Determinants of Export Volume Oil Indonesian Raw Materials to Main Destination Countries

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Abstract Crude Oil, which has long been a mainstay sector in Indonesia's exports, contributes greatly to state revenue, thus driving the pace of national economic growth. In the context of the Indonesian economy, the crude oil industry plays an indispensable role, especially over the past few decades. This study aims to identify the factors that affect the volume of Indonesia's crude oil exports to nine main destination countries—including Japan, South Korea, China, Thailand, Singapore, Malaysia, Australia, the United States, and Taiwan—in the period from 2003 to 2022. Some of the variables analyzed include exchange rates, foreign investment, production, and world oil prices. Through the regression analysis method of panel data, the results of this study indicate that simultaneously, exchange rates, foreign investment, production, and world oil prices have a significant effect on Indonesia's crude oil exports to these countries. Separately, the world exchange rate and oil price variables had a significant negative influence on Indonesia's crude oil export volume, while the foreign investment and production variables showed a positive and significant influence on export volume during the 2003-2022 research period.

Keywords: Exchange, Investment, Oil

1. INTRODUCTION

As one of the countries that actively participates in international trade, Indonesia has an important role in the dynamics of the exchange of goods and services between countries. This international trade activity involves the process of buying and selling goods and services between residents of one country and residents of another country, where this process is driven by various factors that influence the level of demand and supply (Nopirin, 2009:3). Indonesia itself has promising export opportunities, considering the diversity of flora and fauna that it has that are not found in other countries. In addition, Indonesia's strategic geographical location, directly bordering two continents and two oceans, further strengthens its position in global trade (Putra and Yasa, 2016). In the oil and gas export category, crude oil is the main commodity that has a fairly good position in the international market.

The theory of comparative advantage is one of the basic theories in international trade which is based on the principle that each country can improve its standard of living and real income by focusing on the production of commodities in which they have higher productivity. By focusing on the most productive commodities, these countries can maximize production efficiency. This principle of comparative advantage shows that specialization in production not only benefits countries that have absolute efficiency in all commodities, but also provides benefits to other countries. If each country is willing to specialize in commodities in which

they have a comparative advantage or higher efficiency, trade between countries will benefit all parties. Thus, given the varying production conditions in each country, these countries realize that specializing in the production of certain goods will be more profitable than producing all goods themselves.

In modern theories that focus on international trade, the Heckscher-Ohlin (HO) theory is one of the main approaches that is widely known. This theory is often referred to as the theory of proportions and intensity of production factors, because it emphasizes the role of production factors in determining trade patterns. However, the HO theory will only apply if a number of basic assumptions are met, namely the existence of two countries, two types of products, and two factors of production to describe trade between two countries that exchange goods. However, this simplification can be extended to include more than two countries, two products, and two factors of production in more complex practices. In addition, characteristics that distinguish one country from another, such as differences in ownership of production factors (for example, a country is capital-intensive while another country is labor-intensive) and differences in income levels, also play an important role, especially in the context of trade between developed and developing countries (Tan, 2014). For example, in order to increase economic growth in Indonesia which has a lot of workers, efforts to develop the creative industry are carried out as one way to maximize the potential for economic growth (Zamzami and Hastuti, 2018).

Table 1

Year	Export Volume (Barrels)	Year	Export Volume (Barrels)
2003	26,517,000.00	2013	13,016,000.00
2004	23,467,000.00	2014	12,400,000.00
2005	21,488,000.00	2015	15,554,000.00
2006	18,127,000.00	2016	16,955,000.00
2007	18,175,000.00	2017	13,570,000.00
2008	18,235,000.00	2018	10,214,000.00
2009	17,967,000.00	2019	25,716,000.00
2010	18,132,000.00	2020	31,447,000.00
2011	17,819,000.00	2021	43,768,000.00
2012	14,937,000.00	2022	15,493,000.00

Source: Directorate General of Oil and Gas, Ministry of Energy and Mineral Resources

