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## Competitiveness and determinants of Indonesia's natural rubber exports in main partner countries

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**Abstract.** The main destination countries play an important role in Indonesia's natural rubber exports, as most of Indonesia's natural rubber is exported to these countries. The purpose of this study was to examine the comparative advantage and determinants of Indonesia's natural rubber exports to major partner countries. The RCA (Revealed Comparative Advantage) index is used to assess the comparative advantage, and panel data regression analysis is used to analyze the determinants of exports to the main partner countries (USA, China, Japan, India, Republic of Korea, Brazil, Canada, Germany, Belgium and Turkey). The results of this study indicate that Indonesian natural rubber has a comparative advantage in the main partner countries, which are characterized by RCA index  $>1$ . In addition, it was determined that based on panel data regression, the increase in the world price of natural rubber and export restriction policies have led to a decline in natural rubber exports from Indonesia. It is found that the population of Indonesia reduces exports, while the population of partner countries increases exports due to population growth, which will increase the consumption of natural rubber. On the other hand, the increase in Indonesia's gross domestic product (GDP) will lead to an increase in natural rubber production capacity, which will contribute to an increase in exports. It is found that the previous year's demand was also taken into account by partner countries that import Indonesian natural rubber. The results of this study can be useful for the Indonesian government and stakeholders (such as natural rubber producers and exporters) to identify strategies to improve export performance

**Keywords:** comparative advantage, export, international trade, panel data regression, RCA index



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## INTRODUCTION

International trade is key to economies around the world. International trade can boost the economy and achieve broader development goals for the countries involved, such as employment, health, food security and poverty reduction. In conventional trade theory, it is assumed that trade will encourage economic prosperity because it leads to the reallocation of capital and the countries involved tend to be specialized so that economic growth occurs.

In developing countries, trade impacts financial growth, especially in the agricultural trade. It is mainly the case in the subsistence economic period, where most of the country's GDP is generated from the agricultural sector (Sohail *et al.*, 2021; Tulush *et al.*, 2022). In Indonesia, as a developing country, the agricultural sector contributed quite a lot to GDP, amounting to 13.70% in 2020 (Badan Pusat Statistik, 2021). During the economic crisis, the agricultural sector proved strong in the face of shocks and restored the national economy (Mulyani *et al.*, 2021). Meanwhile, during the stagnation due to the Covid-19 pandemic, the agricultural sector is the most potential sector to accommodate workers who have experienced termination of work (Malahayati *et al.*, 2021; Abendin & Duan, 2021).

One of the agricultural sub-sectors that are the mainstay of Indonesia is the plantation sub-sector which has a superior commodity, namely natural rubber. The potential of Indonesian natural rubber is quite promising because Indonesia is one of the largest exporters of natural rubber in the world (Mulyani *et al.*, 2021). Natural rubber not only provides benefits to the industries involved but also contributes greatly to the country's revenue. The contribution of natural rubber also cannot be considered small because in 2020 the export value of Indonesian natural rubber reached 2.9 USD. The export value beats almost all Indonesia's agricultural commodities except palm oil.

Natural rubber is a potential commodity because it supports community activities (Rachman *et al.*, 2020). Natural rubber is a raw material in various industries, especially automotive. The rubber industry is increasingly being developed in the automotive industry to meet the growing tire demand (Saputra *et al.*, 2021). Based on the UN Comtrade report, more than 75% of Indonesia's natural rubber is exported to major trading partner countries such as; the United States, China, Japan, India, the Republic of Korea, Brazil, Canada, Germany, Belgium and Turkey. It indicates that the main trading partner countries determine the development of Indonesia's natural rubber exports. The United States, China, Japan and India are the world's largest consumers of natural rubber (Arunwarakorn *et al.*, 2019). In addition,

Japan, the United States and China are the largest automotive manufacturers in the world (Oktora & Firdani, 2019). In the Republic of Korea, the automotive industry is the main manufacturing industry (Yun *et al.*,

2018), while the German automotive industry is well-known worldwide. Although the automotive industries of Brazil, Canada, Belgium and Turkey are not as famous as other main partner countries, the production of various brands of vehicles or spare parts is in these countries.

