investment can

be fully utilized. This shows that rapid economic growth can be achieved through export development (Abdul, 2012: 137).

Imports Fuel

According to Jimmy (2013) Fuel import is an activity of buying fuel from other countries into a country for use in domestic consumption. Fuel imports occur when a country does not have or lacks sufficient fuel resources to meet internal needs within the country (Jimmy, 2013.Deva et al, 2015). According to T. Gilarso, the occurrence of higher imports than exports will cause a deficit in the balance of payments (Gilarso, 2002: 315). In the event that there is a deficit in the balance of payments, it will slow down the course of state finances and result in economic growth that will be difficult to develop or decline.

Production Crude Oil

Crude oil production is the process of extracting and collecting crude oil from underground storage. Crude oil is a fossil fuel formed from the remains of marine organisms trapped in rock layers for millions of years. Crude oil production is an important industry in many countries, contributing significantly to the global economy. The product can be distributed to various economic sectors, such as industry, transportation, and so on that rely on the product (Handar, 2014). According to M. Hasan & M. Azis, the concept of macroeconomic growth is production or out put, meaning that the production of goods and services has increased, the economy will experience growth (Hasan, 2018: 18).

Consumption Crude Oil

Crude oil consumption is the total amount of crude oil consumed by a country, region, or the entire world in a given period of time. Crude oil is a crude form often measured in volume or physical capacity, such as barrels or tons. Crude oil consumption covers the use of crude oil for various purposes, including fueling vehicles, power generation, heating, and the chemical industry. Crude oil consumption depends on the level of industrialization, economic growth, and other factors (Handar, 2014.Mitev, 2017). According to Priyono Teddy Chandra, consumption is in line with economic growth. When the shift reflects an increase in the level of welfare in society with a measure of economic growth, when consumption needs are carried out to meet the availability, especially non-food, the level of public welfare will be better and this can trigger economic growth (Priyono, 2016: 49).

RESEARCH METHODS

This research uses quantitative descriptive methodology. This method is used in this research because the data is processed statistically and in numerical form for the purpose of statistical analysis. Researchers collect data historically and observe the factors that have a relationship to the problem being researched in order to obtain data that can help in the preparation of the study. Researchers use a quantitative method approach to analyze data in the form of numbers or numerical data to analyze and draw conclusions about a phenomenon under study based on the data used, namely numerical information presented on international websites such as the World Bank and Britsh Petroleum, then the data is processed using the Stata-17 analysis tool to get answers to the hypotheses applied.

Data

This study uses quantitative data or in the form of numerical data or data in the form of numbers themselves. The quantitative data used includes fuel oil exports, fuel oil imports, crude oil production, and crude oil consumption as independent or influencing variables. While the dependent or influenced variable in this study is the real gross domestic product in 8 (eight) G20 countries in the 2012-2021 period.

Variable	Symbol	Operational Definition	Unit
Gross Domestic Product Real	Y	Economic growth at fixed prices	Dollar
Exports Fuel	X1	Fuel oil export amount	Percent
Imports Fuel	X2	Magnitude of fuel oil imports	Percent
Production Crude Oil	X3	Total crude oil production produced by the country	Barrels
Consumption Crude Oil	X4	Total consumption of crude oil consumed by the country	Barrels

Source: research data

Data Analysis Technique

Panel data analysis by combining the two data analyses, namely unit series and time series of 8 (eight) G20 countries during the 2012-2021 time span. Based on panel data, it means that panel data is data consisting of a combination of time series with cross section data. The following is a possible formulation of a panel data regression model with cross section data:

$$LnGDPriil_{it} = \beta_0 + \beta_1 exporfuel_{it} + \beta_2 imporfuel_{it} + \beta_3 Lnproil_{it} + \beta_4 Lnkoil_{it} + \varepsilon it$$

Keterangan :

$LnGDPriil_{it}$ = *Gross Domestic Product* Real (Dollar)

$exporfuel_{it}$= Exports Fuel (Percent)

$imporfuel_{it}$ = Imports Fuel (Percent)

$Lnproil_{it}$ = Production Crude Oil (Barrels)

$Lnkoil_{it}$ = Consumption Crude Oil (Barrels)

Ii = 8 (eight) G20 countries

Tt = period 2012-2021

ε = error term

1) Unit Root Stationarity Test

   Conducting stationary testing aims to prove that the data used has a stationary effect or the data is not stationary. If the data produces a non-stationary effect it does not matter as long as the variables are cointegrated, and vice versa.

2) Panel Data Regression Model

   The panel data regression model consists of 3 (three) ways used to perform multiple linear regression methods on panel data, namely the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM).

3) Panel Seemingly Unrelated Regression

   The selection of the Seemingly Unrelated Regression (SUR) model is based on the classical assumption problems contained in the data used. classical assumption problems that exist include heteroscedasticity and multicollinearity. Based on the best model test, it shows the Fixed Effect Model (FEM) model, but the test results show that it is not good in testing, and there are classical assumption problems, therefore the suitable model or the best model to use in this study is the Seemingly Unrelated Regression (SUR) model.

4) Model Specification Test

   The Model Specification Test must be carried out in order to determine the data to analyze the panel data test which should help researchers in determining the model, namely the Chow Test and the Hausman Test.

ANALYSIS AND DISCUSSION

Descriptive Analysis of Results

Statistical analysis data on the variables used in the research model which explains based on the results of data processing which has the aim of answering the questions to the research.

Variable	Obs	Mean	Std.Dev	Min	Max
Gross Domestic Product Real	80	8.33e+11	1.17e+12	2.07e+11	4.43e+12
Exports Fuel	80	15.57214	7.697571	3.842674	33.34778
Imports Fuel	80	14.1518	8.244477	4.971642	39.5181
Production Crude Oil	80	3272.872	4211.182	322.1192	17113.8
Consumption Crude Oil	80	4188.364	5516.095	915.5596	19423.63

Source: data processing results (stata 17) rearranged

Stationarity Test

In the research conducted through the model choice approach including Philips Perron (PP), Augmented Dickey Fuller (ADF), and Levin Lin Chu (LL). In testing the data through the stationary test shows the probability value below 0.1 or 0.05 or 0.01, it means that the variable is valid stationary.

Stationary Test level

Variable	Level		
	Philips Perron (PP)	Augmented Dickey-Fuller (ADF)	Levin Lin Chu (LL)
Gross Domestic Product Real	2.682 (0.996)	1.121 (0.869)	-0.670 (0.251)
Exports Fuel	2.034 (0.979)	0.163 (0.565)	-4.343 (0.000)***
Imports Fuel	2.665 (0.996)	-1.177 (0.119)	-6.814 (0.000)***

Production Crude Oil	2.796 (0.997)	0.036 (0.514)	-7.650 (0.000)***
Consumption Crude Oil	0.393 (0.653)	0.238 (0.594)	-0.958 (0.168)

Source: Data Processing Results

Stationary Test 1st different level

Variable	Level		
	Philips Perron (PP)	Augmented Dickey-Fuller (ADF)	Levin Lin Chu (LL)
Gross Domestic Product Real	-3.568 (0.000)***	-3.518 (0.000)***	-8.497 (0.000)***
Exports Fuel	-0.325 (0.372)	-2.849 (0.002)***	-13.419 (0.000)***
Imports Fuel	-0.171 (0.432)	-5.492 (0.000)***	-25.015 (0.000)***
Production Crude Oil	-0.634 (0.262)	-1.215 (0.112)	-8.501 (0.000)***
Consumption Crude Oil	-4.086 (0.000)***	0.185 (0.573)	-0.919 (0.179)

Source: Data Processing Results

Stationary Test 2nd different level

Variable	Level		
	Philips Perron (PP)	Augmented Dickey-Fuller (ADF)	Levin Lin Chu (LL)
Gross Domestic Product Real	2.189 (0.985)	-3.015 (0.001)**	-19.053 (0.000)***
Exports Fuel	0.786 (0.784)	-1.285 (0.099)*	-8.534 (0.000)***
Imports Fuel	2.963 (0.998)	-2.860 (0.002)***	-16.855 (0.000)***
Production Crude Oil	-3.112 (0.000)***	-0.639 (0.261)	-7.376 (0.000)***

Consumption Crude Oil	-4.692 (0.000)***	-2.386 (0.008)***	-8.513 (0.000)***

Source: Data Processing Results

Based on the results of the unit root test or stationarity test, researchers can do by changing the level to 2nd difference through the Levin Lin Chu (LL) approach, indicating that of the 5 (five) variables all have a significant effect with a probability value <0.05 or 5%.

Panel Test Results

The results of the panel test researchers present the results of the panel data analysis that has been carried out in order to find out and be able to compare which method is more appropriate in taking the research method.

