Determinants of Indonesia CPO Exports 2018-2022

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Abstract. Indonesia is the largest CPO producer and exporter in the world. Indonesia's CPO export volume for 2020-2022 continues to decline, while the export value continues to increase. The purpose of this study was to determine the direction and effect of the CPO production volume, CPO international prices, CPO domestic prices, and exchange rates on Indonesia's CPO export volume during 2018-2022. this study used the panel data method, combining the time series (2018-2022) and cross-section (25 countries). The result of this study used REM of the best model, after carrying out the Chow test and hausman test. The CPO production and international prices have a positive and significant effect on CPO export volume. Meanwhile, CPO domestic prices and exchange rates have a negative and significant effect on CPO export volume. When domestic prices and exchange rates increase, CPO exports will decrease.

Keywords: CPO Export, CPO Production, international prices, Exchange Rates, Panel Data.

1 Introduction

Exporting is the activity of transporting goods from one country to another country [1]. Is the sale of goods or services owned by one country to another country to receive payment in foreign currency, subject to government regulations? As well as transactions conducted in a foreign language [2]. An export activity occurs when an offer from one country (the party) is accepted by another country (the counterparty) [1].

Several countries use exports as a useful basis for earning income and increasing the country's economic growth, including Indonesia [3]. Indonesian exports of goods and services generate the main foreign exchange earnings. Foreign exchange earnings are used to finance national development. The Indonesian economy is inseparable from foreign countries and requires foreign currency. Thus, export-based industrial and commercial activities are very important to stimulate economic growth [4].

Table 1. Indonesia's Oil and Non-oil and Gas Exports (Thousand Tonnes)

Exports	2017	2018	2019	2020	2021	2022
Oil and Gass	42,505	37,055.5	26,528.2	27,497.9	27,497.9	24,562.5
Non-oil and Gas	503,341.6	571,852	627,946.2	552,280.3	594,777.6	622,764.9
Total	545,846.6	608,907.5	654,474.4	654,474.4	621,667.8	647,327.4

Source: BPS, processed [15]

According to Table 1, Indonesia's exports continue to increase year by year. Even though in 2020 the total export volume decreased due to Covid-19. According to Bea Cukai [5], the spread of COVID-19 has caused a global pandemic and hampered global economic growth. This has led to the restriction of the production process due to difficulties in raw materials, an increase in the number of unemployed people, and delays in export activities. But in 2021, if you look at the table above, the total export volume will grow again, with an increase of 41,989.6 thousand tons. Non-oil and gas commodity exports from 2017 to 2022 have a high export volume compared to oil and gas export volumes.

Indonesia is a country with many advantages in export activities. This is because Indonesia has abundant natural resources and many human resources, which can become a source of food crops and export products [3]. As in Table 1, natural resources, both oil and gas and non-oil and gas are used for export. Indonesia is rich in natural resources both in agriculture and plantations. One of Indonesia's plantation commodities is palm oil [6].

Palm oil is one of the plantation commodities that plays an important role in Indonesia's economy. This is because the vegetable oil produced from palm oil is in great demand by the industry [7]. Indonesia is the largest palm oil-producing country in the world and ranks first as a producer of palm oil. This is what makes palm oil one of Indonesia's top export products [8].

Table 2. Volume and Value of Indonesia Palm Oil Exports (Tons/Thousand USD)

Exports	2018	2019	2020	2021	2022
Volume	29,302,406.3	29,547,938.2	27,326,069.2	26,989,985.4	26,239,708.2
Value	17,898,774.1	15,574,403.6	28,516,016.9	28,606,025.1	29,655,790.2

Source: BPS publication, processed [16]

Based on Table 2, Indonesia's palm oil exports increased from 2018 to 2019, but palm oil exports continued to decline from 2020 to 2022. Although the volume decreased, the value of exports increased. The export volume in 2019 was 29,547,938.2 tons with a value of 15,574,403.6 thousand US dollars. In 2019, export volume decreased to 27,326,069.2 tons and value increased to 28,516,016.9 US dollars despite the ongoing COVID-19 pandemic. Palm oil exports will decline in 2022, indicating weakening global trade. The cause of the weakening is that several countries, including the main destination for Indonesian palm oil exports, are experiencing an economic recession.

