COMPARISON OF PLYWOOD EXPORT COMPETITIVENESS OF INDONESIA AND CHINA IN THE ASEAN+3 MARKET AND ITS INFLUENCING FACTORS

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Abstract

Background: Indonesia and China are the world's major exporters of plywood. ASEAN+3 is one of the plywood importing regions with a share of 20% so it is one of the plywood export destinations.
Purpose: This has led to competition between the two countries in the plywood trade, especially the ASEAN+3 region. This study aims to analyze the comparison of Indonesia and China's plywood export competitiveness in the ASEAN+3 market and the factors that influence it.
Design/methodology/approach: This study uses ten ASEAN+3 countries in the 2015-2022 period using the RCA, EPD, X-Model, and regression analysis methods.
Findings/Result: The results of the RCA value of Indonesia and China are strongly competitive in the majority of ASEAN+3 countries. EPD shows Indonesia's plywood rising star position in seven countries and China's plywood rising star in only four countries. The X-Model method shows Brunei, Japan, South Korea, Thailand, and Vietnam have the potential to be optimistic markets for the development of Indonesian plywood exports, while Chinese plywood exports have the same potential in Malaysia, Myanmar, and Vietnam.
Conclusion: It is concluded that Indonesia's plywood competitiveness is better than China's. Factors affecting Indonesia's plywood export volume are real GDP, population, export price, RCA value, and real exchange rate of the importing country.
Originality/value (State of the art): Therefore, this study recommends several strategies such as market strengthening through certification and improving the quality of Indonesian plywood.

Keywords: competitiveness, EPD, plywood, RCA, regression analysis

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INTRODUCTION

The non-oil and gas industry sector is the largest contributor to Indonesia's exports with a value of 276 million USD in 2022, this value is much higher than the oil and gas sector of 16 million USD. One sector that contributes to the non-oil and gas industry is the forestry sector. The sector performed well in 2022 with export value exceeding the target, reaching 14 billion USD from the initial target of 9.75 billion USD (KLHK, 2023). A supporting factor is Indonesia's location in the tropics with forests covering 62.97 percent of the total land area (KLHK, 2023). According to BPS, in 2019 the wood and bamboo processing industry absorbed 1,12 million workers. The export trend of the wood sector is growing over the period 2017-2021 at a rate of 2.62% (Saraswati RI et al. 2023). Figure 1 shows that the plywood commodity is a leading sector because it has a large value and volume of exports compared to other commodities in the forestry sector.

Plywood is produced from the development of downstream wood processing industries and is made from round wood raw materials (Marbun et al. 2015). This commodity is important today because of its role in various industries such as construction, furniture, and other wood products (Nurprabowo and Rahayu, 2023). The plywood industry can increase state revenues through exports and employment and also increase added value (Malau et al. 2022). Plywood is flexible, malleable, cheap, recyclable, and relatively simple to manufacture (BPSILHK Kuok, 2023). Plywood is included in HS code 4412 covering plywood, veneer panels, and similar laminated wood.

Indonesia and China are the world's largest exporters of plywood (HS 4412), with Indonesia's export value in 2022 amounting to 2.3 million USD, lower than China's exports of 5.6 million USD (Trademap, 2022). China's forest area in 2021 reached 221 million hectares, while Indonesia's was only 91 million hectares (FAO, 2024). Although smaller, Indonesia has sought to improve the quality of its plywood exports through the Timber Legality and Verification System (SVLK) since 2009, which aims to efficiently ensure timber legality and promote good forestry governance (Maryudi et al. 2021). Indonesia and China account for 40.6 percent of the world plywood market. ASEAN+3 is the region with the largest import share in HS 4412, accounting for 20 percent of total world plywood imports. From 2015-2022, Indonesia and China's plywood export trends in the ASEAN+3 market fluctuated, with China's exports decreasing in 2022 and Indonesia's increasing (Trademap, 2024). This shows the importance of plywood to industries and consumers in the region.

