Analysis of Factors Affecting Indonesian Natural Rubber Exports

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ABSTRACT

The aim of this research is to determine and analyze the short-term and long-term influence of Indonesian natural rubber production variables, international consumption, and international natural rubber prices on Indonesian natural rubber exports. This research was carried out using Time series data for the period 1989-2022 using numerical calculations of research variables using the Error Correction Model (ECM) analysis method assisted by EViews12 software. The population used in this research is information on Indonesian Natural Rubber Exports for 1989-2022. As a result of the analysis and discussion that has been carried out, it can be concluded that: Indonesian Natural Rubber Production has a positive influence in both the long and short term on Indonesian Natural Rubber Exports. International Natural Rubber Consumption in the long term has an insignificant influence with a negative correlation on the volume of Indonesian Natural Rubber Exports. International Natural Rubber Prices in both the long and short term have an insignificant influence with a positive correlation on Indonesian Natural Rubber Exports.

Keywords: production, consumption, prices and exports

INTRODUCTION

Indonesia is one of the countries that implements an open system economy, in this context international economic activities will be very important for economic growth and national development. Therefore, countries with an open economic system will tend to increase their export activities on the international market. Increasing exports is important to be able to compete in the global market and gain benefits from international trade that has been carried out. Efforts to increase exports that a country can make are by paying attention to the quality and quantity of products in competing in the global market (Wati et al., 2023).

In the era of free trade, a country must be able to optimize exports in its trade balance. A high export value compared to imports indicates that the country is experiencing a surplus in international trade. The international trade surplus itself will have an impact in the form of good economic growth and country stability (Nurlaili, 2021).

Based on data on the value of Indonesia's oil and gas and non-oil and gas exports obtained from the Central Statistics Agency in the graph, it can be seen that Indonesia exports oil and gas and non-oil and gas commodities, but the export value is still dominated by non-oil and gas commodities with an export value in 2022 of 275906.1 million USD and oil and gas exports of 15998 .2 million USD.

Indonesia is a country with an extensive agricultural and plantation sector, therefore Indonesia is known as an agricultural country. In Indonesia itself, the country's economy has had a major impact from the agricultural and plantation sectors. Most of the population in Indonesia lives in rural areas and depends on the agricultural and plantation sectors. In the plantation sector itself there are several superior commodities such as palm oil, cocoa, rubber and coffee. The abundance of natural resources from both the plantation and agricultural sectors in Indonesia shows that this sector is important and can be utilized to meet the economic and social needs of its people.

An agricultural country like Indonesia has a high dependence on the agricultural sector, especially plantations, to improve the economy and community welfare. In this context, it can be interpreted that

Indonesia has abundant natural resource potential to be developed and utilized to improve the economy. With the availability of abundant natural resources, Indonesia has greater opportunities to optimize exports to improve the national economy (Noviana, 2018).

One of the leading subsectors that makes a large contribution to Indonesia's foreign exchange is plantations. With the climate conditions in Indonesia and the existence of several plantation products that can only be grown in tropical climates, there are market opportunities that can only be met by countries throughout Indonesia that have the same climate (Kamalia & Wardhana, 2020)

Rubber plants are a commodity that can grow in almost all regions of Indonesia throughout the year, this is an opportunity that makes Indonesia able to produce rubber in large quantities. Rubber commodities can also become one of the leading non-oil and gas export commodities in Indonesia and make Indonesia the second largest exporter of natural rubber in the world.

Data obtained from Trade Statistics for International Business Development in the graph shows that Indonesia is the country with the second largest number of natural rubber exports in the world. Even though it has not been able to replace Thailand as the first natural rubber exporter in the world, the amount of Indonesian natural rubber exports is quite high when compared to three other countries that are in the top 5 natural rubber exporters in the world, such as Ivory Coast, Vietnam and Malaysia. One of the factors that influences exports is the large demand for these commodities. In 2020, world demand for natural rubber will decline with international consumption volume of 12 million tons. However, in the period before and after 2020, international consumption of natural rubber tends to increase, in 2022 alone the amount of international natural rubber consumption will reach 14 million tons.