Prasada & Dhamira (2021) said that Indonesian natural rubber has a comparative advantage in the international market. Machmud *et al.* (2022) have discussed the comparative advantages of Indonesian natural rubber in the international market. Still, there have not been many studies that focus on comparative advantages in main partner countries. Therefore, the comparative advantage of natural rubber in major trading partner countries must be studied, considering that these countries are key in Indonesia's natural rubber exports. On the other hand, the demand for Indonesian natural rubber in major trading partner countries tends to fluctuate even though, according to (Prasada & Dhamira, 2021), the world's demand for natural rubber always increases every year. Natural rubber supplier countries other than Thailand and Malaysia are starting to emerge, showing growth in natural rubber exports in Indonesia's main trading partner countries such as Vietnam, Côte d'Ivoire and the Philippines.

Thus, this study examines the comparative advantages and determinants of Indonesian natural rubber exports in main partner countries.

## LITERATUR REVIEW

Comparative advantage is key in the international economy, where comparative advantage determines trade flows (Stellian & Danna-Buitrago, 2019). Bella Balasa first introduced Revealed Comparative Advantage (RCA) in 1965. RCA revealed comparative advantages by checking trade data that realized the impact of non-price and cost factors (Saki *et al.*, 2019). Countries that work together are increasingly suitable to be partners if the value of RCA is greater (Hamid & Aslam, 2017). Usman *et al.* (2022), in their study on the competitiveness of Indonesian and Thai natural rubber exports in the international market, established that using the RCA index, Indonesia and Thailand both have comparative advantages. It is also supported by the research of Daulika *et al.* (2020), which resulted in findings that Indonesia, Thailand, Malaysia and India had a comparative advantage in natural rubber commodities.

Price is decisive in the export of natural rubber. The rise and fall of rubber prices are associated with unstable demand and supply (Arunwarakorn *et al.*, 2019). Sari *et al.* (2021), studying the determinants of Indonesian rubber exports in Japan, found that world natural rubber prices had a positive effect. Meanwhile, in the study by Hanivia & Suprehatin (2022), the world price of natural rubber positively impacts Indonesia's exports to Japan in the long-term estimate. As for the study of Purnomowati *et al.* (2015), international natural

rubber prices negatively impact the demand for Indonesian natural rubber in the United States, Japan, Singapore and the Republic of Korea. Furthermore, in other commodities, international prices show a positive and significant relationship to the volume of North Sumatra coffee exports to the United States, Japan and Malaysia (Sihombing *et al.*, 2020).

In addition to world prices, domestic prices are determinants of natural rubber exports. Rachman *et al.* (2020), in their research on the analysis of Indonesian natural rubber exports using the GLS (Generalized Least Square) method, found that the price of Indonesian natural rubber has a positive influence on Indonesia's natural rubber exports. As for the study of Mulyani *et al.* (2021), domestic rubber prices positively affect Indonesia's natural rubber exports to China. In another study, the price of natural rubber at the exporter level is also positively related to the natural rubber trade to China (Oktora & Firdani, 2019).

Another variable that is estimated to affect natural rubber exports is GDP, which is the value of a country's final goods and services. The GDP or Gross Domestic Product is often associated with a country's income. In the study (Purmiyati & Muhammad, 2020), the destination country's GDP positively affects Indonesia's natural rubber exports. Meanwhile, Abdulrahman's study (2021), which analyzed the determinants of exports in Sudan, produced findings that Sudan's GDP positively affected the country's exports. Meanwhile, in another study, the GDP of exporting and importing countries both positively influenced Pakistan's agricultural commodity exports (Atif *et al.*, 2017).

Several studies explain the effect of population on natural rubber exports (Rachman *et al.*, 2020; Purmiyati & Muhammad, 2020). Ismail *et al.* (2019) analyzed Malaysia's main commodity exports and produced findings if the world population positively affects the export of natural rubber and tin in the long run. In other commodities, the population growth of importing countries will increase rice exports, while in coffee commodities, it will reduce exports (Nguyen, 2022). As for other studies, the world population also positively impacts Indonesia's agricultural commodity exports (Sugiharti *et al.*, 2020).

One of the obstacles in international trade is the restriction of export quotas. Export restrictions are an important instrument in international trade policy in the form of direct restrictions on the number of certain goods in exports (Chen *et al.*, 2021). Hanivia & Suprehatin (2022) in their research, concluded that the export restriction policy negatively affected the volume of Indonesian natural rubber exports in Japan. As for the study of Purnomowati *et al.* (2015), the export quota restriction decreases the demand for Indonesian natural rubber in the United States, China, Japan and the Republic of Korea.