Panel Test Results

Variable	CEM	FEM	REM	SUR
Exports Fuel	0.008 (0.015)**	-0.002 (0.428)	-0.002 (0.407)	0.008 (0.000)***
Imports Fuel	-0.047 (0.000)***	-0.009 (0.014)**	-0.009 (0.011)**	-0.047 (0.000)***
Production Crude Oil	-0.569 (0.000)***	-0.056 (0.505)	-0.063 (0.373)	-0.569 (0.000)***
Consumption Crude Oil	1.494 (0.000)***	0.572 (0.000)***	0.787 (0.000)***	1.494 (0.000)***

Source: Data Processing Results (stata 17) rearranged

Based on the results of the Common Effect Model (CEM), the variables of fuel exports, fuel imports, crude oil production, and crude oil consumption have a significant effect on gross domestic product (GDP). The results of the Fixed Effect Model (FEM), fuel imports and crude oil consumption variables have a significant effect on Gross Domestic Product (GDP). From the calculation of the results of the Random Effect Model (REM), we get the result that the variable Imports of Fuel and Crude Oil Consumption have a significant effect on Gross Domestic Product (GDP).

Chow test

Researchers can identify the model selection that should be used with the Chow Test, with choices including the Common Effect Model (CEM) and the Fixed Effect Model (FEM).

Test Summary	Prob.
F(4,68)=10.95	0.000

Source: Data Processing Results (stata 17) rearranged

It can be observed through the probability value which shows the number 0.000 or <0.05 so it can be interpreted that H0 is rejected and H1 in the Chow Test is selected using the Fixed Effect Model (FEM).

Hausman test

The test has the purpose of choosing between using the Fixed Effect Model (FEM) or Random Effect Model (REM) in panel analysis.

Test Summary	Chi-Sq.Statistic	Prob>Chi2
Cross-section random	37.59	0.000

Source: Data Processing Results (stata 17) rearranged

The table results presented by the researcher above show the probability value in the test results is 0.000 or <0.05. So if the probability value of the Hausman Test <0.05, it can be concluded that it rejects H0, so the right model to use is the Fixed Effect Model (FEM) model.

Seemingly Unrelated Regression (SUR)

Based on the calculations that have been tested by researchers with the estimation results through the method used is Seemingly Unrelated Regression (SUR) which has been processed by researchers using Stata 17, it is presented as follows:

Variable	Coefficient	Std. Err.	z	P>|z|
Exports Fuel	0.0087886	0.0019044	4.61	0.000
Imports Fuel	-0.0473327	0.0057931	-8.17	0.000
Production Crude Oil	-0.5691059	0.0594895	-9.57	0.000
Consumption Crude Oil	1.494844	0.066759	22.39	0.000
_cons	20.00247	0.1171287	170.77	0.000

Source: Data Processing Results (stata 17) rearranged

Fuel Exports have a probability value of 0.000, which means that the

probability value is smaller than the alpha value or 0.05. It can be concluded that rejecting H0 and accepting Ha or it can be interpreted that Fuel Exports have a significant effect on Real Gross Domestic Product (GDP). Based on the coefficient value of Fuel Exports by 1% will increase Real GDP by 0.0087886% and vice versa, so that Fuel Exports have a positive influence on economic growth in 8 (eight) G20 countries.

Fuel imports have a probability value of 0.000 which has a value lower than the alpha value of 0.05. It can be concluded that this rejects H0 and Ha is accepted or it can be interpreted that Fuel Imports have a significant effect on Real Gross Domestic Product (GDP). Based on the coefficient value of Fuel Imports by 1% will reduce the country's economic growth by 0.0473327% and vice versa, from Fuel Imports has a negative and significant effect on economic growth in 8 (eight) G20 countries.

Crude Oil Production has a probability value of 0.000 or the probability value is smaller than the alpha significance of 0.05. It can be concluded that this rejects H0 and Ha is accepted or it can be interpreted that Crude Oil Production has a significant effect on Real Gross Domestic Produc (GDP). Based on the coefficient value of Crude Oil Production of 569 barrels per day will reduce the economic growth of the country and vice versa, from Crude Oil Production has a negative and significant effect on economic growth in 8 (eight) G20 countries.

Crude Oil Consumption has a probability value of 0.000 or the probability value is smaller than the significance alpha of 0.05. It can be concluded that this rejects H0 and Ha is accepted or it can be interpreted that Crude Oil Consumption has a significant effect on Real Gross Domestic Product (GDP). Based on the coefficient value of Crude Oil Consumption of 1,494 barrels per day, it will increase the country's economic growth and vice versa, from Crude Oil Consumption has a positive effect on economic growth in 8 (eight) G20 countries.

DISCUSSION

Exports themselves have a contribution to economic growth in a country through export activities can encourage growth in economic sectors that are related to one of them, the production of goods, especially from the oil mining sector that wants to be exported. For countries that have abundant reserve sources, namely fuel reserves, they can be utilized by exporting these fuels as the main source of income. When a country that has the potential as a fuel exporter to the international market, the country will get revenue that can be used to fund economic development such as health development, infrastructure, education, and many more. This can improve the welfare of the people in the country and will be followed by an increase in economic

growth in the country itself (Muntasir Murshed, 2022.Abdul, 2012).

Imports can affect a country's trade balance, when a country imports excessively or imports more goods than it exports, it will have a deficit in the trade balance and that can slow down the country's economic growth. Importing fuel excessively or for certain countries relying heavily on fuel imports can lead to a deficit in the trade balance. When a country runs a sustained trade deficit, it destabilizes the economy within the country and eliminates opportunities to add value to fuel products before they can be sold domestically or abroad. This can affect economic growth in the long term (Fadila, 2021.Dwi Kartikasari, 2017).

The role of production on economic growth as a determinant of the wheels of trade, through domestic and foreign trade is a driving factor of trade and this can generate domestic and foreign income which is useful as a stimulant to economic growth (Noparima & Sutrisna, 2017). Production restrictions are also needed to anticipate a significant decline in prices and this does not escape the production of raw materials from natural resources which can have an effect on the sustainability of nature itself. When crude oil production exceeds the limit, it will result in a decrease in economic growth in the country. Overproduction of crude oil will result in a fall in the price of crude oil, which can threaten the uncontrollability of the price of crude oil produced which results in reducing the exchange rate. As falling crude oil prices lower the production costs of various sectors of the economy, the impact can undermine the purchasing power of the currency itself and will weaken the exchange rate. After that, economic growth will decline because imports will be more expensive due to the weakened exchange rate caused by overproduction (Yang et al., 2022.Karahan, 2020).

The role of consumption is very important in determining the demand for goods and services, it affects production and economic growth. It is through the consumption of crude oil that crude oil producers can benefit both parties. Crude oil consumption has a major role in the industrial sector to run the industrial activities themselves and can contribute to the economic growth of the country. In addition, crude oil producers will get revenue from the oil sector, this revenue can be used as funding for development programs to improve people's welfare or increase the country's economic growth (Uzma, 2022.Rumbia et al, 2022).

CONCLUSIONS, LIMITATIONS AND SUGGESTIONS

Conclusion

1) The fuel export variable has a significant and positive influence on economic growth (Real GDP). This means that as fuel export activities or activities increase, economic growth will increase.
2) The fuel import variable has a significant and negative influence on economic growth (Real GDP). This means that when fuel import activities or activities increase, economic growth will decrease further.
3) The Crude Oil Production variable has a significant and negative influence on economic growth (Real GDP). This means that when a country produces excess crude oil or increases crude oil production rates, economic growth will decrease.
4) Crude oil consumption variable influences significantly and positively on economic growth (Real GDP). That is, when the value of crude oil consumption increases, economic growth will also increase.

Research Limitations

Based on the results of research that researchers have conducted, this research still has limitations in the variables applied in this research that can be presented, including fuel exports, fuel imports, crude oil production and crude oil consumption. So that the analysis of the country's economic growth against fluctuations in international oil trade is not totally comprehensive.

Suggestion

For G20 Regional Governments, Governments in the G20 Region need to monitor restrictions on excessive crude oil production, the consequences of overproduction will cause a domino effect on the country's economy. By limiting crude oil production, the country will have abundant natural resource reserves and can be a good source of foreign exchange.

For the G20 Area Industry, the Industry must be able to allocate crude oil consumption so that it is not only used as an energy source to carry out industrial activities, but crude oil can be reprocessed to become fuel that can be used by all parties participating in developing the economy. The benefit that will be obtained is that it can increase income for the related industry, if necessary, increase fuel exports so that state income from exports increases and can increase economic growth.

For Communities in the G20 Region, Communities in the G20 Region need to limit the use of fuel so that there is no unbalanced supply which results in countries

importing fuel that exceeds the limit due to a lack of supply to meet the needs of moving the wheels of the country's trade.

For the Audience, the limitations in this research are the use of theory or the use of variables such as fuel exports, fuel imports, crude oil production, crude oil consumption, and exchange rates (Exchange Rates) which can influence economic growth (Real GDP). The researcher's hope for future research or researchers can develop further, so that the latest research can get better results.