In 2010, global plywood consumption reached 101,8 million m^3 and increased to 117.4 million m^3 in 2020 (Pratama, 2022). This increase in demand benefits Indonesia and China as major exporters. Indonesia's plywood exports have been steadily increasing for decades, although production has fluctuated due to the reduction of forest land due to conversion, natural events, and logging (BPS, 2023). China's larger area and technology results in more efficient plywood production, reaching 54 million m^3 in 2022 compared to Indonesia's 4.8 million m^3. From 2015-2022, China's plywood production decreased while Indonesia's production increased (FAO, 2024). This production is in line with the value and volume of China's plywood exports to the world is greater than Indonesia's. China's plywood export volume to the world is also higher than Indonesia's. Indonesia's plywood export volume was 1.8 million tons to the global market in 2022 while China's was 5.6 million tons (Figure 2).

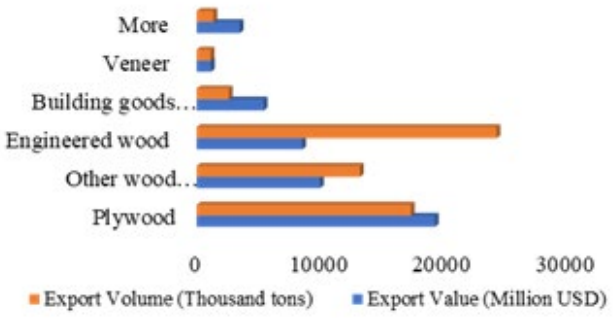

Figure 1. Value and volume of timber exports in Indonesia by type (Central Bureau of Statistics, 2023)

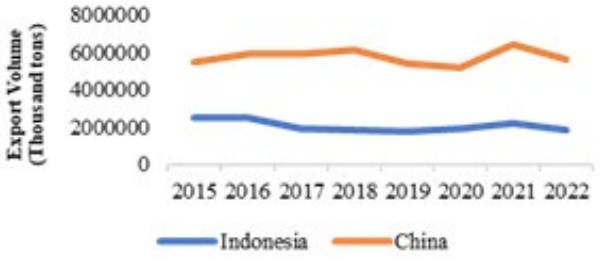

Figure 2. Plywood export volume of Indonesia and China in 2022 in the World (processed from Trademap 2024)

Figure 2 shows that China's plywood export volume is larger in general, but Figure 3 shows that Indonesia's plywood export volume is superior in several ASEAN+3 countries such as Brunei Darussalam, Japan, South Korea, Malaysia, and Singapore. This data shows the strong competitiveness potential of Indonesian plywood in these countries compared to China.

Some previous studies have discussed the competitiveness analysis of Indonesian plywood commodities but not many have analyzed the comparative competitiveness of plywood. For example, Elfira et al. (2023) analyzed the comparative competitiveness of Indonesia and Malaysia in the main petroleum exporting countries of the Crude Palm Oil (CPO) commodity. Then the study Competitiveness of and Determinants of Indonesian Plywood Export (Malau et al. 2022) only focuses on competitiveness and variables that affect Indonesian plywood exports, this study does not compare Indonesian exports with other exporting countries. Dwiprabowo (2009) conducted research related to the comparative competitiveness of plywood but compared Indonesia and Malaysia This research was conducted over a long period of time, namely 2000-2004 which is long enough.

To answer the formulation of the problem that has been proposed, this research will use a quantitative approach. The methods that will be used in this research are:

- Revealed Comparative Advantage (RCA): This method is used to measure a country's comparative advantage in producing a particular product.
- Export Product Dynamics (EPD): This method is used to analyze the export dynamics of a product over a period of time.
- X model: This method is a combination of RCA and EPD methods to see the development of export markets in importing countries.
- Regression Analysis: This method is used to identify factors that significantly affect the dependent variable, which is the export value of plywood.