## MATERIALS AND METHODS

Source of information: This study used secondary data from the United Nations Commodity Trade Statistics Division (UN COMTRADE) with a 6-digit HS code (HS 400122). In addition, this study also uses data sourced from the World Bank, Badan Pusat Statistik (Central Bureau of Statistics), Kementerian Perdagangan Republic Indonesia (Ministry of Trade Republic Indonesia), the Food and Agriculture Organization (FAO) and the Federal Reserve Economic Data (Fred Stlouisfed). The data used in this study is within a period of 17 years (2004-2020). On the other hand, the destination countries analyzed consist of the United States, China, Japan, India, the Republic of Korea, Brazil, Canada, Belgium, Germany and Turkey, considering these countries to be the main destination countries for Indonesian natural rubber exports.

Data analysis method: RCA measurement or commonly referred to as the Balasa index, is used to assess the export potential of Indonesian natural rubber commodities in alternative destination countries, systematically formulated in Long (2021); Pehlivanoğlu *et al.* (2021) as follows:

$$RCA_{ij} = \frac{X_{ij}/X_{tj}}{W_{ij}/W_{tj}} \quad (1)$$

Where  $RCA_{ij}$  is the index of commodity  $RCA-i$  to country  $j$ .  $X_{ij}$  is the value of commodity exports to country  $j$  (USD).  $X_{tj}$  is the total export value of Indonesia to the  $j$ -country (USD).  $W_{ij}$  is the value of the world's commodity exports to the  $j$ -country (USD).  $W_{tj}$  is the total export value of world products to country  $j$  (USD).  $i$  is Indonesia's natural rubber commodity and  $j$  is the main trading partner country. When the RCA index  $>1$ ,  $i$ -commodities have a comparative and specialized advantage (Pascucci, 2018). As for if the RCA index  $<1$ ,  $i$ -commodities have a low comparative advantage and are less specialized (Pascucci, 2018; Long, 2021).

Furthermore, the determinant analysis of Indonesia's natural rubber exports in major trading partner countries was carried out using panel data regression with a natural logarithm model. The natural logarithm model was chosen because there is a difference in units in free variables (Collischon & Eberl, 2020). The function of the model refers to the research of Oktora & Firdani (2019); Rachman *et al.* (2020) presented in equation (2):

$$\begin{aligned} \ln Y_{it} = & \beta_0 + \beta_1 PRICEa_t + \\ & + \beta_2 \ln PRICEb_{it} + \beta_3 \ln GDPa_t + \\ & + \beta_4 \ln GDPb_t + \beta_5 POPa_t + \\ & + \beta_6 POPb_{it} + \beta_7 Y_{it-1} + \beta_8 D_t + \varepsilon_{it}. \end{aligned} \quad (2)$$

Where  $\beta_0$  is an intercept while  $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8$  are estimated parameters.  $Y$  is the export volume of Indonesian natural rubber (tons).  $PRICEa$  is the world price of natural rubber (USD/ton) and  $PRICEb$  is the price of Indonesian natural rubber (USD/ton).  $GDPa$  is Indonesia's real GDP per capita (USD), while  $GDPb$  is the real GDP per capita of trading partner countries (USD).  $POPa$

is the population of Indonesia (people) and  $POP_b$  is the population of trading partner countries (people).  $Y_{t-1}$  is the volume of natural rubber exports in the previous year (tons). At the same time,  $D$  is a dummy variable of export restriction policy (0 = no export restriction policy, 1 = there is export restriction policy).  $i$  is a major trading partner country (United States, China, Japan, India, Republic of Korea, Brazil, Canada, Belgium, Germany and Turkey).  $t$  is the year (2004, 2005, ..., 2020) and  $\varepsilon$  are error terms.