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APPENDIX

Data

countries	code	tahun	gdpriil	expor_fuel	impor_fuel	proil	koil
USA	1	2012	3298732178000,00	10,06	18,64	8931,27	17581,03
USA	1	2013	3416444750000,00	10,76	16,76	10103,36	17992,00
USA	1	2014	3591825301000,00	10,99	14,85	11806,65	18111,09
USA	1	2015	3722979000000,00	8,00	8,66	12783,34	18499,21
USA	1	2016	3802207075000,00	7,58	7,26	12353,66	18592,69
USA	1	2017	3948265313000,00	10,51	8,48	13139,89	18845,19
USA	1	2018	4132056059000,00	13,53	9,25	15309,99	19416,59
USA	1	2019	4240908075000,00	14,20	8,18	17113,80	19423,63
USA	1	2020	4188560174000,00	12,72	5,40	16457,70	17183,32
USA	1	2021	4428099927000,00	15,92	7,63	16585,25	18684,48
AUS	2	2012	364330365393,27	28,45	16,87	472,33	1000,69
AUS	2	2013	374864596984,51	25,87	17,42	400,56	1031,09
AUS	2	2014	367783447691,31	26,60	15,83	420,26	1025,15
AUS	2	2015	354204176720,19	25,29	10,84	378,48	1015,17
AUS	2	2016	341301156652,76	25,60	9,29	353,22	1016,35
AUS	2	2017	341167434722,65	30,32	10,38	322,12	1062,68
AUS	2	2018	357681711028,31	23,07	13,31	341,84	1075,58
AUS	2	2019	353198587805,78	18,93	12,59	452,54	1064,41
AUS	2	2020	343877787214,61	13,91	8,13	452,82	915,56
AUS	2	2021	356886256575,50	27,71	10,27	435,18	943,08
BRA	3	2012	368533509311,92	11,02	18,48	2144,85	2518,81
BRA	3	2013	390008697978,12	7,66	19,50	2109,94	2655,93
BRA	3	2014	373534462804,16	9,35	20,09	2341,37	2728,57
BRA	3	2015	321439478192,91	7,36	15,56	2524,99	2487,94
BRA	3	2016	282449427396,91	6,45	12,35	2607,42	2370,25
BRA	3	2017	275226191286,77	8,71	14,70	2731,24	2406,57
BRA	3	2018	289625360409,93	12,77	15,11	2690,96	2293,32
BRA	3	2019	301285872863,28	13,71	13,86	2889,72	2303,48
BRA	3	2020	299717122812,88	11,89	10,08	3030,27	2133,77
BRA	3	2021	351348215054,74	13,66	13,60	2987,16	2251,77
IND	4	2012	544473773375,58	18,78	37,97	925,71	3673,72
IND	4	2013	552977385036,43	20,67	39,52	925,89	3716,70
IND	4	2014	567372754661,22	19,63	38,51	905,39	3832,11
IND	4	2015	604426918417,25	11,87	26,78	893,46	4147,37
IND	4	2016	655552067838,94	10,64	25,04	873,92	4544,01
IND	4	2017	706699182669,25	12,19	27,72	884,66	4724,32
IND	4	2018	785871176756,20	15,07	33,19	869,39	4974,04

IND	4	2019	798075431661,25	13,78	31,88	826,41	5149,82
IND	4	2020	715041633195,75	10,03	28,36	770,69	4701,40
IND	4	2021	828023933517,91	14,28	29,87	746,08	4878,18
IDN	5	2012	245242940621,47	33,35	22,31	916,82	1611,60
IDN	5	2013	257530294374,66	31,44	24,41	870,99	1572,17
IDN	5	2014	268988067974,97	29,04	24,68	846,98	1572,40
IDN	5	2015	282462859590,97	23,04	17,55	837,65	1505,06
IDN	5	2016	295097786221,16	19,29	14,20	873,25	1454,09
IDN	5	2017	313258027307,63	21,85	16,24	837,30	1564,94
IDN	5	2018	334170650615,19	23,31	16,74	807,56	1615,80
IDN	5	2019	349049206873,40	20,34	13,72	780,66	1578,19
IDN	5	2020	331732642745,20	15,63	11,15	742,03	1398,50
IDN	5	2021	344348989962,65	19,48	14,70	691,55	1471,50
GBR	6	2012	433930335083,34	13,87	13,95	947,26	1507,82
GBR	6	2013	448170112608,38	11,42	13,53	865,34	1489,95
GBR	6	2014	478742084524,93	10,90	11,81	853,55	1491,06
GBR	6	2015	509095258810,75	7,02	8,09	963,53	1537,98
GBR	6	2016	533135183470,67	6,26	6,28	1014,81	1586,94
GBR	6	2017	550713685454,64	7,97	8,12	1005,43	1593,54
GBR	6	2018	550364719634,31	9,46	10,09	1091,76	1568,71
GBR	6	2019	553373864244,42	8,60	8,19	1118,07	1522,00
GBR	6	2020	500764372454,46	7,06	5,31	1048,72	1171,87
GBR	6	2021	530235436912,03	7,77	10,27	874,15	1236,28
CAN	7	2012	377551229932,86	25,62	11,18	3740,24	2426,03
CAN	7	2013	383021626767,12	26,36	10,95	4000,41	2422,27
CAN	7	2014	391640469360,78	28,89	10,37	4270,53	2420,13
CAN	7	2015	371236410475,86	20,60	7,02	4388,14	2442,79
CAN	7	2016	353960551589,24	17,63	6,31	4463,64	2453,38
CAN	7	2017	365806294808,12	21,95	6,99	4813,03	2424,31
CAN	7	2018	372458334043,36	24,02	7,95	5243,88	2500,60
CAN	7	2019	373410312565,30	24,08	7,33	5372,42	2491,24
CAN	7	2020	364302193501,31	19,33	4,97	5130,30	2191,11
CAN	7	2021	390300234382,38	25,89	6,21	5428,81	2228,66
MEX	8	2012	252239923196,92	14,06	8,99	2911,10	2083,00
MEX	8	2013	243788270627,73	12,81	8,63	2882,02	2034,16
MEX	8	2014	250898263199,06	10,41	7,49	2791,50	1959,69
MEX	8	2015	262858210470,52	5,89	6,34	2593,04	1939,29
MEX	8	2016	265029410430,37	4,82	6,20	2460,71	1950,18
MEX	8	2017	261908440017,88	5,51	8,21	2227,45	1883,23
MEX	8	2018	264026588792,13	6,57	9,83	2071,58	1835,96

MEX	8	2019	251527684928,90	5,32	8,83	1920,53	1698,20
MEX	8	2020	206974164231,69	3,84	6,48	1911,59	1313,00
MEX	8	2021	226602846798,97	5,54	8,36	1927,65	1350,43

Summary

```
. sum gdpriil expor_fuel impor_fuel proil koil
```

Variable	Obs	Mean	Std. dev.	Min	Max
gdpriil	80	8.33e+11	1.17e+12	2.07e+11	4.43e+12
expor_fuel	80	15.57214	7.697571	3.842674	33.34778
impor_fuel	80	14.1518	8.244477	4.971642	39.5181
proil	80	3272.872	4211.182	322.1192	17113.8
koil	80	4188.364	5516.095	915.5596	19423.63

Common Effect Model (CEM)

```
. reg log_riil expor_fuel impor_fuel logproil logkoil
```

Source	SS	df	MS		
Model	50.9888019	4	12.7472005	Number of obs	= 80
				F(4, 75)	= 250.14
Residual	3.82195237	75	.050959365	Prob > F	= 0.0000
				R-squared	= 0.9303
				Adj R-squared	= 0.9266
Total	54.8107543	79	.693807016	Root MSE	= .22574

log_riil	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
expor_fuel	.0087886	.0035333	2.49	0.015	.00175	.0158272
impor_fuel	-.0473327	.0046538	-10.17	0.000	-.0566035	-.0380618
logproil	-.5691059	.0537755	-10.58	0.000	-.6762321	-.4619797
logkoil	1.494844	.0638493	23.41	0.000	1.36765	1.622039
_cons	20.00247	.2636308	75.87	0.000	19.47729	20.52765

Random Effect Model (REM)

```
. xtreg log_riil expor_fuel impor_fuel logproil logkoil, re
```

```
Random-effects GLS regression                   Number of obs     =         80
Group variable: code                            Number of groups  =          8

R-squared:                                      Obs per group:
     Within  = 0.3844                                         min =         10
     Between = 0.8517                                         avg =       10.0
     Overall = 0.8436                                         max =         10

                                                Wald chi2(4)      =     109.91
corr(u_i, X) = 0 (assumed)                      Prob > chi2       =     0.0000
```

log_riil	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
expor_fuel	-.00285	.0034402	-0.83	0.407	-.0095927	.0038928
impor_fuel	-.0095541	.0037419	-2.55	0.011	-.0168882	-.0022201
logproil	-.0635381	.0712577	-0.89	0.373	-.2032006	.0761244
logkoil	.7877761	.0882145	8.93	0.000	.6148789	.9606733
_cons	21.41627	.6259412	34.21	0.000	20.18945	22.6431
sigma_u	.21194943					
sigma_e	.0817884					
rho	.87039146	(fraction of variance due to u_i)				