In recent years, Indonesia's crude oil export volume has fluctuated. Based on data from the Directorate General of Oil and Gas of the Ministry of Energy and Mineral Resources and other statistical institutions, Indonesia's crude oil export volume fluctuates depending on world oil prices, domestic production, and international demand.
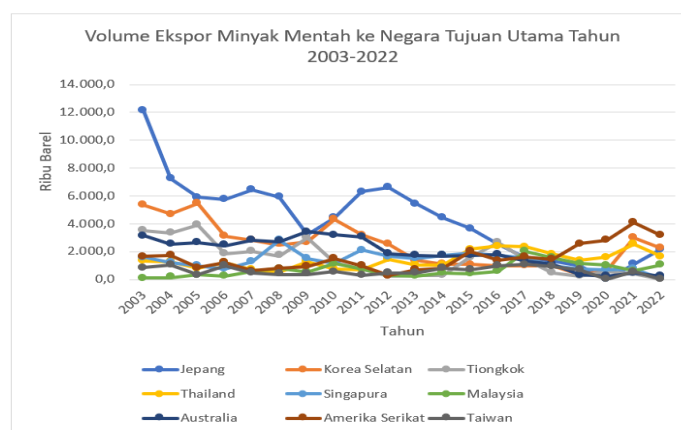
Source: Central Bureau of Statistics, 2023

Figure 1

**Development of Indonesian Crude Oil Export Volume to
Top Destination Countries 2003-2022**

Over the past two decades, several countries recorded as major importers of crude oil from Indonesia include Japan, South Korea, Taiwan, China, Thailand, Singapore, Malaysia, Australia, and the United States, as shown in the illustration above. In 2003, Indonesia reached the peak of its crude oil exports to Japan, with the highest volume of 12,111 thousand tons. Although Japan shows the highest import figure for Indonesian crude oil compared to other countries, this export volume has changed from year to year. Factors influencing this fluctuation include the energy transition in Japan, including the shift from nuclear energy to gas and coal, which has resulted in a reduction in crude oil imports from Indonesia. During this period, the decline in Japanese demand for crude oil could be influenced by various factors, such as changes in energy policy, diversification of energy sources, or a decline in industrial activity that relies on crude oil as fuel or raw materials.

Furthermore, the volume and value of exports can increase or decrease in response to the exchange rate and the amount of money in circulation. For example, a strong exchange rate tends to reduce the value of a country's exports, because domestic products become more expensive than foreign products (Bekti, 2018).

Along with the rapid development of the globalization era, attention to the impact of Foreign Direct Investment (FDI) on trade, especially international demand, is increasing (Mariam, 2004). In developing countries, the relationship between FDI and trade tends to be close, as stated by Jehad (2012). Pacheco-Lopez's (2004) research shows that the presence of multinational companies can trigger an increase in exports, thus having implications for an increase in export volume. In addition, the results of Andina et al.'s (2022) research strengthen this view by finding that FDI has a positive and significant effect on export volume. clothes so Indonesia.

2. RESEARCH METHODS

In this study, the non-participatory observation method was applied, where data collection was carried out by researchers without actively playing a role or being directly involved in the phenomenon being monitored (Sugiyono, 2013). In addition, secondary data sources were collected from official websites, including the Central Bureau of Statistics, the World Bank, the US Energy Information Administration, and indexmundi. To analyze the data, the panel data analysis method was used to evaluate the influence of various factors, such as exchange rates, foreign investment, production, and world crude oil prices, on the volume of Indonesian crude oil exports to major destination countries in the period 2003 to 2022 (Sugiyono, 2017; Ghozali, 2016). This technique integrates time series data with cross sections, using three available regression models: the common effect model (CEM), the fixed effect model (FEM), and the random effect model (REM) (Gujarati & Porter, 2013). The process of selecting the best model is carried out through a series of tests, namely the Chow test (to determine between CEM and FEM), the Hausman test (to determine between FEM and REM), and the Lagrange multiplier test (to choose between CEM and REM).

