

Analysis of Indonesian Rubber Export Supply for 1995-2015

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Abstract

This study aims to determine the factors that influence Indonesian rubber export supply based on the export destination countries. Indonesian rubber export supply is thought to be influenced by the variables like the volume of Indonesia rubber exports, the price of Indonesian natural rubber, the volume of domestic rubber production, the export volume of the previous period, the rupiah exchange rate against US\$, the interest rate and real Gross Domestic Product (GDP). The data used is the annual time series from 1995-2015 based on export countries encompassing the United States, China, and Japan. Multiple linear regression with the Ordinary Least Square (OLS) method is applied to analyse the data. The results showed that the volume of Indonesian rubber exports to China is not influenced by domestic natural rubber prices and the Rupiah exchange rate against the Chinese Yuan. The volume of Indonesian rubber exports to Japan is influenced by the volume of domestic rubber production. The volume of Indonesian rubber exports to the three destination countries is influenced by the volume of domestic rubber production, interest rate, and real GDP.

Keywords: Export, Rubber, Multiple Linear Regression, Ordinary Least Square (OLS)

JEL Classification Code: F00, F10, F49

1. Introduction

The agricultural sector has a fairly important role in the economic activities in Indonesia, this can be seen from its contribution to the GDP which is quite sizeble at around 13.52 percent in 2015, which is second largest after the Manufacturing Industry sector. During the economic crisis, the agricultural sector was a sector that was strong enough to face economic shocks and proved reliable in the recovery of the national economy (Central Bereau of Statistics, 2015). One of the sub-sectors with a large enough potential is the plantation sub-sector. Rubber is one of the plantation commodities that Indonesia relies on to contribute more to Indonesia's foreign exchange earnings. Countries in Southeast Asia such as Indonesia, Thailand, and Malaysia

are the largest rubber exporters in the world. Even though Indonesia is the largest rubber exporter, the quality of rubber products must always be improved. From a market perspective, Indonesian rubber production is primarily aimed at increasing exports and meeting domestic demands. The high demand for rubber commodities shows that the demand for rubber raw materials both local and international markets has excellent prospects for continued development. The purpose of developing rubber in the future is to accelerate the rejuvenation of smallholder rubber by using superior clones, developing downstream industries to increase added value, and increase farmers' income (Indonesian Agricultural Research and Development Center 2005). Indonesian natural rubber has a bright prospect in the future to be developed considering that exports are increasing every year.

Increasing world natural rubber consumption is greater than the increase in world natural rubber production resulting in an increase in world natural rubber demand. Increasing world natural rubber consumption occurred due to the development of the world rubber goods industries. The high demand for natural rubber in the world has an effect on the development of the world's natural rubber market. The increasing need for natural rubber as a base material and the high price of crude oil as raw material for synthetic rubber have caused the price of natural rubber to continue to rise. The world natural rubber market development is indicated by a relatively high price level. The high demand for natural

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rubber in the world opens opportunities for an increase in imports of countries' natural rubber in the world in the coming years. The increasing volume of Indonesian natural rubber exports indicate new opportunities for Indonesian natural rubber. Enhancement in Indonesian natural rubber exports is an important target in the expansion of the Indonesian rubber market. In the end, the increasing demand for Indonesian natural rubber exports will affect Indonesian economic growth.

One of the main destinations for Indonesian rubber exports is China where the economy is supported by the rapid growth of automotive industry so that the demand for rubber as the main raw material for making tires is also increasing. China imports rubber from Southeast Asian countries, especially from Indonesia (Oktora & Firdani, 2019). Novianti and Hendratno (2008) found that the determinants of Indonesian natural rubber exports in China are the export price of Indonesian natural rubber to China in the previous year, world synthetic rubber prices, China's GDP per capita, the yuan exchange rate per US dollar, and the volume of natural rubber export from Indonesia to China in the previous year.

Elwamendri (2000) found that Thailand's technical specification rubber exports to the United States were very responsive to changes in rubber production both in the short and long term when compared to Indonesia and Malaysia. Based on the elasticity of export offers over export prices, the competitiveness of rubber with technical specifications in Indonesia is very limited compared to Malaysia and Thailand. The depreciation of the rupiah against US \$ increased the export price of Indonesian technical specification of rubber.