Fixed Effect Model (FEM)

```
. xtreg log_riil expor_fuel impor_fuel logproil logkoil, fe
```

```
Fixed-effects (within) regression               Number of obs     =         80
Group variable: code                            Number of groups  =          8

R-squared:                                      Obs per group:
     Within  = 0.3918                                         min =         10
     Between = 0.8573                                         avg =       10.0
     Overall = 0.8481                                         max =         10

                                                F(4,68)           =      10.95
corr(u_i, Xb) = 0.7134                          Prob > F          =     0.0000
```

log_riil	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
expor_fuel	-.0027627	.0034674	-0.80	0.428	-.0096818	.0041565
impor_fuel	-.0091993	.0036405	-2.53	0.014	-.0164639	-.0019347
logproil	-.0567873	.0846989	-0.67	0.505	-.2258014	.1122267
logkoil	.5727878	.1048306	5.46	0.000	.3636015	.781974
_cons	23.04734	.9985514	23.08	0.000	21.05476	25.03992
sigma_u	.47852464					
sigma_e	.0817884					
rho	.97161626	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(7, 68) = 71.91                     Prob > F = 0.0000
```

Uji Chow

```
. xtreg log_riil expor_fuel impor_fuel logproil logkoil, fe

Fixed-effects (within) regression               Number of obs     =         80
Group variable: code                            Number of groups  =          8

R-squared:                                      Obs per group:
     Within  = 0.3918                                         min =         10
     Between = 0.8573                                         avg =       10.0
     Overall = 0.8481                                         max =         10

                                                F(4,68)           =      10.95
corr(u_i, Xb) = 0.7134                          Prob > F          =     0.0000
```

log_riil	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
expor_fuel	-.0027627	.0034674	-0.80	0.428	-.0096818	.0041565
impor_fuel	-.0091993	.0036405	-2.53	0.014	-.0164639	-.0019347
logproil	-.0567873	.0846989	-0.67	0.505	-.2258014	.1122267
logkoil	.5727878	.1048306	5.46	0.000	.3636015	.781974
_cons	23.04734	.9985514	23.08	0.000	21.05476	25.03992
sigma_u	.47852464					
sigma_e	.0817884					
rho	.97161626	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(7, 68) = 71.91                     Prob > F = 0.0000
```

Hausman FE RE

```
. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) Std. err.
expor_fuel	-.0027627	-.00285	.0000873	.0004333
impor_fuel	-.0091993	-.0095541	.0003548	.
logproil	-.0567873	-.0635381	.0067508	.0457848
logkoil	.5727878	.7877761	-.2149883	.0566363

```
                b = Consistent under H0 and Ha; obtained from xtreg.
 B = Inconsistent under Ha, efficient under H0; obtained from xtreg.

Test of H0: Difference in coefficients not systematic

    chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
            =  37.59
Prob > chi2 = 0.0000
(V_b-V_B is not positive definite)
```

Seemingly Unrelated Regression (SUR)

```
. xtpcse log_riil expor_fuel impor_fuel logproil logkoil, nmk

Linear regression, correlated panels corrected standard errors (PCSEs)