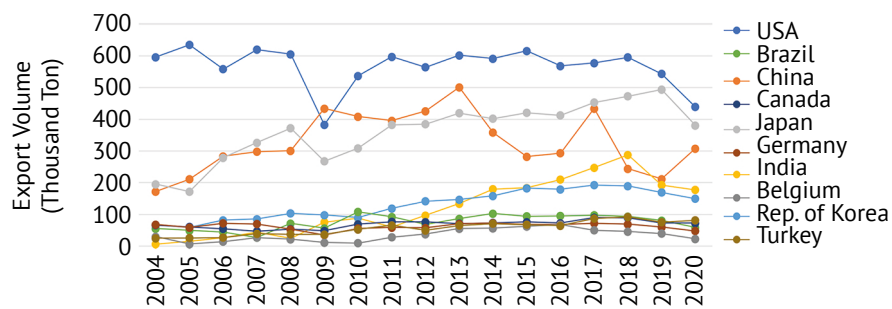
Panel data regression analysis in this study was carried out using STATA software. The coefficient of determination test ( $R^2$ ) measures the goodness of fit in the regression equation. F-test is used to simultaneously determine the independent variables' influence on the dependent variable. The t-test is used to determine the effect of independent variables on dependent variables partially.

Model selection: The data regression panel has three models: pooled OLS, fixed effect and random effect models. Therefore a chow test was conducted to choose a more suitable model for use between pooled OLS or fixed effect models (Herawati & Putra, 2018). If, in the chow test, the probability value  $<0.05$ , a more suitable

fixed effect model is used (Yuliadi, 2021). In addition, a Hausman test was also conducted to choose a model between a fixed effect or a random effect (Herawati & Putra, 2018). In the Hausman test, a better-fixed effect model is used if the probability value is  $<0.05$  (Yuliadi, 2021).

## RESULTS AND DISCUSSION

Figure 1 features the development of Indonesia's natural rubber export volume in major trading partner countries during 2004-2020. The United States is the largest importer of Indonesian natural rubber and the volume of exports to the United States is higher than other trading partner countries (except in 2009). The export volume in China and Japan shows a higher quantity than the Republic of Korea, Brazil, Canada, Germany, Belgium and Turkey. Furthermore, the export volume of natural rubber from India and the Republic of Korea showed a pace that tended to be positive. In 2018, the volume of natural rubber exports to India exceeded China's. On the other hand, Indonesia's natural rubber export volume in Brazil, Canada, Germany, Belgium and Turkey tends to be stable.

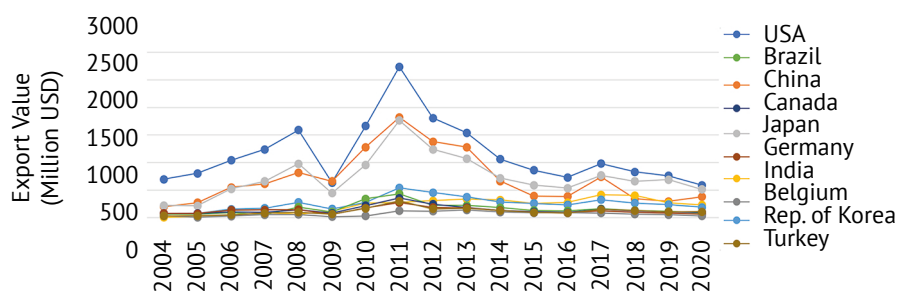


**Figure 1.** Indonesia's Natural Rubber Export Volume in Main Partner Countries during 2004-2020

**Source:** built by authors based on UN Comtrade (2021)

The development of Indonesia's natural rubber export value in the main trading partner countries is presented in Figure 2. The export value of natural rubber in the United States is higher than other trading partner countries because the demand for rubber by this country is the highest. The export value of natural rubber shows a pace with the same tendency in each of the trading partner countries. In 2008, the export value of natural rubber tended to increase, and the Food and

Agriculture Organization (FAO) reported an increase in the price of natural rubber. The following year (2009), the price of natural rubber decreased, resulting in a decrease in the value of exports in almost all trading partner countries. The export value of natural rubber peaked in 2011 due to the price of natural rubber being at the highest level. After 2011, the export value of natural rubber tended to decline even though in 2017, it experienced a slight increase due to price increase.