Table 3. CPO Exports to 5 Destination Countries (Tons)

Countries	2019	2020	2021	2022
India	4,576,596,863	4,568,714,663	3,088,659,615	4,996,331,648
United States of America	1,189,012,676	1,123,713,223	1,640,227,562	1,789,559,184
Pakistan	2,215,881,815	2,486,983,109	2,674,324,639	2,807,708,928
China	5,791,122,867	4,390,471,405	4,703,091,641	3,839,927,171
Malaysia	1,436,288,137	1,163,853,642	1,244,942,425	1,329,494,366

Source: BPS publication, processed [16]

Table 3 shows the five countries that import Indonesia's CPO in large numbers. The volume of CPO exports from year to year in the five countries above has increased and decreased. China and India are the destination countries for Indonesia's CPO exports due to the high demand for CPO. Various factors contribute to the value of Indonesia's CPO export to India, one of which is exchange rate fluctuations caused by depreciation or appreciation of domestic money which will cause commodity prices to become cheaper or more expensive for foreigners [9].

In 2020, at the start of the Covid-19 pandemic, several countries reduced the demand for Indonesia CPO. China CPO demand was 16.07% down from a year earlier. Meanwhile, India, the United States of America, and Malaysia have also reduced the demand for Indonesia CPO. Unlike Pakistan, in 2020 the demand for CPO grew to 9.10% from the previous year of 7.50% and continued to see an increase in the demand for CPO till 2022. The increase in CPO demand must be balanced with Indonesia's CPO production.

Table 4. Total CPO Production Volume According to Company Status in Indonesia

Company Status	2018	2019	2020	2021	2022
Smallholders	15,296,801	14,925,877	15,495,427	15,503,840	15,519,234
Government	2,147,136	2,134,367	2,310,612	2,310,612	2,217,122
Private	25,439,694	30,060,003	27,935,807	27,935,807	27,844,536
Total	42,883,631	47,120,247	45,741,845	45,121,480	45,580,892

Source: Direktorat Jendral Perkebunan, processed [17]

Table 4 shows the amount of palm oil produced by various companies in Indonesia. Private companies produce more palm oil than state-owned companies and small farmers. According to Erik Thohir [10], the combined area of oil palm plantations owned by smallholders and the state is still less than the area of oil palm plantations owned by the private sector. Palm oil production from state companies from 2020 and 2021 has increased.

Palm oil or CPO has many uses. According to Radifan [6], palm oil can be used as a raw material for cooking oil, vegetable oil for milk, ice cream, etc. Can also be used as a raw material for biodiesel oil. Palm oil production in Indonesia is used as cooking oil, soap, and margarine.

Table 5. Domestic Cooking Oil Consumption

	2018	2019	2020	2021	2022
Consumption	104.368	105.067	108.472	116.138	112.128

Source: BPS, processed [18]

Consumption of cooking oil from year to year continues to increase, even though it will decrease in 2022. According to CCN Indonesia [11] between mid-2021 and the end of 2021 there will be a scarcity of cooking oil in the community. This scarcity will continue until 2022 after the policy

for the highest retail price for cooking oil is Rp 13,500.00 per liter on January 19, 2022. Shortly after the policy was established, the government revoked it in June 2022. Then the government provided subsidies to increase the selling price of cooking oil and cooking oil consumption. According to Solopos [12], in July the government issued a minyakita to meet domestic demand for cooking oil.

Based on the description above, this study aims to determine and measure the direction and magnitude of the influence of CPO production volume, international CPO prices, domestic CPO prices, and exchange rate on Indonesia's CPO export volume from 2018 to 2022. Factors that have a positive influence or negative impact on CPO export volume.

2 Method

The analytical tool used in this study is panel data regression analysis to determine the direction and influence of all independent variables on dependent variables. The econometric model is a modification of the research Primahesa [13], Asliyana [14], and Radifan [6]:

$$Eks_{it} = \beta_0 + \beta_1 Vp_{it} + \beta_2 Pi_{it} + \beta_3 Pd_{it} + \beta_4 Ks_{it} + \varepsilon_{it} \tag{1}$$

Eks	=	Palm Oil Export Volume (Kg)
Vp	=	Production Volume of Palm Oil (Tons)
Pi	=	International Volume of Palm Oil (USD/Kg)
Pd	=	Domestic Prices of Palm Oil (Rp/Kg)
β_0	=	Constant
$\beta_1 ... \beta_4$	=	Independent Variable Regression Coefficient
t	=	Year-t
i	=	Region-i
ε	=	Error term

Estimating the panel data econometric model above includes the steps (1) estimating the PLS, FEM, and REM panel data model, (2) testing the panel data model selection using the Chow test and Hausman test, (3) testing the goodness of the model on the selected panel model and interpretation determinant coefficient (R^2), and (4) effect validation test.