Group variable:   code                          Number of obs     =         80
Time variable:    tahun                         Number of groups  =          8
Panels:           correlated (balanced)         Obs per group:
Autocorrelation:  no autocorrelation                              min =         10
                                                                  avg =         10
                                                                  max =         10
Estimated covariances      =        36          R-squared         =     0.9303
Estimated autocorrelations =         0          Wald chi2(4)      =   18277.28
Estimated coefficients     =         5          Prob > chi2       =     0.0000
```

log_riil	Panel-corrected Coefficient	std. err.	z	P>|z|	[95% conf.	interval]
expor_fuel	.0087886	.0019044	4.61	0.000	.005056	.0125212
impor_fuel	-.0473327	.0057931	-8.17	0.000	-.0586869	-.0359784
logproil	-.5691059	.0594895	-9.57	0.000	-.6857031	-.4525087
logkoil	1.494844	.066759	22.39	0.000	1.363999	1.62569
_cons	20.00247	.1171287	170.77	0.000	19.7729	20.23203

Uji Stationer Level

Level

PP

GDP Riil

Null Hypothesis: Unit root (individual unit root process)
Series: LOG_RIIL
Date: 06/20/23 Time: 12:13
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 72
Cross-sections included: 8

Method	Statistic	Prob.**
PP - Fisher Chi-square	4.96257	0.9959
PP - Choi Z-stat	2.68295	0.9964

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results LOG_RIIL

Cross section	Prob.	Bandwidth	Obs
USA	0.3440	8.0	9
AUS	0.8623	4.0	9
BRA	0.9933	3.0	9
IND	0.5339	3.0	9
IDN	0.8998	2.0	9
GBR	0.8831	1.0	9

ADF

GDP Riil

Null Hypothesis: Unit root (individual unit root process)
Series: LOG_RIIL
Date: 06/20/23 Time: 12:19
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 64
Cross-sections included: 8

Method	Statistic	Prob.**
ADF - Fisher Chi-square	14.7390	0.5438
ADF - Choi Z-stat	1.12146	0.8690

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results LOG_RIIL

Cross section	Prob.	Lag	Max Lag	Obs
USA	0.3651	1	1	8
AUS	0.5598	1	1	8
BRA	0.9383	1	1	8
IND	0.1626	1	1	8
IDN	0.0286	1	1	8
GBR	0.9958	1	1	8

LL

GDP Riil

Null Hypothesis: Unit root (common unit root process)
Series: LOG_RIIL
Date: 06/20/23 Time: 12:00
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 64
Cross-sections included: 8

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-0.67003	0.2514

** Probabilities are computed assuming asympotic normality

Intermediate results on LOG_RIIL

Cross section	2nd Stage Coefficient	HAC of Regression	Variance of Dep.	Lag	Max Lag	Band-width	Obs
USA	-2.06167	0.00010	4.E-05	1	1	6.0	8
AUS	-0.90105	0.00041	0.000	1	1	8.0	8
BRA	-0.21999	0.00254	0.004	1	1	3.0	8
IND	-2.14410	0.00147	0.000	1	1	8.0	8
IDN	-4.33560	0.00012	0.000	1	1	7.0	8
GBR	0.43884	0.00096	0.000	1	1	3.0	8
CAN	-1.03170	0.00092	0.000	1	1	8.0	8
MEX	-1.12104	0.00337	0.000	1	1	8.0	8

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs

0 0.874 CAN 3 3.0 9 0.765 MEX 2 3.0 9	0.781 CAN 8 1 1 8 0.901 MEX 6 1 1 8	Poole 1.00 d -0.97541 -4.654 1.346 -0.703 3 64
Ekspor Bahan Bakar	Ekspor Bahan Bakar	Ekspor Bahan Bakar
Null Hypothesis: Unit root (individual unit root process) Series: EXPOR_FUEL Date: 06/20/23 Time: 12:13 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear Trends Newey-West automatic bandwidth selection and Bartlett kernel Total (balanced) observations: 72 Cross-sections included: 8	Null Hypothesis: Unit root (individual unit root process) Series: EXPOR_FUEL Date: 06/20/23 Time: 12:20 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear trends User-specified lags: 1 Total (balanced) observations: 64 Cross-sections included: 8	Null Hypothesis: Unit root (common unit root process) Series: EXPOR_FUEL Date: 06/20/23 Time: 12:01 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear trends User-specified lags: 1 Newey-West automatic bandwidth selection and Bartlett kernel Total (balanced) observations: 64 Cross-sections included: 8
Method / Statistic / Prob.* PP - Fisher Chi-square 9.61380 0.886 0 PP - Choi Z-stat 2.03417 0.979 0	Method / Statistic / Prob.* ADF - Fisher Chi-square 10.674 5 0.829 1 ADF - Choi Z-stat 0.1636 1 0.565 0	Method / Statistic / Prob.* Levin, Lin & Chu t* -4.3438 1 0.000 0
** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.	** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.	** Probabilities are computed assuming asympotic normality
Intermediate Phillips-Perron test results EXPOR_FUEL	Intermediate ADF test results EXPOR_FUEL	Intermediate results on EXPOR_FUEL
Cross section / Bandwidth / Prob. / Obs USA 8 8.0 0.921 9 AUS 9 8.0 0.668 9 BRA 9 8.0 0.055 9 IND 8 7.0 0.918 9	Cross section / Lag / Prob. / Max Lag / Obs USA 6 1 0.452 1 8 AUS 9 1 0.364 1 8 BRA 4 1 0.687 1 8 IND 8 1 0.469 1 8 IDN 0 1 0.458 1 8	Cross section / 2nd Stage Coefficient / Variance of Reg / HAC of Dep. / Lag / Max Lag / Band-width / Obs USA -0.90669 1.7644 0.497 6 1 1 8.0 8 AUS -1.85388 14.566 16.40 0 1 1 3.0 8 BRA -0.81465 2.3447 0.778 3 1 1 8.0 8 IND -1.03890 4.8656 1.570 9 1 1 8.0 8 IDN -1.07761 4.4881 1.107 6 1 1 8.0 8 GBR -0.76793 1.3918 0.418 2 1 1 8.0 8 CAN -1.25586 10.011 2.209 6 1 1 8.0 8 MEX -0.64476 1.1543 0.314 3 1 1 8.0 8

IDN	0.931 8	8.0	9
GBR	0.351 6	8.0	9
CAN	0.800 2	7.0	9
MEX	0.983 9	8.0	9

GBR	0.597 4	1	1	8
CAN	0.576 0	1	1	8
MEX	0.572 1	1	1	8

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-0.91038	-7.404	1.041	-0.703	1.003	64

Impor Bahan Bakar

Null Hypothesis: Unit root (individual unit root process)
Series: IMPOR_FUEL
Date: 06/20/23 Time: 12:13
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 72
Cross-sections included: 8

Method	Statistic	Prob.*
PP - Fisher Chi-square	5.07348	0.995 4
PP - Choi Z-stat	2.66598	0.996 2

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results IMPOR_FUEL

Cross section	Prob.	Bandwidth	Obs
USA	0.966 2	8.0	9
AUS	0.831 7	8.0	9
BRA	0.336	8.0	9

Impor Bahan Bakar

Null Hypothesis: Unit root (individual unit root process)
Series: IMPOR_FUEL
Date: 06/20/23 Time: 12:20
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 64
Cross-sections included: 8

Method	Statistic	Prob.*
ADF - Fisher Chi-square	19.1957	0.2586
ADF - Choi Z-stat	-1.17787	0.1194

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results IMPOR_FUEL

Cross section	Prob.	Lag	Max Lag	Obs
USA	0.686 3	1	1	8
AUS	0.274 4	1	1	8
BRA	0.247 7	1	1	8

Impor Bahan Bakar

Null Hypothesis: Unit root (common unit root process)
Series: IMPOR_FUEL
Date: 06/20/23 Time: 12:02
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 64
Cross-sections included: 8

Method	Statistic	Prob.*
Levin, Lin & Chu t*	-6.81452	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on IMPOR_FUEL

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
USA	-0.72732	2.722959	0.546 9	1	1	8.0	8
AUS	-1.10055	2.325609	0.890 9	1	1	8.0	8
BRA	-1.67230	2.362055	0.941 5	1	1	8.0	8
IND	-0.92369	7.963477	3.171 7	1	1	8.0	8
IDN	-1.47210	2.936211	1.670 1	1	1	8.0	8
GBR	-1.08054	3.190433	0.804 3	1	1	7.0	8
CAN	-1.09527	0.893211	0.243 1	1	1	8.0	8

5 0.896 IND 8 7.0 9 0.731 IDN 0 8.0 9 0.987 GBR 1 8.0 9 0.829 CAN 4 8.0 9 0.545 MEX 2 8.0 9	0.338 IND 6 1 1 8 0.236 IDN 0 1 1 8 0.606 GBR 0 1 1 8 0.417 CAN 9 1 1 8 0.071 MEX 9 1 1 8	0.333 MEX -1.33698 0.4756 2 1 1 8.0 8
Produksi Minyak Mentah	Produksi Minyak Mentah	Produksi Minyak Mentah
Null Hypothesis: Unit root (individual unit root process) Series: LOGPROIL Date: 06/20/23 Time: 12:14 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear Trends Newey-West automatic bandwidth selection and Bartlett kernel Total (balanced) observations: 72 Cross-sections included: 8	Null Hypothesis: Unit root (individual unit root process) Series: LOGPROIL Date: 06/20/23 Time: 12:20 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear trends User-specified lags: 1 Total (balanced) observations: 64 Cross-sections included: 8	Null Hypothesis: Unit root (common unit root process) Series: LOGPROIL Date: 06/20/23 Time: 12:03 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear trends User-specified lags: 1 Newey-West automatic bandwidth selection and Bartlett kernel Total (balanced) observations: 64 Cross-sections included: 8