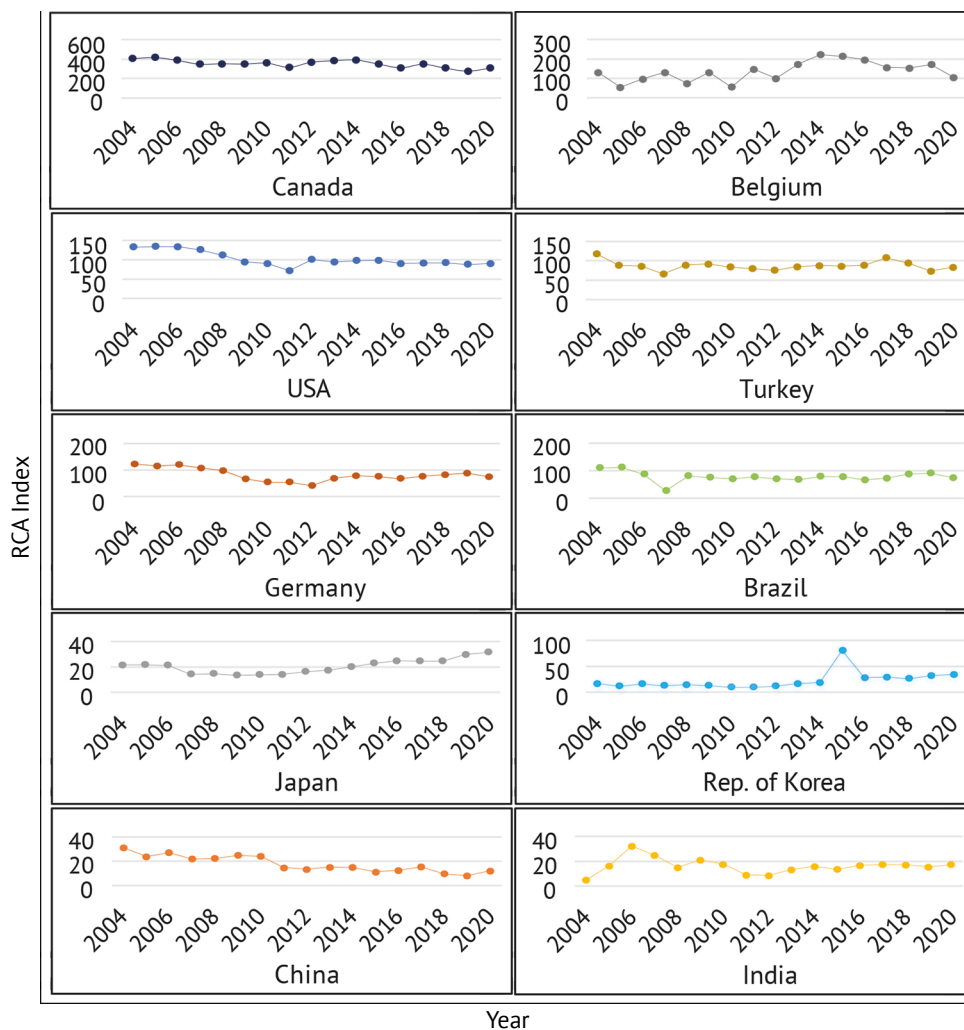


**Figure 2.** Indonesia's Natural Rubber Export Value in Main Partner Countries during 2004-2020

**Source:** built by authors based on UN Comtrade (2021)

Competitiveness is the ability of a commodity to enter foreign markets. Commodities are said to be competitive if they can survive in the market when there is a shock. Overall, the RCA index of Indonesian natural rubber commodities in major trading partner countries is  $> 1$  (shown in Fig. 3), so Indonesian natural rubber has a comparative advantage in major trading partner countries. The results of the RCA index also indicate that Indonesian natural rubber is specialized. The RCA index of Indonesia's natural rubber commodities in Belgium has fluctuated, while it has a more stable structure in other partner countries. The RCA index of Indonesia's natural rubber commodities in Canada is higher

than other trading partner countries. The RCA index in Belgium, the United States, Brazil, Germany and Turkey is larger than in China, Japan, the Republic of Korea and India. Although the value of natural rubber exports in the United States is the highest among other partner countries, the RCA index in that country is smaller than that of Canada and even Belgium. It is because the RCA index has relative properties. The rise and fall of the RCA index are not only caused by the export value of commodities in the country concerned but also influenced by the value of world natural rubber exports and also the export value of world products (natural rubber and others) both in exporting and partner countries etc.