Therefore, the purpose of this study is to determine the factors that influence the export supply of Indonesian rubber based on the export destination countries. The expectation of this study results, can provide benefits for the government and related stakeholders regarding input and also additional information in determining policies to the development of the Indonesian natural rubber exports market. Then for academicians and students the study can provide rich information material for the development of similar research.

2. Literature Review

The history of rubber in Indonesia reached its peak in the period before World War II in 1945. At that time, Indonesia became the largest natural rubber producing country in the world. This commodity was once relied upon to support the country's economy (PS Writers Team, 2008). Since 1957 Indonesia's position as the number one rubber producer has been taken by Malaysia. Even so, rubber still provides a large economic contribution to the economy.

Table 1: Development of Indonesian Rubber Exports in 1995 - 2015

Year	Production (Ton)	Export Volume (Ton)	Value (000 US\$)
1995	1,573,303	1,324,295	1,963,636
1996	1,574,026	1,434,285	1,917,902
1997	1,552,585	1,404,010	1,493,416
1998	1,661,898	1,641,186	1,101,453
1999	1,604,359	1,494,543	849,200
2000	1,501,428	1,379,612	888,623
2001	1,607,461	1,453,382	786,197
2002	1,630,359	1,495,987	1,037,562
2003	1,792,348	1,662,210	1,494,811
2004	2,065,817	1,874,261	2,180,029
2005	2,270,891	2,024,593	2,582,875
2006	2,637,231	2,286,897	4,321,525
2007	2,755,172	2,407,972	4,868,700
2008	2,754,356	2,283,158	6,023,323
2009	2,440,347	1,991,533	3,241,534
2010	2,734,854	2,351,915	7,326,605
2011	2,990,184	2,556,233	11,763,667
2012	3,012,254	2,444,503	7,861,947
2013	3,237,433	2,701,445	6,906,952
2014	3,153,186	2,623,471	4,741,574
2015	3,108,260	2,630,313	3,699,055

Source: Ministry of Agriculture, 2016

Indonesian natural rubber production in 2012 was 3.04 million tons; 2013 amounted to 3.20 million tons; 2014 amounted to 3.18 million tons and in 2015, it amounted to 3.11 million tons (Gapkindo, 2016). Rubber production in Indonesia comes from the provinces of South Sumatra, North Sumatra, Riau, Jambi and West Kalimantan. As the second largest rubber producer in the world after Thailand, the amount of Indonesian rubber supply is important for the global market.

The six countries that import the most rubber from Indonesia are the United States (US), Japan, China, Korea, India and Brazil. The development of Indonesia's rubber export volume from 1995 to 2015 has increased even though it fluctuates. The highest volume of rubber exports occurred in 2013, amounting to 2.70 million tons. In 2009 it was the largest decrease in export volume to 1.99 million tonnes. This decline occurred due to the decline in Indonesian rubber production in 2009. The development of Indonesian rubber exports in 1995 - 2015 is shown in Table 1 as follows.

Domestic demand for natural rubber is still low compared to the amount of production each year. That is why Indonesian natural rubber must be more export-oriented (PS Writing Team, 2008). Domestic rubber consumption absorbs only a small part of Indonesian rubber production. Most of the consumption is absorbed by the tyre factories, which are still experiencing overcapacity due to the decreasing demand for domestic tyres, and tyre factories have found a way to export abroad so that it is hoped that domestic rubber consumption will continue to increase due to increased demand by rubber shoe and as a raw material for the glove factories.

Exports are an effort to sell commodities that are owned to other nations or foreign countries by expecting payment in foreign currency, as well as communicating in foreign languages (Amir, 2005). Goods that are traded abroad or exported consist of various types of agricultural products such as rubber, coffee, pepper, wood, as well as mining products such as crude oil, tin, nickel, and others. The export problem is the end of an economic activity which is a chain of economic activity in general.

The supply theory explains the nature of the sellers in offering the commodities they will sell (Sugiarto, 2007). A statement describing the nature of the relationship between the price of a commodity and the quantity of that commodity supplied by producers is known as the law of supply. In general, the higher the price of a commodity, the more quantity the commodity will be offered by the seller. Conversely, the lower the price of a commodity, the less the quantity offered by the seller. Duangmanee (2020) stated that shifts in prices and production have an impact on rubber farmers and can affect rubber supply. Rahardja and Manurung (2008) added there are several factors which influence the supply of the following items:

- 1) The price of the item itself.
- 2) Prices of other related items.
- 3) Price of factors of production.
- 4) Production cost.
- 5) Production technology.
- 6) The number of sellers.
- 7) Company goals.
- 8) Government policy

Regression analysis is a method used to analyze the relationship between variables. This relationship can be expressed in the form of an equation that connects the dependent variable Y with one or more independent variables X_1, X_2, \dots, X_n (Nachrowi, 2008). If there is only one independent variable, the model obtained is called simple linear regression. The relationship between one dependent variable and several independent variables is called a multiple regression model.