According to (Lisdiani et al., 2021) the high level of international natural rubber consumption will provide an opportunity for Indonesia to increase the supply of natural rubber exports on the international market. Countries that need a commodity will continue to request re-delivery to meet their country's needs. This will benefit exporting countries and open up opportunities to increase supply due to increasing demand in the market.

Another factor that influences export offers is price, according to Sukirno in (Fihri et al., 2021) price is one of the factors that has a positive influence on the amount of exports, producers will tend to try to increase their export offers when export offers increase. commodity prices increase.The international price of natural rubber since 2003 has tended to fluctuate, however since 2018 the international price of natural rubber has increased to reach 70.41 USD per ton and the highest price achieved thereafter is 94.52 USD per ton in 2021.

Based on data from the Central Statistics Agency, trends show that Indonesia's natural rubber export volume tends to fluctuate. Since 2018, Indonesia's natural rubber export growth has decreased with a decrease of -6%, then in 2021 the growth of natural rubber exports has increased with a growth value of 2.4%. However, in 2022 the growth of natural rubber exports will decline again to reach -12.7%.

Based on the description above, researchers are interested in studying why Indonesia's natural rubber exports have decreased even though international consumption has increased. This raises questions regarding the potential for Indonesian natural rubber production, international consumption, and international natural rubber prices in influencing Indonesian natural rubber exports.

METHOD

This research was conducted using time series data for the period 1989-2022 using numerical calculations of research variables and statistical data analysis to determine the short-term and long-term effects of Indonesian natural rubber production variables (X1), international consumption (X2), and international natural rubber prices. (X3) on Indonesian natural rubber exports (Y) using the Error Correction Model (ECM) analysis method.

The population used in this research is information on Indonesian Natural Rubber Exports. The sampling technique used in this research is to use data measured in time or time series for the years 1989-2022. The data used in this research is secondary data on Indonesian Natural Rubber Production, International Consumption

In this study, data were analyzed using the Error Correction Model analysis method with the assistance of EViews12 software on a Windows device to determine the short-term and long-term effects of independent variables consisting of Indonesian Natural Rubber Production (X1), International Consumption (X2), and International Natural Rubber Prices. (X3) on the dependent variable Indonesian Natural Rubber Exports (Y).

The use of the ECM method is carried out to avoid pseudo-regression (Spurious Regression) where data moves in the same direction but has no causal relationship, this method can also determine the consistency of a relationship between variables, and determine the long-term and short-term effects between variables (Juanda & Junaidi, 2011).

This research uses an error correction model (ECM). This model is used to see the short-term and long-term effects of the independent variables consisting of Indonesian Natural Rubber Production (X1), International Consumption (X2), and International Natural Rubber Prices (X3) on the dependent variable Indonesian Natural Rubber Exports (Y).

ECM models have the ability to cover more variables and analyze economic phenomena. The use of the ECM model can also be used to solve research problems in the form of false regressions and non-stationary time series data (Basuki & Prawoto, 2017). Error Correction Term (ECT) is a stationary residual obtained through a cointegrated regression equation. In the ECM model, a significant ECT value reflects that the variables in the long-term equation have been cointegrated. If the ECM model meets these criteria, the ECM model can be used to estimate an equation function well. In this research, the ECM model used is the Engle-Granger ECM model which was popularized by Engle-Granger (EG) which requires two stages or is called Two Steps EG.

RESEARCH RESULTS AND DISCUSSION

Test result
Correction Model Approach Error
Unit Root Test (Unit Root Test)

In processing time series data using ECM methods are important for ensure that data stationary before carry out test results estimation, by reason That so need unit root test is carried out for see data stationarity. Testing unit root is performed with alpha α limits of 1%, 5%, and 10% using the ADF (Augmented Dickey-Fuller) test.