**Figure 3.** Indonesia's natural rubber export RCA index in main partner countries during 2004-2020

**Source:** built by authors based on UN Comtrade (2021)

Based on Figure 3, the RCA Index in Brazil experienced the largest decline in 2007 when a global economic crisis caused Brazil to experience a recession (Haines *et al.*, 2020). On the other hand, the RCA Index in the Republic of Korea experienced the largest increase

and was at a peak point in 2015 due to the rise in the share of world natural rubber exports to world exports. Meanwhile, in the following year (2016), it experienced the biggest decline; that year there was a trade war in Asia Pacific.

**Table 1.** Result of panel data regression

	Pooled OLS		Fixed Effect		Random Effect	
	Intercept	Prob.	Intercept	Prob.	Intercept	Prob.
lnPRICEa	-.2843412 <sup>ns</sup>	0.251	-.4622568 <sup>**</sup>	0.035	-.2845626 <sup>ns</sup>	0.249
lnPRICEb	.2661314 <sup>ns</sup>	0.295	.3243442 <sup>ns</sup>	0.146	.2660823 <sup>ns</sup>	0.293
lnGDPa	.5047384 <sup>ns</sup>	0.214	.8955477 <sup>**</sup>	0.014	.5051322 <sup>ns</sup>	0.212
lnGDPb	.1442847 <sup>***</sup>	0.001	-.0805985 <sup>ns</sup>	0.458	.1445511 <sup>***</sup>	0.001
lnPOPa	-2.518593 <sup>ns</sup>	0.314	-4.108242 <sup>*</sup>	0.070	-2.519889 <sup>ns</sup>	0.312
lnPOPb	.2120623 <sup>***</sup>	0.000	1.972252 <sup>**</sup>	0.038	.212345 <sup>***</sup>	0.000
lnYt-1	.7310479 <sup>***</sup>	0.000	.5113546 <sup>***</sup>	0.000	.7306415 <sup>***</sup>	0.000
D (0 = no export restriction policy, 1 = there is export restriction policy)	-.0862928 <sup>ns</sup>	0.121	-.0880502 <sup>*</sup>	0.070	-.086295 <sup>ns</sup>	0.119
_cons	42.93925	0.357	43.36921	0.293	42.96	0.355
R-square	0.8143		0.7120		68.06	
Prob>F	0.0000		0.0000		0.000	

**Note:** ns insignificant; \* significant at  $\alpha = 10\%$ ; \*\* significant at  $\alpha = 5\%$ ; \*\*\* significant at  $\alpha = 1\%$

**Source:** own calculation from STATA 15

World natural rubber prices, Indonesia's per capita real GDP and Indonesia's population are positively significant in the fixed effect model. The real GDP per capita of the destination country is significant in the pooled OLS (Ordinary Least Square) model and the random effect model and has a positive influence. In addition, the population of the destination country and the volume of natural rubber exports of the previous year had a positive and significant effect on all models. The export restriction policy is only significant in the fixed effect model and has a negative impact. The price of Indonesian natural rubber is insignificant in all models.

More, world natural rubber prices, Indonesia's real GDP per capita, Indonesia's population and export quota restriction policies are not significant in the pooled OLS model and random effect model. To determine the model to be analyzed, the study was based on the results of the Chow test and the Hausman test. Chow test results are based on Table 2 showing a probability value of 0.000 ( $< 0.05$ ), making the fixed effect model more suitable. Similarly, the results of the Hausman test also showed a probability value of  $< 0.05$ , so the fixed effect model is more appropriate. Based on the results of the two tests, it was decided to use the fixed effect model in the analysis.

**Table 2.** Result of chow and hausman test

Test	N	Statistic Type	Statistic Value	Prob.
Chow	85	F	6.60	0.0000
Hauman	85	X <sup>2</sup>	79.97	0.0000