3. RESULTS AND DISCUSSION

Descriptive statistical analysis in this study was conducted on independent variables, namely exchange rates $(X1)$, foreign investment $(X2)$, production $(X3)$, world crude oil prices $(X4)$. Then there is one dependent variable, namely the volume of Indonesian crude oil exports to the main destination countries. The data in this study are data from 2003-2022. Descriptive statistics focus on the maximum value, minimum value, average value *(mean)* and standard deviation value which are presented in the following table.

Table 2

Descriptive Statistical Analysis Test Results

	Y (Thousand Barrels)	X1 (USD)	X2 (BillionUSD)	X3 (Thousand Barrels)	X4 (USD/barrel)
Mean	2,410,673	2,021,856	42,783,377	1,491,773	80.84244
Median	1,285,150	6,763,000	6,273,299	4,911,500	74.79500
Maximum	12.111	131,436	511,434,000	160,520	202.61
Minimum	0	966	-4,947,474	0	24.10
Std. Dev.	9,032,315	3,234,692	9,744,603	2,614,994	34.14357
Observations	180	180	180	180	180

Source: Processed data, 2024

Before determining the best model that can be produced in regressing panel data, several tests need to be carried out including the Chow Test, Hausman Test, and Lagrange Multiplier Test. In this regression analysis, the model selection tests carried out are only the Chow Test and the Hausman Test which are explained as follows.

Table 3

Test Results Based on *Chow Test*

Effects Test	Statistics	df	Prob.
Cross-section F	3.199741	(8,167)	0.0021
Cross-section Chi-square	25.669969	8	0.0012

Source: Processed data, 2024

As shown by the Chow test results in the table above, the probability obtained is 0.0000. Given that the probability value is below 0.05, H0 must be rejected and H1 accepted. Thus, the estimation model chosen for this analysis is the Fixed Effect Model (FEM).

Table 4

Test Results Based on Hausman Test

Correlated Random Effects - Hausman Test			
Equation: Untitled			
Cross-section random effects test			
Test Summary	Chi-Sq. Statistic	Chi-Sq. df	Prob.
Random cross section	22.916696	4	0.0001

Source: Processed data, 2024

Based on the results of the Hausman test shown in the table above, the probability is recorded at 0.000. Given that this probability value is below the threshold of 0.05, then H0 is rejected and H1 is accepted, which means that the more appropriate estimation model to use is the Fixed Effect Model (FEM).

In this study, panel data regression analysis is applied to identify how much influence factors such as exchange rates, foreign investment, production volume, and world oil prices have on Indonesia's crude oil exports to major destination countries in the period 2003-2022. The panel data regression equation is applied in the calculation. Through testing carried out using the E-views program, both the Hausman Test and the Chow Test direct the selection of this research model to the Fixed Effect Model. Therefore, this model is used to evaluate the effect of variable x on variable y, which is presented in the following table :

Table 5

Panel Data Regression Results on *Fixed Effect Model*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	36.25358	2.319662	15.62882	0.0000
X1	-0.095445	0.029105	-3.279331	0.0013
X2	0.071523	0.016616	4.304422	0.0000
X3	2.561807	0.207718	12.33311	0.0000
X4	-0.317833	0.033218	-9.568001	0.0000
	Effects Specification			
Root MSE	4.638952	R-squared		0.911500
Mean dependent var	17.38518	Adjusted R-squared		0.905140
S.D. dependent var	15.63712	S.E. of regression		4.816126
Akaike info criterion	6.051298	Sum squared resid		3873.577
Schwarz criterion	6.281901	Log likelihood		-531.6169
Hannan-Quinn criter.	6.144798	F-statistic		143.3330
Durbin-Watson stat	1.275260	Prob(F-statistic)		0.000000

Source: Processed data, 2024

Based on the regression results in table 5, the equation model to describe *the fixed effect model* is formulated as follows.