Table 1. Unit Root Test Results

Variable	Unit Root Test		
	Levels		
	ADF	Prob	Conclusion
Exports (Y)	-1.352606	0.5931	No Stationary
Production (X1)	-1.319343	0.6088	No Stationary
Consumption (X2)	0.222920	0.9697	No Stationary
Price (X3)	-1.794013	0.3768	No Stationary

Source : processed data (2024)

Based on results testing on the table that, you can seen that the data is still Not yet stationary on test level level because still prob value more big of $\alpha = 5\%$ (0.05). Because of That so required there is a degree test integration for see whether at the 1 st level the data difference will be stationary.

Degree Test Integration
Because the data is still there Not yet stationary in the level and 1st difference tests, then furthermore the test was carried out at the 2nd difference level.

Table 2. Degree Test Results Integration

Variable	1 st Difference		
	ADF	Prob	Conclusion
Export Rubber Indonesian Nature (Y)	-5.323882	0.0001	Stationary
Production Rubber Indonesian Nature (X1)	-3.758568	0.0077	Stationary
Consumption Rubber Natural International (X2)	-6.267669	0.0000	Stationary
Price Rubber Natural International (X3)	-4.907660	0.0004	Stationary

Source : processed data (2024)

Degree test results integration at the level ^{of} 1st difference gets results that the data has stationary with mark probability on exports rubber Indonesian nature, production rubber Indonesian nature, consumption rubber natural International , and price rubber natural International more small of α = 5% (0.05).

Cointegration Test
Cointegration test can done after the data is stationary in degrees the same integration, in study this data has stationary in degrees integration of ^{1st} difference. Step next thing to do is carry out cointegration tests for know is there is connection period short and term long between variable, a variable that has cointegration show that variable the own connection period short and term long.

Estimate Long -term
Result of estimate period long on research This can seen in the table following:

Table 3 Estimation Results Long -term

Variable	Coefficient	Std. Error	t-statistic	Prob.	t- table	Information
C	327702.4	52845.10	6.201189	0.0000		
Production Rubber Indonesia's nature	0.812687	0.073875	11.00081	0.0000	2,042	Significant
Consumption Rubber Natural International	-0.034368	0.018096	-1.899161	0.0672	2,042	No Significant
Price Rubber Natural International	712.5103	516.5299	1.379417	0.1780	2,042	No Significant

Source : processed data (2024)

From the results estimate the can seen equality regression long term as following:
Export = 327702.4 + 0.812687Production – 0.034368International Consumption + 712.5103Price + $_{et}$
Equality on can outlined become conclusion as following:
1. Constant (β0): Constant Value = 327702.4
These results show that if variable Production Rubber Indonesian Nature (X1), Consumption Rubber Natural International (X2), and Price Rubber Natural International (X3) constant or still then Export volume Rubber Indonesian Nature (Y) is 327702.4.

2. Coefficient Regression X1 (β1): Production = 0.812687
Coefficient value regression variable production is 0.812687 with probability 0.0000. These results show that in a way Partial variable production own influence positive significant to variable Y at level significant 0.05. Every increase in variables production as big as 1 ton will increase export volume rubber Indonesia's natural resources amounted to 0.812687 tons.

3. Coefficient Regression X2 (β2): Consumption = -0.034368
Coefficient value regression variable consumption is -0.034368 with probability 0.0672. These results show that in a way Partial variable consumption No influential significant with correlation negative to variable Y at level significant 0.05. Every increase as big as 1 ton on variable consumption will reduce export volume rubber Indonesia's natural resources amounted to -0.034368 tonnes, however conclusion This No can accepted because the result is no significant with mark probability (0.0672) > 0.05.

4. Coefficient Regression X3 (β3): Price = 712.5103
Coefficient value regression variable price is 712.5103 with probability 0.1780. These results show that in a way Partial variable price own influence positive No significant to variable Y at level significant 0.05. Every increase of 1 USD/Ton on variables consumption will increase export volume rubber Indonesia's natural

resources amounted to 712.5103 tons, however conclusion This No can accepted because the result is no significant with mark probability (0.1780) > 0.05.