3 Results and Discussion

The results of panel data regression estimation with the approach Pooles Ordinary Least Square (PLS), Fixed Effect Model (FEM), and Random Effect Model (REM) can be seen in Table 6.

Table 6. Econometric Model Estimation Results

Variable	Regression Coefficient		
	CEM	**FEM**	**REM**
C	-421524849.7476	1291427519.8371	84698603.8337
Vp	71.2656	3.3171	51.1850
Pi	1.1229	-0.0067	0.7890
Pd	-50382.6955	-8973.0104	-38145.0208
Ks	-137000.8596	-21954.6128	-103001.6023
R^2	0.7015	0.9494	0.4522
Adj. R^2	0.6915	0.9346	0.4339
F-statistic	70.5006	64.3280	24.7626
Prob. F-statistic	0.0000	0.0000	0.0000

Source: BPS, processed

3.1 Model Selection Test

Chow Test

Table 7. Chow Test Results

Effects Test	Statistic	d.f.	Prob.
Cross-section F	19.5967	(24,96)	0.0000
Cross-section Chi-square	221.8516	24	0.0000

The conclusion from the Chow test is that H_0 is rejected because the probability values of F and Chi-square (0.0000 and 0.0000) are < 0.05. so the best model to use is the Fixed Effect Model (FEM).

Hausman Test

Table 8. Hausman Test Results

Test Summary	Chi-sq. Statistic	Chi-sq. d.f.	Prob.
Cross-section random	0.0000	4	1.0000

The conclusion H_0 is accepted because the probability value of Chi-square (1.0000) > 0.10. so the best model to use is the Random Effect Model (REM).

Based on the results of the model selection test described above, the best model used is the Random Effect Model (REM). The estimation results of the Random Effect Model (REM) can be seen in Table 9.

Table 9. Estimation Results Random Effect Model

$$\hat{E}Ks_{it} = 8498603.8337 + 51.1850Vp_{it} + 0.7890Pi_{it} - 38145.0208Pd_{it}$$
$$(0.0366)** \quad (0.0000)* \quad (0.0000)*$$
$$-103001.6023Ks_{it}$$
$$(0.0326)**$$

$R^2 = 0.4522$; Dw-stat = 0.8015; F-stat = 24.7626; Prob. F-stat = 0.0000

Explanation: *Significant on $\alpha = 0.01$; **Significant on $\alpha = 0.05$; ***significant on $\alpha = 0.10$. The number in brackets is the probability of the t-statistic value.

Table 10. Effect and Constanta Random Effect Model

No.	Country	Effect	Constant
1	South Africa	-176150982.3760	-91452378.5423
2	United States of America	-11188462.0042	73510141.8295
3	Bangladesh	72913456.0782	157612059.9119
4	Netherlands	-1994592.2204	82704011.6133
5	Brazil	-450210406.4968	-365511802.6631
6	China	1043781448.6017	1128480052.4354
7	Philippines	-139634975.1173	-54936371.2836
8	India	1317945517.2605	1402644121.0942
9	Italy	-73664886.8549	11033716.9788
10	Japan	-175546193.9591	-90847590.1254
11	Kenya	-187793627.4396	-103095023.6059
12	Malaysia	48314151.2013	133012755.0350
13	Egypt	-25135449.0265	59563154.8072
14	Myanmar	-77037666.6834	7660937.1503
15	Pakistan	339912319.3500	424610923.1837
16	Republik of Korea	-168222390.9060	-83523787.0723
17	Russia	-101736583.8415	-17037980.0078
18	Saudi Arabia	-204921550.7255	-120222946.8918
19	Singapore	-151520979.1196	-66822375.2859
20	Spain	16197894.6735	100896498.5072
21	Tanzania	-187901992.5009	-103203388.6672
22	Turki	-189676556.4266	-104977952.5929
23	United Arab Emirates	-192511756.5549	-107813152.7212
24	Ukraine	-194096690.7136	-109398086.8799
25	Vietnam	-130119044.1983	-45420440.3646

Model Goodness Test

Based on Table 9, it is known that the empirical statistically significant value of F in REM estimation is 0.0000 (< 0.05). So H_0 is rejected. In conclusion, the model used in this study exists together with the variables CPO production, international CPO prices, domestic CPO prices, and exchange rates that affect CPO exports.