$$\hat{Y} = 36.25358 - 0.095445 \, X_{1it} + 0.071523$$

This research can provide theoretical implications, namely it can contribute to scientific knowledge and support existing theories and journals and obtain new research results based on the results of research on exchange rates, foreign investment, production, and world crude oil prices affecting the volume of Indonesian crude oil exports. The theoretical implications of the results of this study include:

The results of the study indicate that the exchange rate has a negative effect on the volume of Indonesian crude oil exports. The theory of demand elasticity explains that changes in the exchange rate can affect the volume of international trade, depending on the price

elasticity of export and import goods. If the demand for Indonesian crude oil is price elastic (meaning, demand is very sensitive to price changes), then a price increase caused by domestic currency appreciation will cause a decrease in export volume. Even if demand is inelastic, the impact of the price increase may still lead to a decrease in export volume. In general, domestic currency appreciation usually leads to a decrease in export volume because the price of export goods becomes more expensive in foreign currency and reduces competitiveness in the international market. Price increases caused by currency appreciation often lead to a decrease in export volume, except in certain situations that allow to reduce the impact.

The results of the study show that foreign investment has a positive effect on Indonesia's crude oil exports. This means that an increase in foreign investment will lead to an increase in the volume of Indonesia's crude oil exports. Where when the main destination country receives capital and technology flows that will increase productivity in its country, the volume of Indonesia's crude oil exports will actually increase. The theory of comparative advantage by David Ricardo explains that a country will export goods that can be produced at a relatively lower cost. If FDI increases the efficiency of crude oil production, then production costs can decrease, and Indonesia will have a comparative advantage in producing and exporting crude oil, so that export volumes can increase.

The results of the study show that crude oil production has a positive effect on the volume of Indonesian crude oil exports to the main destination countries. This means that even though the main destination countries have produced enough crude oil but may not have the capacity to produce crude oil with a certain quality or specification, the destination countries will import crude oil in Indonesia because the quality of crude oil produced in Indonesia may have a higher quality standard compared to crude oil production in the destination countries.

The results of the study show that world crude oil prices have a negative effect on Indonesia's crude oil exports to the main destination countries. In the theory of price elasticity, it states that if world crude oil prices rise, and if the demand for crude oil in the international market is elastic to price (meaning, demand is very sensitive to price changes), then the volume of crude oil demand will decrease. The decline in global demand due to rising prices can cause a decline in Indonesia's crude oil export volume. Buying countries may reduce their purchases or look for cheaper alternatives if price too tall .

4. CONCLUSION AND SUGGESTIONS

Overall, the exchange rate, foreign investment, production, and world crude oil prices have a significant influence on Indonesia's crude oil exports to major destination countries during the period 2003 to 2022. Separately, the exchange rate and world crude oil prices have a significant negative impact on Indonesia's crude oil export volume. Meanwhile, foreign investment and production levels have a positive and significant influence on increasing crude oil exports to major destination countries during the same period.

Therefore, it is expected that the Indonesian government will continue to advance the crude oil industry sector, considering its important role as one of the largest contributors to national export value. In addition, increasing the volume of crude oil production is expected to be a major concern, considering the large contribution of production to the amount of exports. No less important, monetary stability also needs to be maintained properly, and the right policy regarding the dollar exchange rate needs to be considered so that Indonesia's export activities can take place without significant obstacles.

REFERENCES

Airlangga, Brahma. 2007. Analisis Pengaruh Jumlah Produksi Kelapa Sawit, Harga Dan Kurs Dollar Amerika Terhadap Volume Ekspor Minyak Kelapa Sawit Indonesia Periode 1994-2006, *Skripsi* Jurusan Ilmu Ekonomi, Denpasar: Fakultas Ekonomi UNUD.