Method Statistic Prob.* PP - Fisher Chi-square 3.26573 0.9997 PP - Choi Z-stat 2.79613 0.9974	Method Statistic Prob.* ADF - Fisher Chi-square 28.0537 0.0312 ADF - Choi Z-stat 0.03636 0.5145	Method Statistic Prob.* Levin, Lin & Chu t* -7.65067 0.0000
** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.	** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.	** Probabilities are computed assuming asymptotic normality
Intermediate Phillips-Perron test results LOGPROIL	Intermediate ADF test results LOGPROIL	Intermediate results on LOGPROIL
Cross section Prob. Bandwidth Obs USA 0.8439 8.0 9 AUS 0.6506 6.0 9	Cross section Prob. Lag Max Lag Obs USA 0.0025 1 1 8 AUS 0.8054 1 1 8	Cross section 2nd Stage Coefficient Variance of Reg HAC of Dep. Lag Max Lag Band-width Obs USA -1.73325 0.00036 0.000 1 1 8.0 8 AUS -0.59320 0.00898 0.001 1 1 8.0 8 BRA -0.93889 0.00042 0.000 1 1 8.0 8 IND -0.87017 0.00035 8.E-05 1 1 6.0 8 IDN -0.39442 0.00057 0.000 1 1 2.0 8 GBR -0.38323 0.00311 0.007 1 1 2.0 8
		Coefficient t-Stat SE Reg mu* sig* Obs Pooled -1.14449 -9.820 1.042 -0.703 1.003 64

3	0.515	4
0.685		0.000
BRA 4 3.0 9	BRA 4 1 1 8	CAN -2.30206 8.E-05 2 1 1 8.0 8
0.941	0.805	0.001
IND 2 2.0 9	IND 1 1 1 8	MEX -0.74243 0.0005 6 1 1 1.0 8
0.925	0.932	
IDN 7 1.0 9	IDN 1 1 1 8	Coefficient t-Stat SE Reg mu* sig* Obs
0.864	0.956	Pooled -1.50675 -11.615 1.300 -0.703 1.003 64
GBR 0 1.0 9	GBR 3 1 1 8	
0.810	0.001	
CAN 9 8.0 9	CAN 3 1 1 8	
0.850	0.831	
MEX 9 0.0 9	MEX 1 1 1 8	

Konsumsi Minyak Mentah

Null Hypothesis: Unit root (individual unit root process)
Series: LOGKOIL
Date: 06/20/23 Time: 12:14
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 72
Cross-sections included: 8

Method	Statistic	Prob.**
PP - Fisher Chi-square	18.3162	0.3057
PP - Choi Z-stat	0.39347	0.6530

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results LOGKOIL

Cross section	Prob.	Bandwidth	Obs
USA	0.3264	4.0	9
BRA	0.9417	3.0	9
IND	0.9254	2.0	9
IDN	0.8647	1.0	9
GBR	0.8107	1.0	9
CAN	0.8509	8.0	9
MEX	0.0000	9.0	9

Konsumsi Minyak Mentah

Null Hypothesis: Unit root (individual unit root process)
Series: LOGKOIL
Date: 06/20/23 Time: 12:21
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 64
Cross-sections included: 8

Method	Statistic	Prob.**
ADF - Fisher Chi-square	16.3242	0.4306
ADF - Choi Z-stat	0.23821	0.5941

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results LOGKOIL

Cross section	Prob.	Lag	Max Lag	Obs
USA	0.3236	1	1	8
BRA	0.5151	1	1	8
IND	0.8051	1	1	8
IDN	0.9321	1	1	8
GBR	0.9561	1	1	8
CAN	0.0013	1	1	8
MEX	0.8311	1	1	8

Konsumsi Minyak Mentah

Null Hypothesis: Unit root (common unit root process)
Series: LOGKOIL
Date: 06/20/23 Time: 12:03
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 64
Cross-sections included: 8

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-0.95873	0.1688

** Probabilities are computed assuming asympotic normality

Intermediate results on LOGKOIL

Cross section	2nd Stage Coefficient	HAC of Reg	Variance of Dep.	Lag	Max Lag	Band-width	Obs
USA	-5.92920	0.0007	0.000 3	1	1	8.0	8
AUS	-2.62544	0.0012	0.000 3	1	1	8.0	8
BRA	-2.10749	0.0005	0.001 0	1	1	5.0	8
IND	-1.05748	0.0015	0.001 4	1	1	3.0	8
IDN	-1.74233	0.0009	0.000	1	1	8.0	8

	2		
	0.735		
AUS	6	2.0	9
	0.002		
BRA	2	8.0	9
	0.892		
IND	7	1.0	9
	0.402		
IDN	4	8.0	9
	0.820		
GBR	1	1.0	9
	0.838		
CAN	9	4.0	9
	0.811		
MEX	6	2.0	9

	0.491			
AUS	1	1	1	8
	0.102			
BRA	9	1	1	8
	0.848			
IND	2	1	1	8
	0.158			
IDN	1	1	1	8
	0.981			
GBR	9	1	1	8
	0.145			
CAN	2	1	1	8
	0.912			
MEX	4	1	1	8

			4				
			0.000				
GBR	0.05919	0.0052	9	1	1	7.0	8
			0.000				
CAN	-4.98940	0.0004	2	1	1	8.0	8
			0.000				
MEX	-2.07322	0.0040	6	1	1	8.0	8

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-2.04181	-7.641	1.129	-0.703	1.003	64

1st Different

PP

GDP Riil

Null Hypothesis: Unit root (individual unit root process)
Series: D(LOG_RIIL)
Date: 06/20/23 Time: 12:15
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 64
Cross-sections included: 8

Method	Statistic	Prob.*
PP - Fisher Chi-square	40.0398	0.0008
PP - Choi Z-stat	-3.56845	0.0002

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron

ADF

GDP Riil

Null Hypothesis: Unit root (individual unit root process)
Series: D(LOG_RIIL)
Date: 06/20/23 Time: 12:22
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 56
Cross-sections included: 8

Method	Statistic	Prob.*
ADF - Fisher Chi-square	39.5259	0.0009
ADF - Choi Z-stat	-3.51850	0.0002

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate ADF test

LL

GDP Riil

Null Hypothesis: Unit root (common unit root process)
Series: D(LOG_RIIL)
Date: 06/20/23 Time: 12:05
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 56
Cross-sections included: 8

Method	Statistic	Prob.*
Levin, Lin & Chu t*	-8.49743	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(LOG_RIIL)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
USA	-3.24226	8.E-05	0.000 1	1	1	7.0	7
AUS	-1.69205	0.0003	0.000 1	1	1	7.0	7

test results D(LOG_RIIL)

Cross section	Prob.	Bandwidth	Obs
USA	0.015 2	6.0	8
AUS	0.124 0	6.0	8
BRA	0.134 0	6.0	8
IND	0.228 3	7.0	8
IDN	0.172 0	5.0	8
GBR	0.028 9	2.0	8
CAN	0.565 5	6.0	8
MEX	0.012 5	7.0	8

Ekspor Bahan Bakar

Null Hypothesis: Unit root (individual unit root process)
Series: D(EXPOR_FUEL)
Date: 06/20/23 Time: 12:15
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 64
Cross-sections included: 8

Method	Statistic	Prob.**
PP - Fisher Chi-square	18.4772	0.296 7
PP - Choi Z-stat	-0.32515	0.372 5

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic

results D(LOG_RIIL)

Cross section	Prob.	Lag	Max Lag	Obs
USA	0.026 3	1	1	7
AUS	0.125 0	1	1	7
BRA	0.168 8	1	1	7
IND	0.241 7	1	1	7
IDN	0.338 4	1	1	7
GBR	0.002 7	1	1	7
CAN	0.071 5	1	1	7
MEX	0.292 4	1	1	7

Ekspor Bahan Bakar

Null Hypothesis: Unit root (individual unit root process)
Series: D(EXPOR_FUEL)
Date: 06/20/23
Time: 12:22
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 56
Cross-sections included: 8

Method	Statistic	Prob.**
ADF - Fisher Chi-square	36.6705	0.0023
ADF - Choi Z-stat	-2.84996	0.0022

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic

			3				
		0.001					
BRA	-1.28298	0.0013	0	1	1	7.0	7
		0.002					
IND	-2.97547	0.0026	0	1	1	7.0	7
		0.000					
IDN	-4.67680	0.0005	3	1	1	7.0	7
		0.002					
GBR	-1.82895	3.E-05	5	1	1	2.0	7
		0.000					
CAN	-1.91585	0.0004	3	1	1	7.0	7
		0.002					
MEX	-2.65601	0.0026	6	1	1	7.0	7

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-1.894905	-15.1931	1.208	-0.703	1.003	56

Ekspor Bahan Bakar

Null Hypothesis: Unit root (common unit root process)
Series: D(EXPOR_FUEL)
Date: 06/20/23 Time: 12:06
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 56
Cross-sections included: 8

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-13.4190	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(EXPOR_FUEL)

Cross sectio	2nd Stage Coefficie	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs

normality.

Intermediate Phillips-Perron test results
D(EXPOR_FUEL)

Cross section	Prob.	Bandwidth	Obs
USA	0.4646	7.0	8
AUS	0.9963	6.0	8
BRA	0.0647	7.0	8
IND	0.2137	7.0	8
IDN	0.6619	7.0	8
GBR	0.3328	7.0	8
CAN	0.1678	7.0	8
MEX	0.4109	7.0	8

normality.

Intermediate ADF test results
D(EXPOR_FUEL)

Cross section	Prob.	Lag	Max Lag	Obs
USA	0.0256	1	1	7
AUS	0.8459	1	1	7
BRA	0.4049	1	1	7
IND	0.0785	1	1	7
IDN	0.0059	1	1	7
GBR	0.4390	1	1	7
CAN	0.0920	1	1	7
MEX	0.0774	1	1	7

n	nt					s
		1.1563				
USA	-1.85515	0.79843	1	1	7.0	7
		56.061				
AUS	-1.94378	37.1761	1	1	0.0	7
		1.2063				
BRA	-1.57052	2.75771	1	1	7.0	7
		3.4163				
IND	-1.85772	3.77841	1	1	7.0	7
		2.9743				
IDN	-1.99151	1.03026	1	1	7.0	7
		0.6516				
GBR	-1.47754	1.96755	1	1	7.0	7
		5.3163				
CAN	-2.03459	6.88907	1	1	7.0	7
		0.7327				
MEX	-1.67250	0.72204	1	1	7.0	7

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-1.85739	-17.554	1.021	-0.703	1.003	56

Impor Bahan Bakar

Null Hypothesis: Unit root (individual unit root process)
Series: D(IMPOR_FUEL)
Date: 06/20/23 Time: 12:16
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 64
Cross-sections included: 8

Method	Statistic	Prob.**
PP - Fisher Chi-square	13.5684	0.6308
PP - Choi Z-stat	-0.17131	0.4320

** Probabilities for Fisher

Impor Bahan Bakar

Null Hypothesis: Unit root (individual unit root process)
Series: D(IMPOR_FUEL)
Date: 06/20/23
Time: 12:23
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 56
Cross-sections included: 8