**Source:** own calculation from STATA 15

According to Piepho (2019), R-square describes the proportions of the corrected sum of squares defined by the model. The R-square value based on the fixed effect approach (Table 1) is 0.7120. These results show that 71.20% of Indonesia's natural rubber exports can be explained by the world natural rubber price (PRICEa), Indonesia's natural rubber price (PRICEb), Indonesia's per capita real GDP, Indonesia's population (POPa), the population of the destination country (POPb), the previous year's export volume ( $Y_{t-1}$ ) and the export restriction policy (D). In contrast, other variables outside the model explain the remaining 28.80%. In addition, the probability value of F based on the fixed effect model

is 0.000. If the probability value of  $F < 0.05$ , the independent variables simultaneously have a significant relationship with the dependent variable (Herawati & Putra, 2018). Based on the result, simultaneously, Indonesia's natural rubber exports are influenced by world natural rubber prices (PRICEa), Indonesian natural rubber prices (PRICEb), Indonesia's per capita real GDP, Indonesia's population (POPa), the population of the destination country (POPb), the previous year's export volume ( $Y_{t-1}$ ) and the export restriction policy (D).

The world natural rubber price with a probability of 0.035 (significant at  $\alpha = 5\%$ ) negatively influences Indonesia's natural rubber exports. These results are not

in line with the findings of (Mulyani *et al.*, 2021; Hanivia & Suprehatin, 2022). With every 1% increase in world natural rubber prices, Indonesia's exports to partner countries decreased by 0.462%. That is under demand theory, where every time there is a price increase, it will cause demand to fall. On the other hand, Indonesia's natural rubber prices have a positive but insignificant influence. Domestic rubber prices are subject to world rubber prices (Ismail *et al.*, 2019). The rise and fall of domestic rubber prices follow the movement of world rubber prices. Therefore, Indonesia's trading partners prefer to make purchasing decisions based on world prices compared to domestic prices.

Indonesia's real GDP per capita has a probability value of 0.024 (significant at  $\alpha = 5\%$ ) and positively affects natural rubber exports in partner countries. These results are in line with the findings of Atif *et al.* (2017) and Sugiharti *et al.* (2020). Every 1% increase in Indonesia's GDP will increase natural rubber exports by 1.40%. Rosyadi *et al.* (2021) stated that the larger the GDP of a country, the greater the production capacity. It has led to an increase in the number of offers so that exports increase (Abafita & Tadesse, 2021). The GDP of exporters with a negative relationship with exports indicates competition between domestic market demand and export markets (Sugiharti *et al.*, 2020). Next, the real GDP per capita of the destination country has a positive but insignificant effect. These results indicate that the income of partner countries will not affect the demand for Indonesian natural rubber. Despite changes in revenue, partner countries continue to buy Indonesian natural rubber.

Another variable is that the Indonesian population has a probability value of 0.070 and is significant at  $\alpha = 1\%$ . Every 1% growth in Indonesia's population will reduce natural rubber exports by 2.52%. The growth of the population of exporting countries has caused the level of demand for domestic goods to increase. As a result, exports will decrease due to the supply of goods that meet domestic needs. On the other hand, the population of export destination countries increases Indonesia's natural rubber exports, which is in line with the findings of Purmiyati & Muhammad (2020) and Rachman *et al.* (2020). With every population growth of 1%, Indonesia's natural rubber exports increased by 1.97%. As is the case in exporting countries, according to Purmiyati & Muhammad (2020), the larger the population of the importing country, the greater the level of need for goods. The population growth of partner countries will also increase the number of overseas consumers (Susanto & Admi, 2021). Thus, it will indirectly increase the number of exports due to the increasing demand of partner countries.

The previous year's export volume ( $Y_{t-1}$ ) was significant at  $\alpha = 1\%$  (probability value 0.000). The increase in export volume during the last year by 1% will increase Indonesia's natural rubber export by 0.51%.

These results are in line with the findings of Sugiharti *et al.* (2020). The positive relationship between  $Y_t$  (export volume in year t) and  $Y_{t-1}$  indicates a growth trend in natural rubber exports (Purnomowati *et al.*, 2015). Within each period, the gap between the actual volume and the desired number of requests will be covered (Bose *et al.*, 2019). Unmet demand in the  $t-1$  year will increase the import of the destination country in the year  $t$ . The high coefficient of variable export volumes of the previous year signifies strong relationships with partners, increased demand and concentration of certain markets (Sugiharti *et al.*, 2020).