3. Materials and Methods

3.1. Framework

This study aims to analyze the supply of rubber exports in Indonesia. Rubber is one of the main export commodities in Indonesia. Indonesia is the world's second-largest rubber exporting country after Thailand. The volume of Indonesian rubber export growth from 1980 to 2015 has increased despite fluctuating. Because rubber is a commodity export of Indonesia, it is no wonder if its balance is always positive or surplus.

Increased consumption in world natural rubber is greater than the increase in world production of natural rubber resulting in increased demand for natural rubber worldwide. Increased consumption in world natural rubber occurred due to the development of the world rubber goods industries. Increasing Indonesian natural rubber production can encourage market expansion abroad. Several things such as rubber demand in the export markets, the need for rubber materials in the industry, high market opportunities, the existence of the Indonesian rubber market, competition with other rubber exporting countries to be important in the development of the Indonesian rubber market.

Indonesian rubber export market supply is thought to be influenced by the variables such as the volume of the Indonesian rubber export volume to the destination countries, the price of Indonesian natural rubber, the volume of domestic rubber production, the export volume of the previous period, the rupiah exchange rate against the US\$, the interest rate and real GDP of the destination country. Other variables which are not observed in the Analysis of Indonesian Rubber Export Supply in the study are considered constant and their influence is ignored.

3.2. Data Collection

This research was conducted from February to April 2018 and the scope of the research was to analyse the Indonesian rubber export market supply with all those factors that affect the exports of the Indonesian rubber. The data used is quantitative data in the form of secondary data for the exported rubber. Annual time series (time series) data from 1995 - 2015 was used to analyze Indonesian rubber export supply based on export destination countries are the United States, China, and Japan. The international data required was sourced from the World Bank, UN Comtrade, and FAO (Food and Agricultural Organization) Statistical.

3.3. Data Analysis

The method of data analysis used in this study is multiple linear regression. To test the influence of the variable whether

it has a positive effect is a study in explaining and evaluating the relationship between an independent variable and one dependent variable, with the aim of estimating or predicting the value of the dependent variable based on the known value of the independent variable (Gujarati, 2012) and the significance of the Indonesian rubber export supply used multiple linear regression analysis with the OLS method. In the linear regression model, a method that is based on the number of squares rather than the point of observation which can be used with the regression line being searched to be as small as possible, this is called the OLS method.

The model function formulated in this equation as follows:

$$Qs_{it} = \beta_0 + \beta_1 PCi_{St} + \beta_2 PCd_{St} + \beta_3 QD_{St} + \beta_4 ERs_{St} + \beta_5 IR_{St} + \beta_6 GDP_{Sti} + \varepsilon_t$$

whereas,

Qs_{it} = the volume of Indonesian rubber exports to destination country (thousand tons)

PCi_{St} = International market price of natural rubber (US \$/kg)

PCd_{St} = domestic natural rubber prices (IDR/kg)

QD_{St} = the volume of domestic rubber production (tons)

ERs_{St} = Rupiah exchange rate rupiah against US \$

IR_{St} = interest rate

GDP_{Sti} = GDP destination country

β_0 = constant

ε_t = error

t = time to - t

i = destination countries are United States, China, Japan

4. Results

The general overview of Indonesian rubber export volume to the primary destination countries during the period 1995-2015 is described below.

4.1. Overview of Indonesian Rubber Export Volume to the United States for 1995 - 2015

The United States is the destination country for Indonesian rubber exports with the largest volume. The development can be seen in the following graph (see Figure 1).

The figure above demonstrates that the volume of Indonesian rubber exports fluctuated during the 1995-2015 period. It can be seen that the lowest Indonesian rubber export volume to the United States occurred in 1998 which amounted to 162.19 thousand tons. Meanwhile, the highest Indonesian rubber export volume to the United States occurred in 2005 amounting to 669,868 thousand tons. If calculated, the average volume of Indonesian rubber exports to the United States during the 1995 to 2015 period was 521,644 thousand tons.