Stationary Test on Residual Series ECT
Results of the stationary residual series ECT test in the study This can seen in the table following:

Table 4. Stationary Test on Residual Series ECT

Variable	ADF Critical Values			ADF	Probability	Decision
	1%	5%	10%			
ECT	-3.646342	-2.954021	-2.615817	-3.047138	0.0408	Cointegrated

Source : processed data (2024)

From the results the can seen that ECT value (0.0000) < α = 5% (0.05). Results have meaning that ECT had stationary and present cointegration between variable. ECT has been done stationary at the level unit root test can be interpreted that there is cointegration, variable dependent and variable free each other cointegrate and the ECM model is said to be valid so this test can proceed to stage next.

Estimated Results Period Short (ECM)
Result of estimate period long on research This can seen in the table following :

Table 5. Estimation Results Period Short (ECM)

Variable	Coefficient	Std. Error	t-statistic	Prob.	t- table	Information
C	-23063.54	14244.94	-1.619069	0.1166		
D (Production Rubber Indonesia's nature)	0.925132	0.087445	10.57959	0.0000	2,042	Significant
D (Consumption Rubber Natural International)	0.022357	0.028564	0.782686	0.4404	2,042	No Significant
D (Price Rubber Natural International)	290.8578	583.8291	0.498190	0.6222	2,042	No Significant
ECT (-1)	-0.511517	0.144743	-3.533972	0.0014		

Source : processed data (2024)

Based on results estimate From the Error Correction Model above, it is obtained results equality period short ECM as following:

DExports = -23063.54 + 0.925132 Production + 0.022357 Consumption International +290.8578 Price – 0.511517 ECT + $_{et}$

Equality on can outlined become conclusion as following:

1. Constant (β0): Constant Value = -23063.54
These results show that if variable Production Rubber Indonesian Nature (X1), Consumption Rubber Natural International (X2), and Price Rubber Natural International (X3) constant or still then Export volume Rubber Indonesian Nature (Y) is -23063.54.

2. Coefficient Regression X1 (β1): Production = 0.925132
Coefficient value regression variable production is 0.925132 with probability 0.0000. These results show that in a way Partial in period short variable production own influence positive significant to variable Y at level significant 0.05. Every increase in variables production as big as 1 ton will increase export volume rubber in Indonesia is 0.925132 tons.

3. Coefficient Regression X2 (β2): Consumption = 0.022357

Coefficient value regression variable consumption is 0.022357 with probability 0.4404. These results show that in a way Partial in period short variable consumption own influence positive No significant to variable Y at level significant 0.05. Every increase as big as 1 ton on variable consumption will increase export volume rubber Indonesia's natural resources amounted to 0.022357 tonnes, however conclusion This No can accepted because the result is no significant with mark probability (0.4404) > 0.05.

4. Coefficient Regression X3 (β3): Price = 290.8578

Coefficient value regression variable price is 290.8578 with probability 0.6222. These results show that in a way Partial variable price own influence positive No significant to variable Y at level significant 0.05. Every increase of 1 USD/Ton on variables price will increase export volume rubber Indonesia's natural resources amounted to 290,8578 tons, however conclusion This No can accepted because the result is no significant with mark probability (0.6222) > 0.05.

5. Coefficient value *Error Correction Term* (ECT) in the model is 0.0014 < 0.05 which shows that *Error Correction Model* (ECM) used has been valid. Balance value of -3.533972 shows that adjustment process to imbalance change Export Rubber The nature of Indonesia for the period 1989-2022 is relative slow.

The ECT value of -3.533972 has meaning that if there is past imbalances by 100% then change Export Rubber Natural will adapt self with decrease amounting to 35.33%. With thereby can interpreted that Export Rubber Natural need time 3-4 years for reach balance full (100%) change Export Rubber Nature.

Hypothesis Test Results

F Test (Simultaneous Test)

Table 6. F Test Results

Long -term		Period Short	
F-Statistics	**Prob.**	**F-Statistics**	**Prob.**
391.5654	0.000000	48.06236	0.000000

Source : processed data (2024)

The F test is purposeful for know influence all over variable independent in a way simultaneous or together to variable dependent. Basis for taking decision use level significance 5%.