Method	Statistic	Prob.**
ADF - Fisher Chi-square	65.1797	0.0000
ADF - Choi Z-stat	-5.49206	0.0000

** Probabilities for Fisher tests

Impor Bahan Bakar

Null Hypothesis: Unit root (common unit root process)
Series: D(IMPOR_FUEL)
Date: 06/20/23 Time: 12:06
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 56
Cross-sections included: 8

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-25.0150	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(IMPOR_FUEL)

tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results
D(IMPOR_FUEL)

Cross sectio n	Prob.	Bandwidt h	Obs
USA	0.290 2	7.0	8
AUS	0.353 1	7.0	8
BRA	0.436 0	6.0	8
IND	0.280 8	7.0	8
IDN	0.475 4	6.0	8
GBR	0.844 2	7.0	8
CAN	0.284 4	7.0	8
MEX	0.790 0	7.0	8

Produksi Minyak Mentah

Null Hypothesis: Unit root (individual unit root process)
Series: D(LOGPROIL)
Date: 06/20/23 Time: 12:16
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 64
Cross-sections included: 8

Method	Statistic	Prob.*
PP - Fisher Chi-square	24.3776	0.081 6

are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results
D(IMPOR_FUEL)

Cross sectio n	Prob.	Lag	Max Lag	Obs
USA	0.170 6	1	1	7
AUS	0.047 8	1	1	7
BRA	0.082 9	1	1	7
IND	0.176 1	1	1	7
IDN	0.001 4	1	1	7
GBR	0.000 5	1	1	7
CAN	0.139 3	1	1	7
MEX	0.000 6	1	1	7

Produksi Minyak Mentah

Null Hypothesis: Unit root (individual unit root process)
Series: D(LOGPROIL)
Date: 06/20/23
Time: 12:23
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 56
Cross-sections included: 8

Method	Statistic	Prob.*
ADF - Fisher Chi-square	30.9070	0.0138
ADF - Choi Z-stat	-1.2150	0.1122

Cross sectio n	2nd Stage Coefficie nt	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
USA	-1.83159	2.3062	1.359 1	1	1	7.0	7
AUS	-1.88887	1.8126	2.140 2	1	1	7.0	7
BRA	-2.02720	2.4009	1.952 2	1	1	7.0	7
IND	-1.63503	10.177	6.384 7	1	1	7.0	7
IDN	-1.87858	0.6145	2.452 5	1	1	7.0	7
GBR	-2.16067	0.2970	1.924 3	1	1	7.0	7
CAN	-1.90389	0.9369	0.616 2	1	1	7.0	7
MEX	-1.90602	0.1123	0.755 7	1	1	7.0	7

	Coefficie nt	t-Stat	SE Reg	mu*	sig*	Obs
Poole d	-1.95334	-28.683	1.035	-0.703	1.00 3	56

Produksi Minyak Mentah

Null Hypothesis: Unit root (common unit root process)
Series: D(LOGPROIL)
Date: 06/20/23 Time: 12:06
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 56
Cross-sections included: 8

Method	Statistic	Prob.*
Levin, Lin & Chu t*	-8.50150	0.0000

** Probabilities are computed assuming asympotic normality

PP - Choi Z-stat 0.262 -0.63445 9 ** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality. Intermediate Phillips-Perron test results D(LOGPROIL) Cross sectio Bandwidt n Prob. h Obs 0.508 USA 9 7.0 8 0.373 AUS 4 7.0 8 0.001 BRA 3 7.0 8 0.640 IND 0 5.0 8 0.115 IDN 1 7.0 8 0.944 GBR 2 7.0 8 0.322 CAN 4 7.0 8 0.888 MEX 5 2.0 8	8 ** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality. Intermediate ADF test results D(LOGPROIL) Cross sectio Lag Max n Prob. Lag Obs 0.007 USA 9 1 1 7 0.272 AUS 9 1 1 7 0.289 BRA 5 1 1 7 0.432 IND 4 1 1 7 0.458 IDN 5 1 1 7 0.722 GBR 1 1 1 7 0.002 CAN 2 1 1 7 0.996 MEX 2 1 1 7	Intermediate results on D(LOGPROIL) Cross sectio 2nd Stage Coefficient Variance of Reg HAC of Dep. Lag Max Lag Band-width Obs 0.001 USA -1.83635 0.0005 1 1 1 7.0 7 0.003 AUS -2.07576 0.0066 5 1 1 7.0 7 0.000 BRA -1.91285 0.0006 5 1 1 7.0 7 0.000 IND -1.45726 0.0003 2 1 1 4.0 7 0.000 IDN -1.29067 0.0004 1 1 1 7.0 7 0.000 GBR -1.00306 0.0025 5 1 1 6.0 7 0.000 CAN -2.34601 0.0001 4 1 1 7.0 7 0.000 MEX 0.32460 0.0002 3 1 1 2.0 7 Coefficient t-Stat SE Reg mu* sig* Obs Pooled -1.66648 -11.273 1.463 -0.703 1.00 3 56
Konsumsi Minyak Mentah	Konsumsi Minyak Mentah	Konsumsi Minyak Mentah
Null Hypothesis: Unit root (individual unit root process) Series: D(LOGKOIL) Date: 06/20/23 Time: 12:16 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear trends Newey-West automatic bandwidth selection and Bartlett kernel Total (balanced) observations: 64 Cross-sections included: 8 Method Statistic Prob.*	Null Hypothesis: Unit root (individual unit root process) Series: D(LOGKOIL) Date: 06/20/23 Time: 12:23 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear trends User-specified lags: 1 Total (balanced) observations: 56 Cross-sections included: 8 Method Statistic Prob.* ADF - Fisher 17.730 0.339	Null Hypothesis: Unit root (common unit root process) Series: D(LOGKOIL) Date: 06/20/23 Time: 12:07 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear trends User-specified lags: 1 Newey-West automatic bandwidth selection and Bartlett kernel Total (balanced) observations: 56 Cross-sections included: 8 Method Statistic Prob.* Levin, Lin & Chu t* -0.91914 0.1790

PP - Fisher Chi-square	0.000 43.5312 2
PP - Choi Z-stat	0.000 -4.08618 0

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(LOGKOIL)

Cross section n	Prob.	Bandwidth	Obs
USA	0.006 7	7.0	8
AUS	0.148 3	4.0	8
BRA	0.085 3	7.0	8
IND	0.073 3	7.0	8
IDN	0.247 7	7.0	8
GBR	0.085 6	2.0	8
CAN	0.020 8	7.0	8
MEX	0.129 3	3.0	8

Chi-square	5 9
ADF - Choi Z-stat	0.1857 0.573 6 7

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results D(LOGKOIL)

Cross section n	Prob.	Lag	Max Lag	Obs
USA	0.127 9	1	1	7
AUS	0.770 0	1	1	7
BRA	0.151 7	1	1	7
IND	0.703 9	1	1	7
IDN	0.289 4	1	1	7
GBR	0.994 5	1	1	7
CAN	0.055 0	1	1	7
MEX	0.848 3	1	1	7

** Probabilities are computed assuming asymptotic normality

Intermediate results on D(LOGKOIL)

Cross section n	2nd Stage Coefficient	SE of Reg	Variance of Dep.	HAC Lag	Max Lag	Band-width	Obs
USA	-5.35901	0.0007	0.001 0	1	1	7.0	7
AUS	-2.08375	0.0026	0.001 7	1	1	4.0	7
BRA	-1.90222	0.0008	0.000 6	1	1	7.0	7
IND	-1.27302	0.0013	0.000 7	1	1	7.0	7
IDN	-2.05588	0.0022	0.001 1	1	1	7.0	7
GBR	0.61294	0.0018	0.004 4	1	1	5.0	7
CAN	-4.21435	0.0004	0.000 7	1	1	7.0	7
MEX	-2.19777	0.0042	0.002 4	1	1	7.0	7

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-2.11982	-7.634	1.270	-0.703	1.00 3	56

2nd Different

PP	ADF	LL
GDP Riil	GDP Riil	GDP Riil
Null Hypothesis: Unit root (individual unit root process) Series: D(LOG_RIIL,2) Date: 06/20/23 Time: 12:17 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear trends Newey-West automatic bandwidth selection and	Null Hypothesis: Unit root (individual unit root process) Series: D(LOG_RIIL,2) Date: 06/20/23 Time: 12:24 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear trends User-specified lags: 1 Total (balanced) observations: 48	Null Hypothesis: Unit root (common unit root process) Series: D(LOG_RIIL,2) Date: 06/20/23 Time: 12:08 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear trends User-specified lags: 1 Newey-West automatic bandwidth selection and Bartlett kernel Total (balanced) observations: 48 Cross-sections included: 8

Bartlett kernel
Total (balanced) observations: 56
Cross-sections included: 8

Method	Statistic	Prob.**
PP - Fisher Chi-square	18.9913	0.2691
PP - Choi Z-stat	2.18900	0.9857

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(LOG_RIIL,2)

Cross section	Prob.	Bandwidth	Obs
USA	0.9858	6.0	7
AUS	0.6468	6.0	7
BRA	0.8567	6.0	7
IND	0.9999	6.0	7
IDN	0.0633	6.0	7
GBR	0.0053	2.0	7
CAN	0.3689	6.0	7
MEX	0.9990	6.0	7

Cross-sections included: 8

Method	Statistic	Prob.**
ADF - Fisher Chi-square	40.9174	0.0006
ADF - Choi Z-stat	-3.01593	0.0013

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results D(LOG_RIIL,2)

Cross section	Prob.	Lag	Max Lag	Obs
USA	0.2201	1	1	6
AUS	0.3556	1	1	6
BRA	0.0362	1	1	6
IND	0.0671	1	1	6
IDN	0.7387	1	1	6
GBR	0.0007	1	1	6
CAN	0.3481	1	1	6
MEX	0.2663	1	1	6

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-19.0533	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(LOG_RIIL,2)

Cross section	2nd Stage Coefficient	SE of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
USA	-3.20845	0.00033	0.0003	1	1	6.0	6
AUS	-1.79489	0.00096	0.0000	1	1	6.0	6
BRA	-1.72462	0.00072	0.0002	1	1	6.0	6
IND	-5.20733	0.00173	0.0004	1	1	6.0	6
IDN	-3.63029	0.00122	0.0001	1	1	5.0	6
GBR	-3.00197	2.E-06	0.0003	1	1	3.0	6
CAN	-1.94933	0.00129	0.0000	1	1	6.0	6
MEX	-5.16049	0.00400	0.0004	1	1	6.0	6

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-2.83814	-28.393	1.543	-0.703	1.003	48

Ekspor Bahan Bakar	Ekspor Bahan Bakar	Ekspor Bahan Bakar