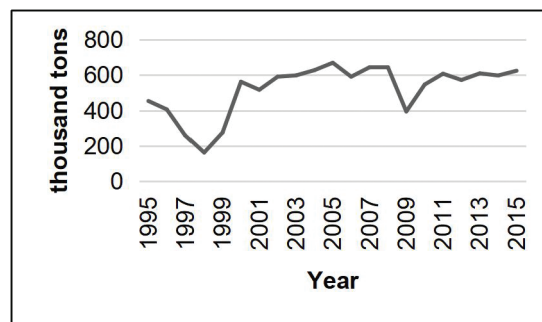


Figure 1: Development of Indonesian rubber export volume to the United States for the period 1995-2015

In the picture above, it can be seen that there were two sharp decreases in the volume of Indonesian rubber exports to the United States. This sharp decline occurred in 1998 and 2009. There are differences in the phenomenon of the decline in rubber exports in the two years. If in 1998 the decline had begun to appear since the previous two years, in 1996. When compared to 1995, the volume of Indonesian rubber exports to the United States in 1996 decreased by 47.64 thousand tons and increased to 291.39 tons in 1998.

In contrast to the decline that occurred in 1998, the decline in Indonesia rubber export volume to the United States in 2009 occurred in one year. When compared with 2008, the volume of Indonesian rubber exports to the United States in 2009 decreased by 38.79 percent or 249.96 thousand tons. The decline that occurred in 1998 and 2009 could be caused by the global crisis affecting the world economy, including the United States. The weakening of the economy due to the global crisis could affect the quantity of goods imported by the United States, including rubber from Indonesia.

4.2. Overview of Indonesian Rubber Export Volume to Japan for 1995 - 2015

Japan is a destination country of Indonesian rubber export with the second-largest volume after the United States. The development of Indonesian rubber export volume to Japan during the 1995 - 2015 period can be seen in the following graph (see Figure 2).

In the picture above, it can be seen that the development of Indonesian rubber export volume to Japan during the 1995-2015 period, in general, tended to increase, despite the fact that there was a decrease in several years of observation, such as in 1997, 2003, and 2009. The highest volume of Indonesian rubber exports to Japan occurred in 2013, which amounted to 425.9 thousand tons. Meanwhile, the lowest volume of rubber exports occurred in 1997, amounting to 65.22 thousand tons. The average volume of Indonesian rubber exports to Japan during the 1995 to 2015 period was 254.74 thousand tons.

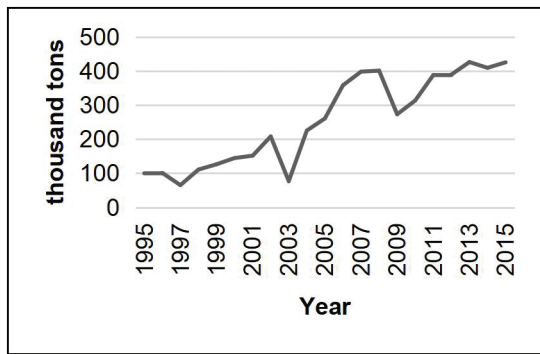


Figure 2: Development of Indonesian rubber export volume to Japan for the period 1995-2015 (thousand tons)

The most extreme decline in the volume of Indonesian rubber exports to Japan occurred in 1997, 2003, and 2009. This phenomenon was possible occurred due to the effects of the global financial crisis which also affected Japan.

4.3. Overview of Indonesian Rubber Export Volume to China for 1995-2015

China is an importing country of Indonesian rubber export with the third-largest volume after the United States and Japan. The development of Indonesian rubber export volume to China during the 1995 - 2015 period can be seen in the following graph (see Figure 3).

In the picture above, it can be seen that the tendency of the volume of Indonesian rubber exports to China increased during the period 1995 to 2015. The highest volume of rubber exports occurred in 2013, amounting to 511.7 thousand tons. Meanwhile, the lowest volume of rubber exports occurred in 1998, which was 18.2 thousand tons. If calculated, the average Indonesian rubber export volume to China during the 1995 to 2015 period was 228.34 thousand tons. When compared with the pattern of rubber exports to the United States and Japan, the pattern of Indonesian rubber exports to China did not experience a sharp decline during the global crisis period of 1998 and 2008. From the graph, it can be seen that the volume of Indonesian rubber exports to China has decreased in 2014 and 2015.