From the results of the term test length that has been done obtained mark probability F is 0.000000 < 0.05. These results can interpreted that the independent variable, namely Production Rubber Indonesian Nature, Consumption Rubber Natural International, and Price Rubber Natural International in a way together or simultaneous influential significant to variable dependent ie Export Indonesian Natural Rubber.

Meanwhile, in the term test results short that has done obtained mark probability F is 0.000000 < 0.05. These results can interpreted that the independent variable, namely Production Rubber Indonesian Nature, Consumption Rubber Natural International, and Price Rubber Natural International in a way together or simultaneous influential significant to variable dependent ie Export Indonesian Natural Rubber.

t Test (Partial Test)

The t test is a test carried out for know is in a way individual variable independent influential to variable dependent , test this done through testing each variable independent with variable dependent .

Table 7. t test results

Variable	T Table	Long -term		Period Short	
		t-Statistics	Prob.	t-Statistics	Prob.
D(X1) Production	2,042	11.00081	0.0000	10.57959	0.0000
D(X2) Consumption International	2,042	-1.899161	0.0672	0.782686	0.4404
D(X3) Price	2,042	1.379417	0.1780	0.498190	0.6222

Source : processed data (2024)

Long -term

1. On testing variable production rubber natural Indonesia (X1) t- statistical value equal to 11.00081 t- table value amounting to 2,042. It means that t- statistical value (11.00081) > t- table (2.042) with probability 0.0000 < α 0.05. Based on t test results in period long the can is known that variable production rubber Indonesia's nature is influential positive significant to export rubber Indonesia's nature.

2. On testing variable consumption rubber natural International (X2) t- statistic value of -1.899161 t- table value amounting to 2,042. It means that t -statistical value (1.899161) < t- table (2.042) with probability 0.0672 > α 0.05. Based on t test results in period long the can is known that variable consumption rubber natural International No influential significant and has correlation negative to export rubber Indonesia's nature.

3. On testing variable price rubber natural International (X3) t- statistic value amounting to 1.379417 t- table value amounting to 2,042. It means that t -statistical value (1.379417) < t- table (2.042) with probability 0.1780 > α 0.05. Based on t test results in period long the can is known that variable price rubber natural International No influential significant and has correlation positive to export rubber Indonesia's nature.

Period Short

1. On testing variable production rubber natural Indonesia (X1) t- statistical value amounting to 10.57959 t- table value amounting to 2,042. It means that t- statistical value (10.57959) > t- table (2.042) with probability 0.0000 < α 0.05. Based on t test results in period short the can is known that variable production rubber Indonesia's nature is influential significant with correlation positive to export rubber Indonesia's nature.

2. On testing variable consumption rubber natural International (X2) t- statistic value of 0.782686 t- table value amounting to 2,042. It means that t -statistical value (0.782686) < t- table (2.042) with probability 0.4404 > α 0.05. Based on t test results in period short the can is known that variable consumption rubber natural International No influential significant and has correlation positive to export rubber Indonesia's nature.

3. On testing variable price rubber natural International (X3) t- statistic value of 0.498190 t- table value amounting to 2,042. It means that t -statistical value (0.498190) < t- table (2.042) with probability 0.6222 > α 0.05. Based on t test results in period short the can is known that variable price rubber natural International No influential significant and has correlation positive to export rubber Indonesia's nature.

Discussion

Influence Production Rubber Indonesian nature towards Export Rubber Indonesia's nature

On testing long term and term short that has done at the level a significance of 0.05 was obtained results that production influential in a way simultaneous in period long nor period short. Whereas in a way Partial Good in Long term or period short production rubber Indonesia's nature is influential positive significant to export rubber Indonesia's nature.