The export restriction policy is negatively significant at  $\alpha = 10\%$  (probability value 0.070). Every increase in natural rubber export restriction by 1% will decrease the export by 0.09%. These results align with the findings of Purnomowati *et al.* (2015) and Hanivia & Suprehatin (2022). Export restrictions are a useful policy in protecting the domestic population from scarcity of basic goods needs, protecting domestic industries from shortages of raw materials and maintaining scarce resources (Chen *et al.*, 2021). The policy of export restriction directly decreases the number of offers on the world market and impacts increasing international prices (Zhai *et al.*, 2022).

Indonesian natural rubber has competitiveness in main partner countries; the United States, China, Japan, India, the Republic of Korea, Brazil, Canada, Belgium, Germany and Turkey. It indicates that Indonesia and the leading partner countries are suitable for cooperating in the field of natural rubber trade. Therefore, Indonesia needs to pay attention and focus on carrying out exports in these countries. World natural rubber prices, Indonesia's GDP, Indonesia's population, the population of partner countries, the volume of natural rubber exports in the previous year and the policy of export quotas restriction are determinants in Indonesia's natural rubber exports in major partner countries. Efforts to increase natural rubber exports in main partner countries must be carried out because these countries support the success of Indonesia's natural rubber exports.

## CONCLUSIONS

This study analyzes the comparative advantages and determinants of Indonesia's natural rubber exports in main partner countries. In general, Indonesian natural rubber has a comparative advantage in major trading partner countries, so Indonesian natural rubber is specialized. The results indicate that Indonesia and the main trading partner countries are suitable as partners. The world's natural rubber prices, Indonesia's population and export quota restriction policies have a negative effect on natural rubber exports. On the contrary, Indonesia's GDP, the population of partner countries and the volume of exports in the previous year had a positive relationship with Indonesia's natural rubber exports in main partner countries.

Based on the conclusions obtained from the results of the analysis, Indonesia needs to maintain the competitiveness of natural rubber, considering that the main partner countries are key in Indonesia's natural rubber exports. The main trading partner countries are also the most potential markets because the need for natural rubber in the country is very high, considering the automotive industry in the country. Therefore, Indonesia needs to improve the quality of Indonesian natural rubber through a more standardized production

process. On the other hand, Indonesia also needs to increase the production and productivity of natural rubber to support increased export. This research can still be developed using other methods, such as EPD (Export Product Dynamics) and CMS (Constant Market Share), in analyzing the competitiveness of natural rubber. Other variables can be included in the model to explore export determinants, such as exchange rate, price of substitution goods (synthetic rubber), consumption of natural rubber, tariff policy, inflation rate and others.

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## Конкуренентоспроможність та детермінанти експорту натурального каучуку Індонезії в основних країнах-партнерах

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**Анотація.** Основні країни призначення відіграють важливу роль в експорті натурального каучуку з Індонезії, оскільки більша частина індонезійського каучуку експортується саме в ці країни. Метою цього дослідження було вивчення порівняльних переваг та детермінант експорту натурального каучуку Індонезії до основних країн-партнерів. Для оцінки порівняльних переваг використано індекс RCA (Revealed Comparative Advantage), а для аналізу детермінант експорту до основних країн-партнерів (США, Китай, Японія, Індія, Республіка Корея, Бразилія, Канада, Німеччина, Бельгія та Туреччина) – регресійний аналіз панельних даних. Результати даного дослідження свідчать про те, що індонезійський натуральний каучук має порівняльні переваги в основних країнах-партнерах, які характеризуються індексом  $RCA > 1$ . Крім того, визначено, що на основі регресії панельних даних зростання світової ціни на натуральний каучук та політика обмеження експорту призвели до скорочення експорту натурального каучуку з Індонезії. Виявлено, що населення Індонезії скорочує експорт, тоді як населення країн-партнерів збільшує експорт за рахунок зростання чисельності населення, що сприятиме збільшенню споживання натурального каучуку. З іншого боку, збільшення валового внутрішнього продукту (ВВП) Індонезії призведе до збільшення виробничих потужностей з виробництва натурального каучуку, що сприятиме збільшенню обсягів експорту. Виявлено, що попит попереднього року також був врахований країнами-партнерами, які імпортують індонезійський натуральний каучук. Результати цього дослідження можуть бути корисними для уряду Індонезії та зацікавлених сторін (таких як виробники та експортери натурального каучуку) для визначення стратегій покращення експортних показників

**Ключові слова:** порівняльна перевага, експорт, міжнародна торгівля, регресія панельних даних, індекс RCA