4.4. Empirical Results

4.4.1 Simultaneous Significance Test (F-Test)

F-test is to determine whether all the variables studied in the model have an overall effect on the dependent variable that is the volume of Indonesian rubber exports to the destination country. Table 5 presents the results of the simultaneous test analysis.

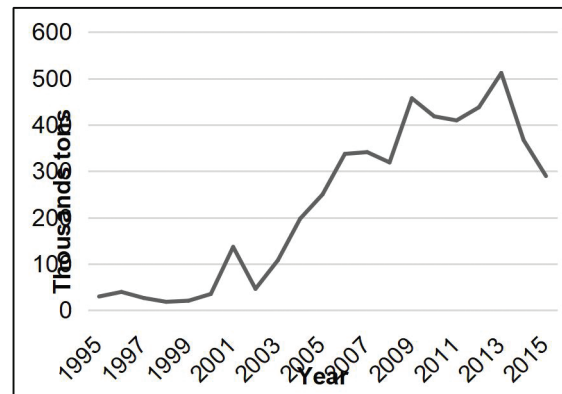


Figure 3: Development of Indonesian rubber export volume to China in for the period 1995-2015 (thousand tons)

Table 5: The Results of Simultaneous Test

Prob>F	USA	China	Japan	Combined
	0,0115	0,0000	0,0000	0,0000

The significance value in the USA regression model is 0.0115 which is smaller than $\alpha = 0.05$. Thus, a decision to reject H_0 can be taken, which means that there is a significant influence between the price of natural rubber on the international market (X1), the price of natural rubber (X2), the volume of domestic rubber production (X3), the rupiah exchange rate against the US Dollar (X4), the interest rate (X5), and the USA GDP (X6) on the volume of Indonesian rubber exports to the USA.

The significance value in the China regression model is 0.0000, which is smaller than $\alpha = 0.05$. Thus, a decision to reject H_0 can be taken which means that there is a significant influence between the price of natural rubber international market (X1), the price of domestic natural rubber (X2), the volume of domestic rubber production (X3), the rupiah exchange rate against the Chinese Yuan (X4), the interest rate (X5), and China's GDP (X6) on the volume of Indonesian rubber exports to China.

The significance value in the Japan regression model is 0.0000, which is smaller than $\alpha = 0.05$. Thus, a decision to reject H_0 can be taken which means that there is a significant influence between the price of natural rubber in the international market (X1), the price of domestic natural rubber (X2), the volume of domestic rubber production (X3), the rupiah exchange rate against the Japanese Yen (X4), the interest rate (X5), and China's GDP (X6) on the volume of Indonesian rubber exports to Japan.

The significance value in the Combined regression model is 0.0000, which is smaller than $\alpha = 0.05$. Thus, a decision to reject H_0 can be taken which means that there is a significant influence between the price of natural rubber international market (X1), the price of domestic natural rubber (X2), the volume of domestic rubber production (X3), the rupiah exchange rate against the currency of the destination country (X4), the interest rate (X5), and the GDP of the destination country (X6) on the volume of Indonesian rubber exports to the destination country.

4.4.2. Partial Significance Test (T-Test)

The partial test is conducted to determine the coefficient or each variable that affects the regression modeling. The result of the t-test is as follows.

$-H_0 : b_i = 0$, it means that there is no significant effect of the independent variable on the dependent variable.

$-H_a : b_i \neq 0$, it means that there is a significant effect of the independent variable on the dependent variable.

The decision making on the t-test is:

-If *p-value* of t count $< 0,05$, then H_0 is rejected, H_a is accepted

-If *p-value* of t count $> 0,05$, then H_0 is accepted, H_a is rejected.

Table 6 above presents the regression coefficient and the significance value of each independent variable on the dependent variable. The regression model obtained is as follows.