This result in line with research that has been carried out by (Wati et al., 2023) who stated that Production Rubber Natural will influential to Export Rubber Nature, lots of it amount production rubber natural will affect export volumes commodity rubber Indonesia's nature . Production rubber Alone influenced by several factor like exists change climate, broad land, equipment used, existence disturbance attacking disease tree rubber, as well enhancement on request commodity rubber in the world. Increasing request commodity rubber nature in the world especially as material standard industry will cause producer rubber endeavor in increase export volume rubber (Krismawan et al., 2021) . Productivity plant rubber in Indonesia itself moment This experience problem form exists disease fall leaves that cause decline amount production and necessity cost tall in handle problem the. This matter furthermore cause big loss Because become impact on income on commodity rubber (Sayurandi et al., 2023).

Influence Consumption Rubber Natural International to Export Rubber Indonesia's nature

On testing period long and term short that has done at the level a significance of 0.05 was obtained results that consumption influential in a way simultaneous in period long nor period short. By Partial to export rubber deep Indonesian nature period long consumption own correlation negative No significant and has correlation positive No significant in the term short.

Research result This leaving behind with research conducted by (Lisdiani et al., 2021) Where consumption rubber natural International own influence positive significant to export rubber Indonesia's nature . By theory consumption international will give influence positive significant to export something commodities , however exists competition on international markets , differences tastes , and differences quality commodities in a market of course will cause a country does not can respond request international with Good (Sitanini et al., 2020) . There is emergence several countries entering the export market rubber natural such as Myanmar, Laos and Cambodia as well as Still lack of use technology and quality rubber nature produced by Indonesia causes Indonesia's inability to increase export and respond request rubber on the international market (KMD Sari & Darsana, 2019) .

Influence Price Rubber Natural International to Export Indonesian Natural Rubber
On testing long term and term short that has done at the level a significance of 0.05 was obtained results that price influential in a way simultaneous in period long nor period short. Whereas in a way Partial Good in Long term or period short price rubber natural International own correlation positive and not significant to export rubber Indonesia's nature.
This result in line with research conducted by (Mulyani et al., 2021) Where price rubber natural International influential positive No significant to Export Rubber Indonesia's nature. Based on theory demand and supply (Mankiw, 2019) price will influence demand and supply something goods , if prices on international markets more tall compared to with price domestic then the producers will more choose For become exporters and increase offer the export . But in Indonesia itself producer rubber natural Still dominated by people's plantation owners, p This furthermore cause price international own influence positive No significant to export rubber Indonesia's nature. Farmer will sell results garden in a way straight to get it profit in a way fast , so furthermore price International on rubber natural No can perceived by producers rubber nature in Indonesia (Sani & Huda, 2022) .

CONCLUSIONS

As a result of the analysis and discussion that has been carried out, it can be concluded that: Indonesian Natural Rubber Production has a positive influence in both the long and short term on Indonesian Natural Rubber Exports. In the long term, every increase in the production variable of 1 ton will increase the volume of Indonesian natural rubber exports by 0.812687 tons. Meanwhile, in the short term, every increase in the production variable of 1 ton will increase the volume of Indonesian natural rubber exports by 0.925132 tons. International Natural Rubber Consumption in the long term has an insignificant influence with a negative correlation on the volume of Indonesian Natural Rubber Exports, every increase of 1 ton in the consumption variable will reduce the volume of Indonesian natural rubber exports by 0.034368 tons. Meanwhile, in the short term, International Natural Rubber Consumption has an insignificant influence with a positive correlation on Indonesian Natural Rubber Exports, every increase of 1 ton in the consumption variable will increase the volume of Indonesian natural rubber exports by 0.022357 tons. However, both in the short term and long term the results are not significant, so the conclusion cannot be accepted. International Natural Rubber Prices in both the long and short term have an insignificant influence with a positive correlation on Indonesian Natural Rubber Exports. In the long term, every increase of 1 USD/ton in the consumption variable will increase the volume of Indonesian natural rubber exports by 712.5103 tons. Meanwhile, in the short term, every increase of 1 USD/ton in the price variable will increase the volume of Indonesian natural rubber exports by 290,8578 tons. Meanwhile, in the short term. However, both in the short term and long term the results are not significant, so the conclusion cannot be accepted.

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