Null Hypothesis: Unit root (individual unit root process) Series: D(EXPOR_FUEL,2) Date: 06/20/23 Time: 12:17 Sample: 2012 2021 Exogenous variables: Individual effects, individual	Null Hypothesis: Unit root (individual unit root process) Series: D(EXPOR_FUEL,2) Date: 06/20/23 Time: 12:25 Sample: 2012 2021 Exogenous variables: Individual	Null Hypothesis: Unit root (common unit root process) Series: D(EXPOR_FUEL,2) Date: 06/20/23 Time: 12:09 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear trends User-specified lags: 1 Newey-West automatic bandwidth selection and

linear
Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 56
Cross-sections included: 8

Method	Statistic	Prob.**
PP - Fisher Chi-square	12.5924	0.7023
PP - Choi Z-stat	0.78674	0.7843

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(EXPOR_FUEL,2)

Cross section	Prob.	Bandwidth	Obs
USA	0.9198	6.0	7
AUS	0.5143	1.0	7
BRA	0.1310	6.0	7
IND	0.6914	6.0	7
IDN	0.9782	6.0	7
GBR	0.2206	6.0	7
CAN	0.2496	6.0	7
MEX	0.7978	6.0	7

Impor Bahan Bakar

Null Hypothesis: Unit root (individual unit root process)
Series: D(IMPOR_FUEL,2)

effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 48
Cross-sections included: 8

Method	Statistic	Prob.**
ADF - Fisher Chi-square	21.1057	0.1745
ADF - Choi Z-stat	-1.28543	0.0993

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results D(EXPOR_FUEL,2)

Cross section	Prob.	Lag	Max Lag	Obs
USA	0.2077	1	1	6
AUS	0.9373	1	1	6
BRA	0.2188	1	1	6
IND	0.3244	1	1	6
IDN	0.1094	1	1	6
GBR	0.1856	1	1	6
CAN	0.3756	1	1	6
MEX	0.2478	1	1	6

Impor Bahan Bakar

Null Hypothesis: Unit root (individual unit root process)
Series: D(IMPOR_FUEL,2)

Bartlett kernel
Total (balanced) observations: 48
Cross-sections included: 8

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-8.53449	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(EXPOR_FUEL,2)

Cross section	2nd Stage Coefficient	HAC of Reg	Variance of Dep.	Lag	Max Lag	Band-width	Obs
USA	-1.85345	2.43740	2.982	1	1	6.0	6
AUS	-0.83485	54.5342	104.02	1	1	0.0	6
BRA	-1.93782	2.37688	3.561	1	1	6.0	6
IND	-1.83996	10.8224	10.78	1	1	4.0	6
IDN	-1.96967	3.85786	6.967	1	1	6.0	6
GBR	-1.85278	1.35147	1.833	1	1	6.0	6
CAN	-1.93999	20.5087	16.13	1	1	6.0	6
MEX	-1.79636	1.70332	2.165	1	1	4.0	6

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-1.87334	-13.7581	1.01044	-0.7033	1.003	48

Impor Bahan Bakar

Null Hypothesis: Unit root (common unit root process)
Series: D(IMPOR_FUEL,2)
Date: 06/20/23 Time: 12:09

Date: 06/20/23
Time: 12:18
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 56
Cross-sections included: 8

Method	Statistic	Prob.**
PP - Fisher Chi-square	5.99788	0.9881
PP - Choi Z-stat	2.96301	0.9985

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(IMPOR_FUEL,2)

Cross section	Prob.	Bandwidth	Obs
USA	0.5211	6.0	7
AUS	0.9313	6.0	7
BRA	0.7115	6.0	7
IND	0.3101	6.0	7
IDN	0.6471	6.0	7
GBR	0.9981	6.0	7
CAN	0.7228	6.0	7
MEX	0.9971	6.0	7

Produksi Minyak Mentah

Date: 06/20/23
Time: 12:26
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 48
Cross-sections included: 8

Method	Statistic	Prob.**
ADF - Fisher Chi-square	34.2112	0.0051
ADF - Choi Z-stat	-2.86006	0.0021

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results D(IMPOR_FUEL,2)

Cross section	Prob.	Lag	Max Lag	Obs
USA	0.3197	1	1	6
AUS	0.3028	1	1	6
BRA	0.4171	1	1	6
IND	0.2312	1	1	6
IDN	0.0321	1	1	6
GBR	0.0032	1	1	6
CAN	0.3727	1	1	6
MEX	0.1041	1	1	6

Produksi Minyak Mentah

Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 48
Cross-sections included: 8

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-16.8559	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(IMPOR_FUEL,2)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
USA	-1.89370	4.39663	3.643	1	1	6.0	6
AUS	-1.91707	6.20846	7.705	1	1	4.0	6
BRA	-1.96182	8.49708	5.406	1	1	6.0	6
IND	-1.62752	13.0869	17.44	1	1	4.0	6
IDN	-1.81261	2.01608	5.884	1	1	6.0	6
GBR	-2.01466	0.33559	5.056	1	1	5.0	6
CAN	-1.93857	2.29234	1.991	1	1	5.0	6
MEX	-1.79840	0.45232	3.964	1	1	3.0	6

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-1.90963	-21.706	1.020	-0.703	1.003	48

Produksi Minyak Mentah

Null Hypothesis: Unit root (individual unit root process)
Series: D(LOGPROIL,2)
Date: 06/20/23 Time: 12:18
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 56
Cross-sections included: 8

Method	Statistic	Prob.**
PP - Fisher Chi-square	50.1722	0.0000
PP - Choi Z-stat	-3.11281	0.0009

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(LOGPROIL,2)

Cross section	Prob.	Bandwidth	Obs
USA	0.4647	6.0	7
AUS	0.0720	6.0	7
BRA	0.0052	6.0	7
IND	0.6877	6.0	7
IDN	0.0173	6.0	7
GBR	0.0623	6.0	7
CAN	0.9858	6.0	7
MEX	0.0715	6.0	7

Null Hypothesis: Unit root (individual unit root process)
Series: D(LOGPROIL,2)
Date: 06/20/23 Time: 12:26
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 48
Cross-sections included: 8

Method	Statistic	Prob.**
ADF - Fisher Chi-square	19.6158	0.2380
ADF - Choi Z-stat	-0.63990	0.2611

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results D(LOGPROIL,2)

Cross section	Prob.	Lag	Max Lag	Obs
USA	0.0701	1	1	6
AUS	0.7444	1	1	6
BRA	0.3536	1	1	6
IND	0.8208	1	1	6
IDN	0.6038	1	1	6
GBR	0.1172	1	1	6
CAN	0.0625	1	1	6
MEX	0.8231	1	1	6

Null Hypothesis: Unit root (common unit root process)
Series: D(LOGPROIL,2)
Date: 06/20/23 Time: 12:10
Sample: 2012 2021
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 48
Cross-sections included: 8

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-7.37686	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(LOGPROIL,2)

Cross section	2nd Stage Coefficient	SE of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
USA	-1.98529	0.00180	0.0030	1	1	6.0	6
AUS	-1.93797	0.01820	0.0100	1	1	6.0	6
BRA	-2.35145	0.00147	0.0030	1	1	3.0	6
IND	-1.78834	0.00074	0.0010	1	1	0.0	6
IDN	-2.02097	0.00114	0.0000	1	1	6.0	6
GBR	-2.14654	0.00136	0.0010	1	1	5.0	6
CAN	-2.31989	0.00052	0.0010	1	1	6.0	6
MEX	-1.66320	0.00021	0.0010	1	1	2.0	6

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-2.11408	-13.957	1.0143	-0.7033	1.0000	48

0.000 MEX 1 6.0 7		
Konsumsi Minyak Mentah	Konsumsi Minyak Mentah	Konsumsi Minyak Mentah
Null Hypothesis: Unit root (individual unit root process) Series: D(LOGKOIL,2) Date: 06/20/23 Time: 12:18 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear trends Newey-West automatic bandwidth selection and Bartlett kernel Total (balanced) observations: 56 Cross-sections included: 8	Null Hypothesis: Unit root (individual unit root process) Series: D(LOGKOIL,2) Date: 06/20/23 Time: 12:26 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear trends User-specified lags: 1 Total (balanced) observations: 48 Cross-sections included: 8	Null Hypothesis: Unit root (common unit root process) Series: D(LOGKOIL,2) Date: 06/20/23 Time: 12:10 Sample: 2012 2021 Exogenous variables: Individual effects, individual linear trends User-specified lags: 1 Newey-West automatic bandwidth selection and Bartlett kernel Total (balanced) observations: 48 Cross-sections included: 8
Method / Statistic / Prob.* PP - Fisher Chi-square 61.3995 0.0000 PP - Choi Z-stat -4.69276 0.0000	Method / Statistic / Prob.* ADF - Fisher Chi-square 33.5657 0.0062 ADF - Choi Z-stat -2.38656 0.0085	Method / Statistic / Prob.* Levin, Lin & Chu t* -8.51392 0.0000
** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.	** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.	** Probabilities are computed assuming asymptotic normality
Intermediate Phillips-Perron test results D(LOGKOIL,2)	Intermediate ADF test results D(LOGKOIL,2)	Intermediate results on D(LOGKOIL,2)
Cross section / Prob. / Bandwidth / Obs USA 0.0456 6.0 7 AUS 0.0957 6.0 7 BRA 0.0104 6.0 7 IND 0.0099 6.0 7 IDN 0.9585 6.0 7	Cross section / Prob. / Lag / Max Lag / Obs USA 0.2352 1 1 6 AUS 0.6981 1 1 6 BRA 0.5085 1 1 6 IND 0.1502 1 1 6 IDN 0.6476 1 1 6 GBR 0.1260 1 1 6	Cross section / 2nd Stage Coefficient / Variance of Reg / HAC of Dep. / Lag / Max Lag / Band-width / Obs USA -5.153900 0.001999 1 1 6.0 6 AUS -2.333590 0.003007 1 1 1.0 6 BRA -2.084740 0.002601 1 1 6.0 6 IND -4.549670 0.001118 1 1 6.0 6 IDN -2.330470 0.005906 1 1 3.0 6 GBR -6.995950 0.000622 1 1 6.0 6 CAN -4.564790 0.000201 1 1 6.0 6 MEX -6.073760 0.001507 1 1 6.0 6
		Coefficient / t-Stat / SE / mu* / sig* / Obs

	0.000				0.001				nt	Reg		s
GBR	1	6.0	7	CAN	2	1	1	6	Poole			1.00
	0.060				0.041				d	-4.30767	-17.338 1.347 -0.703	3 48
CAN	0	6.0	7	MEX	6	1	1	6				
	0.018											
MEX	8	6.0	7									