Table 6: Results of partial test

Variable	USA		China	
	Koef	Prob> t	Koef	Prob> t
PCd _{St}	-12,464	0,792	73,905	0,024
PCi _{St}	0,278	0,320	0,120	0,523
QD _{St}	-0,186	0,844	-0,609	0,616
ERs _t	0,246	0,143	0,183	0,004
IR _{St}	-11,593	0,061	-3,036	0,477
GDP _{Sti}	9,843	0,395	3,457	0,301
Const	284,984		-165,334	
Variable	Japan		Combined	
	Koef	Prob> t	Koef	Prob> t
PCd _{St}	-16,568	0,340	-5,007	0,789
PCi _{St}	0,062	0,573	0,107	0,387
QD _{St}	1,884	0,000	0,790	0,014
ERs _t	0,025	0,678	0,078	0,813
IR _{St}	-1,757	0,460	-6,154	0,023
GDP _{Sti}	-0,052	0,936	3,035	0,000
Const	-180,804		-87,169	

$$Q_{USA} = 284,984 - 12,464PCd_{USA} + 0,278PCi_{USA} - 0,186QD_{USA} + 0,246ER_{USA} - 11,593IR_{USA} + 9,843GDP_{USA}$$

$$Q_{China} = -165,334 + 73,905PCd_{China} + 0,120PCi_{China} - 0,609QD_{China} + 0,183ER_{China} - 3,036IR_{China} + 3,457GDP_{China}$$

$$Q_{Japan} = -87,169 - 16,568PCd_{Jepang} + 0,062PCi_{Jepang} + 1,884QD_{Jepang} + 0,025ER_{Jepang} - 1,757IR_{Jepang} - 0,052GDP_{Jepang}$$

$$Q = -87,169 - 5,007PCd + 0,107PCi + 0,790QD + 0,078ER - 6,154IR + 3,305GDP$$

4.4.3. Coefficient of Determination (R²)

This test aims to simultaneously measure the impact of the independent variables on the dependent variables. If (R²) is obtained equal to 1 (one), it indicates that dependent variable is completely explained by the independent variables in the model.

USA

The influence of the natural rubber price on the international market, the domestic natural rubber price, the volume of domestic rubber production, the rupiah exchange rate against the US Dollar, the interest rate, and the USA GDP on the volume of Indonesian rubber exports to the USA is of 67.28% and the rest of 32.72% explained by other variables not examined in this study.

China

The influence of natural rubber prices on the international market, the domestic natural rubber price, the volume of domestic rubber production, the rupiah exchange rate against the Chinese Yuan, interest rates, and China's GDP on the volume of Indonesian rubber exports to China is of 87.24% and the rest of 12.76% explained by other variables not examined in this study.

Japan

The influence of natural rubber prices on the international market, the domestic natural rubber price, the volume of domestic rubber production, the rupiah exchange rate against the Japanese Yen, interest rates, and Japanese GDP on the volume of Indonesian rubber exports to Japan is of 93.17% and the rest of 6.83% is explained by other variables which have not been examined in this study.

Combined

The influence of the natural rubber price on the international market, the domestic natural rubber price, the

volume of domestic rubber production, the rupiah exchange rate against the currencies of destination countries (USA, China, and Japan), interest rates, and GDP of destination countries (USA, China, and Japan) to the volume of Indonesian rubber exports to destination countries (USA, China, and Japan) was of 84.68% and the remaining of 15.32% was explained by other variables which have not been examined in this study.

5. Discussion

5.1. The Influence of The Indonesian Natural Rubber Price

Based on the results of statistical testing, it is concluded that the price of Indonesian natural rubber has a significant effect on the volume of Indonesian rubber exports to China. Meanwhile, the price of Indonesian natural rubber does not have a significant effect on the volume of rubber exports to other countries are the USA, Japan, and combined (USA, China, and Japan).

The resulting beta value on the Indonesian natural rubber price on the volume of Indonesian rubber exports to China is positive at 73.905. Estimates of the positive direction of the variable coefficient of the Indonesian natural rubber price indicate that any increase in the Indonesian natural rubber price will increase the volume of Indonesian rubber exports to China. If the change in the price of Indonesian natural rubber is increased by 1 unit, it will cause an increase in the volume of Indonesian rubber exports to China by 73.905.

In the regression model for the volume of Indonesian rubber exports to the USA, Japan, and combined (USA, China, and Japan), the t-test in the equation shows a significance value above 0.05 so that it shows that there is no significant effect of the Indonesian natural rubber price on the volume of Indonesia rubber exports to the USA, Japan, and combined (USA, China, and Japan). This is because producers who want high profits, because if prices increase they are more likely to sell domestically without the need to export. Pithak (2020) added that the price in period $t - 1$ affects the expected rubber price. Changes in world rubber prices in the past period led to a change in the expected rubber prices in the short term, which in turn affected the expected profits of rubber.