Agustina., dan Reny. (2014). Pengaruh Ekspor, Impor, Nilai Tukar Rupiah Dan Tingkat Inflasi Terhadap Cadangan Devisa Indonesia. *Jurnal Wira Ekonomi Mikroskil*, 4(2), 61-70.

Badan Pusat Statistik. (2023). *Jumlah Berat Bersih (Ribu Ton) Produksi Ekspor Minyak Mentah Indonesia Menurut negara Tujuan Utama*. Berita Resmi Statistik. Indonesia. Diunduh : 14 Desember 2023.

Badan Pusat Statistik. (2023). *Perkembangan Volume dan Nilai Ekspor Minyak Mentah*. Berita Resmi Statistik. Indonesia. Diunduh : 14 Desember 2023.

Bekti, Setyorani. (2018). Pengaruh Nilai Tukar Terhadap Ekspor dan Jumlah Uang Beredar di Indonesia. *FORUM EKONOMI*, 20 (1), 1411-1713.

Ghalayini, L. (2011). The Interaction between Oil Price and Economic Growth. *Review of Middle East Economics and Finance (13)*.

Hastuti, D., Delis, A., & Rosmeli, R. (2018). Pengembangan Komoditas Kelapa Sawit dan Karet SertaDampaknya Terhadap Pendapatan Petani di Kecamatan Pelepat Ilir. *Jurnal Sains Sosio Huaniora. 2(2), 92-104*

Indexmundi. (2023). *Perkembangan Harga Minyak Mentah Dunia.* Diunduh dari website: https://www.indexmundi.com/commodities/?commodity=crudeoil&months=180. Diunduh : 25 Pebruari 2024.

Mankiw, N. Gregory. (2006*). Makroekonomi. Edisi Keenam.* Jakarta: Erlangga. Marbun, L. (2015). Pengaruh Produksi, Kurs, dan Gross Domestic Product (GDP) terhadap Ekspor Kayu Lapis. *Economics Development Analysis Journal,* 4(2): 129-136.

Maygirtasari, Y., dan Mawardi. (2015). Faktor-Faktor yang Mempengaruhi Volume Ekspor Crude Palm Oil (CPO). Indonesia. *Jurnal Administrasi Bisnis.* 25(2), 1- 8.

Nopirin. (2009). *Ekonomi Moneter, Buku II, Edisi ke-1, Cetakan Ketujuh,* Yogyakarta: BPFE. Pemerintah Pusat. Peraturan Pemerintah Pengganti Undang-Undang (Perpu) tentang Pertambangan Minyak dan Gas Bumi. (1960). Indonesia.

Perdew, Jessica., dan Shively, Gerarld. (2009). The Economics Of Pest And Production Management In Small-Holder Cocoa: Lessons From Sulawesi. *Bulletin of Indonesian Economic Studies,* 45(3), 409–25.

Putra, A A. N. A. M., dan Yasa, I. N. M. (2016). Pengaruh Inflasi dan Pertumbuhan Ekonomi Terhadap Kurs Dollar Amerika Dan Ekspor Indonesia. *E-jurnal Ekonomi Pembangunan Universitas Udayana,* 5(7), 2303-0178.

Sugiyono. (2013). *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif Dan R&D.* Bandung: Alfabeta.

Stephen, V. Marks., Donald, F. Larson., dan Jacqueline Pomeroy. (1998). Economic Effects of Taxes on Exports of Palm Oil Products. *Bulletin of Indonesian Economic Studies,* 34(3), 37-58

_____. (2014). *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif dan R&D.* Bandung. Alfabeta.

Triyono. (2013). Metodologi Penelitian Pendidikan. Yogyakarta: Ombak. Utama, E. R. (2014). Analisis Faktor-Faktor Yang Mempengaruhi Impor Minyak Mentah Di Indonesia. JEJAK *Journal of Economics and Policy,* 7(1), 85-91.

World Bank Data. (2021). *Exchange Rate of United States Dollar Against Indonesia Rupiah* 2011-2022. Diunduh : 27 Februari 2024.