Based on Table 9, the determinant coefficient (R^2) shows the predictive power of the estimates model. Based on Table 9, it is known that the R^2 value for REM is 0.4522, meaning that 45.22% of the variation in CPO export variables can be explained by CPO production, International CPO prices, domestic CPO prices, and exchange rate variables. While the remaining 54.78% is influenced by other variables or factors that are not included in the research model.

Influence Validation Test

Table 11. Influence Validation Test Results

Variable	t-statistic	Prob. t-stat	Criteria	Conclusion
Vp	2.1139	0.0366	< 0.05	Significant on $\alpha = 55$
Pi	18.2033	0.0000	< 0.01	Significant on $\alpha = 1\%$
Pd	-5.2063	0.0000	< 0.01	Significant on $\alpha = 1\%$
Ks	-2.1617	0.0326	< 0.05	Significant on $\alpha = 1\%$

Based on the effect verification test (t-test) described above, we can see that there are two independent variables with positive and significant effects and two independent variables have a negative and significant effect in the Random Effect Model (REM). Variables that have a positive effect on CPO export are CPO production and CPO international prices. On the other hand, variables that negative effect on CPO export are CPO domestic prices and exchange rate.

The production variable CPO has a regression coefficient of 51.1850. The relationship model between CPO production and CPO export is linear-linear. If CPO production increases by 1 ton, CPO export will increase by 51.185 kg. Conversely, if CPO production decreases by 1 ton, CPO export will decrease by 51.1850 kg.

The international CPO prices variable has a regression coefficient of 0.7890 with a linear-linear relationship. So when the international CPO prices increase by 1 USD/kg, CPO exports will also increase by 0.7890 kg. When the international CPO prices drop by 1 USD/kg, CPO exports will fall by 0.7890 kg.

The domestic CPO prices variable has a regression coefficient of -38145.0208 and the relationship between domestic CPO prices and CPO export is linear-linear. Therefore, when domestic CPO prices are by 1 Rupiah/kg, CPO exports decrease by 38145.0208 kg. Meanwhile, when domestic CPO prices decrease by 1 Rupiah/kg, CPO exports increase by 38145.0208 kg.

The relationship pattern between the exchange rate and CPO exports is linear and the regression coefficient value of the exchange rate variable is -103001.6023. When the exchange rate increases by 1 Rupiah, CPO exports will decrease by 103001.6023 kg. When the exchange rate decreases by 1 Rupiah, CPO exports will increase by 103001.6023 kg.

4 Conclusion and Suggestion

4.1 Conclusion

The results of the selection test for the best estimator model prove that the Random Effect Model (REM) is the chosen model.

Based on the Random Effect Model (REM) regression, the determinant coefficient value (R^2) is 0.4522, which means that 45.22% of the variation in CPO export is influenced by variations in changes in CPO production, international CPO prices, CPO domestic prices, and exchange rates.

Based on the influence validation test (t-test) it appears that partially the CPO production variable and the international prices of CPO have a positive and significant effect on CPO

export. Meanwhile, the CPO domestic prices and exchange rate have a negative and significant effect on Indonesian CPO exports to 25 countries.

4.2 Suggestion

1. Seeing the extent of the influence of the volume of CPO production, the government must work to increase productivity by assisting in the form of fertilizer subsidies so that palm oil quality increases and reduces the cost of palm tree care palm oil. Subsidies focus on state and public plantations. In addition, subsidies are provided so that domestic CPO prices do not go in the opposite to CPO exports.

2. International CPO prices have a positive influence and direction on CPO exports where as international CPO prices increase, export and CPO for domestic consumption given the high domestic consumption of cooking oil. The government must pay attention to the share of CPO available to avoid shortages.

3. for academics who will conduct further research on Indonesian CPO exports, hopefully, they can include other variables so that research on CPO exports becomes more complex.

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