5.2. The Influence of The International Natural Rubber Price

Based on the results of statistical testing, it is concluded that the international natural rubber price has no significant effect on the volume of Indonesian rubber exports from the USA, China, Japan, and combined (USA, China, and Japan). This is indicated by the results of the t-test on the international natural rubber price variable where the p-value

is greater than $\alpha = 0.05$. The results obtained in this study are different from the results of research by Suparman (2014) which states that the price of rubber is in a positive direction so that it affects Indonesian rubber exports.

The international price or the world price is the price of an item that applies to the world market. If the international price is higher than the domestic price, then a country will tend to become an exporter. Producers in these countries are interested in taking advantage of higher prices in the world markets and start selling their products to buyers in other countries. On the contrary, when international prices are lower than the domestic prices and when the international trade starts then the country will become an importer because consumers in that country will be attracted to take advantage of lower prices prevailing in other countries (Mankiw, 2008).

5.3. The Influence of Domestic Rubber Production Volume

Based on the results of statistical testing, it is concluded that the volume of domestic rubber production has a significant effect on the volume of Indonesian rubber exports to Japan and combined (USA, China, and Japan). Meanwhile, the volume of domestic rubber production does not have a significant effect on the volume of rubber exports to other countries are the USA and China.

The resulting beta value on the volume of domestic rubber production against the volume of Indonesian rubber exports to Japan is positive at 1.884. The positive direction estimation on the coefficient of the variable volume of domestic rubber production shows that any increase in the volume of domestic rubber production will increase the volume of Indonesian rubber exports to Japan. If the change in the volume of domestic rubber production increased by 1 unit, it will cause an increase in the volume of Indonesian rubber exports to Japan by 1.884.

The resulting beta value on the volume of domestic rubber production against the volume of Indonesian rubber exports to destination countries (USA, China, and Japan) is positive at 0.790. The positive direction estimation on the coefficient of the variable volume of domestic rubber production shows that any increase in the volume of domestic rubber production will increase the volume of Indonesian rubber exports to destination countries (USA, China, and Japan). If the change in the volume of domestic rubber production increased by 1 unit, it will cause an increase in the volume of Indonesian rubber exports to destination countries (USA, China, and Japan) by 0.790.

Wirawan and Indrajaya (2012) stated that the increase in the volume of Indonesian natural rubber exports was due to the increase in the amount of rubber production due to the expansion of Indonesian rubber plantations. The production also has an influence on the level of supply of goods (Komalasari, 2009). The larger the production, the higher

will be the supply that occurs in the market. The level of Indonesian natural rubber production is high, while domestic demand is still low, making Indonesia prefer exporting rubber to other countries.

5.4. The Influence of the Rupiah Exchange Rate

Based on the results of statistical testing, it is concluded that the Rupiah exchange rate against the Chinese Yuan has a significant effect on the volume of Indonesian rubber exports to China. Meanwhile, the rupiah exchange rate against the US Dollar and Japanese Yen did not have a significant effect on the volume of rubber exports to destination countries are the USA, Japan, and combined (USA, China, and Japan).

The resulting beta value in the Rupiah exchange rate against the Chinese Yuan against the volume of Indonesian rubber exports to China is positive at 0.183. The positive direction estimation on the variable coefficient of the Rupiah exchange rate against the Chinese Yuan shows that any increase in the Rupiah exchange rate against the Chinese Yuan will increase the volume of Indonesian rubber exports to China. If the change in the Rupiah exchange rate against the Chinese Yuan increased by 1 unit, it will cause an increase in the volume of Indonesian rubber exports to China by 0.183.

According to Sartono (1995), the exchange rate is the price of one currency relative to other currencies. The exchange rate is defined as the point of balance between the supply and demand of a currency in the currency market. Foreign trade, both exports and imports, will directly use the exchange rate. Changes in the exchange rate will affect the competency level of export products in the international market.

The exchange rate is one of the most important prices in an open economy, given its enormous effect on the current account as well as on other economic variables. Exchange rates also play a central role in international trade. Exchange rates can change suddenly according to the news circulating about the value of the currency in the future.

In the market mechanism, the exchange rate of a currency will experience fluctuations which have a direct impact on the prices of exported and imported goods (Salvatore, 1997). the intended change are as follows:

1. Appreciation, is the event of an automatic currency exchange rate strengthening due to the operation of supply and demand forces for the currency concerned in the free market system. As a result of this change in the exchange rate, the price of the country's products for foreign parties is getting more expensive. Meanwhile, import prices for domestic products are cheap.
2. Depreciation, is the event of an automatic decline in the exchange rate of the currency due to the operation

of the supply and demand forces for the currency involved in the free market system, as a result of this change in exchange rates for the country's products, for foreign parties it becomes cheap, while the import price for domestic residents to be expensive.

5.5. The Influence of Interest Rate Prices

Based on the results of statistical testing, it is concluded that the interest rate has a significant effect on the combined volume of Indonesian rubber exports to destination countries (USA, China, and Japan). Meanwhile, the interest rate does not have a significant effect on the volume of rubber exports to the USA, China, and Japan if analyzed by each destination country.

The resulting beta value at the interest rate on the volume of Indonesian rubber exports to destination countries (USA, China, and Japan) is negative at -6.154. The negative direction estimation on the coefficient of the interest rate variable indicates that any increase in the interest rate will result in a decrease in the volume of Indonesian rubber exports to destination countries collectively (USA, China, and Japan). If the change in the interest rate increased by 1 unit, it will result in a decline in the volume of Indonesian rubber exports to destination countries combined (USA, China, and Japan) by 6.154.

The interest rate assumed as part of export financing should have a negative effect. This means that when the loan interest is higher, production costs will increase which in turn reduces the value of exports. However, there are other possible arguments where when the loan interest rate increases, the value of exports also increases. The assumption used is that export performance is strongly influenced by demand from export destination countries so that an increase in loan interest rates will not have a significant impact on reducing exports (Ministry of Trade, 2014).

5.6. The Influence of the Real GDP of the Destination Countries

Based on the results of statistical testing, it is concluded that the real GDP of the destination countries has a significant effect on the combined volume of Indonesian rubber exports to destination countries (USA, China, and Japan). Meanwhile, the real GDP of destination countries does not have a significant effect on the volume of rubber exports to the USA, China, and Japan if analyzed by the destination country.

The resulting beta value in the real GDP of the destination country against the volume of Indonesian rubber exports to the destination countries combined (USA, China, and Japan) is positive at 3.035. Estimates of a positive direction on the

coefficient of the real GDP variable of the destination country show that any increase in the real GDP of the destination country will increase the volume of Indonesia's rubber exports to the destination country collectively (USA, China, and Japan). If the change in the real GDP of the destination country increased by 1 unit, it will cause a combined decline in the volume of Indonesian rubber exports to the destination countries (USA, China, and Japan) by 3.035.

According to Samanhudi (2009) in his research on what factors influence the export of Indonesian agricultural products to the United States, the GDP of the United States of America has a very significant effect on the volume of exports of Indonesian agricultural products to the United States. Furthermore, Daulay (2010) in his research on the determinants of Indonesia's net exports revealed that the increase in GDP of destination countries (Indonesian trading partner countries, namely Malaysia, Singapore, Thailand, and the United States) led to an increase in Indonesian exports to these countries. These exports increased due to an increase in domestic investment in these importing countries, which led to an increase in the need for imported goods, including capital goods and raw materials as inputs in the production process from Indonesia. Thus, the need for capital goods and raw materials offered (supply) must be purchased from Indonesia.

In addition to these reasons, the increase in GDP of the destination countries causes an increase in people's income in the destination country, which results in an increase in the purchase of final products because not all of these needs can be met by domestic production of these countries (Daulay, 2010). Thus, it can be concluded that an increase in the GDP of the destination countries will boost the volume of Indonesian rubber exports to the destination countries.

6. Conclusions

According to the results and discussion that has been done, it is concluded that the volume of Indonesian rubber exports to the USA is not influenced by the variables in this study. The volume of Indonesian rubber exports to China is influenced by the domestic natural rubber price and the Rupiah exchange rate against the Chinese Yuan. The volume of Indonesian rubber exports to Japan is influenced by the volume of domestic rubber production. The volume of Indonesian rubber exports to destination countries (USA, China, and Japan) is influenced by the volume of domestic rubber production, interest rates, and real GDP of the destination countries.

The suggestions that can be given by researchers based on the conclusions obtained are that a country's GDP can be used as an indicator to determine the target country for rubber marketing, so that it is expected to increase the volume of Indonesian rubber exports.

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