Based on the previous explanation, the objectives of this study are to compare the competitiveness of plywood in China and Indonesia in the ASEAN+3 Market 2015-2022 and identify factors that affect the export volume of plywood Indonesia in the ASEAN+3 market during the period 2015-2022.

METHODS

The data used uses secondary data panel data. Panel data is a combination of time series and cross-section data. Time series used from 2015-2022 and cross-section data in the form of ten countries that are plywood importing countries from Indonesia and China in the ASEAN+3 Region including Brunei Darussalam, Cambodia, Myanmar, Philippines, Malaysia, Singapore, Thailand, Vietnam, Japan, South Korea. The object of this study is the commodity Plywood (HS 4412). Sources of data used for this research come from the World Integrated Trade Solution (WITS), World Bank, Trademap, Central Bureau of Statistics (BPS), UNCTAD, and several other sources such as scientific journals and empirical reviews of previous studies that are aligned with this research.

Revealed Comparative Advantage (RCA) is a method to calculate the competitiveness of a country's commodities. The fundamental idea behind this approach is that a country's comparative advantage is reflected in its exports and is measured by its inter-country commerce (Arsyad et al. 2020) Systematically, this calculation can be formulated as follows:

$$RCA = (x_{ij}/x_j)/(Y_{jw}/Y_w)$$

Description: RCA (Plywood competitiveness score (i) of exporters (Indonesia/China) to importing countries); x_{ij} (Export value of plywood (i) from exporter (Indonesia/China) to importer (j) (USD)); x_j (Total value of exports from exporting country (Indonesia/China) to importing country (j) (USD)); Y_{jw} (World plywood export value to importing country (j) (USD); Y_w (Total value of world exports to importer country (j) (USD).

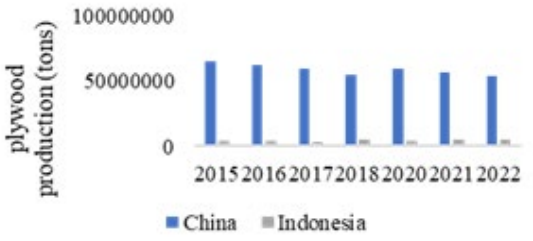

Figure 3. Indonesia and China plywood production to the world (FAO, 2024)

A country has a comparative advantage and high competitiveness in plywood if the RCA value is greater than 1. If it is less than 1, the country does not have strong competitiveness in plywood.

Export Product Dynamic (EPD) measures a country's market position for a particular market destination and the dynamism of a product in the market (Hanafi and Tinaprilla, 2017). With this approach, the performance of export products of countries in the world can be compared (Nibras and Widyastutik, 2020). EPD can be measured through the x-axis and y-axis with the following formula:

$$\text{X-axis} = \frac{\sum_{t=1}^{t} \left(\frac{Xijt}{Wjt} x100\%\right) - \left(\frac{Xijt-1}{Wijt-1} x100\%\right)}{T}$$

$$\text{Y-axis} = \frac{\sum_{t=1}^{t} \left(\frac{Xjt}{Wjt} x100\%\right) - \left(\frac{Xjt-1}{Wjt-1} x100\%\right)}{T}$$

Description: X-axis (Export market share growth); Y-axis (Product market share growth); x_{ijt} (Export value of the commodity (i) (Indonesia/China) to importing country (j) in year t); w_{ijt} (World export value of commodity (i) to importing country in year t); x_{jt} (Total value of exports from exporting countries (Indonesia/China) to importing countries in year t); w_{jt} (Total value of world exports to the importing country in year t); T (Number of years); t (Year t); t-1 (Previous year); i (Plywood commodity).

There are four analysis positions: rising star, falling star, lost opportunity, and retreat (Esterhuizen, 2006). The rising star indicates a commodity with a fast-growing market share. Falling star means an increase in market share in a product that is not dynamic. Lost opportunity describes the loss of market share of a dynamic product. The retreat is the least desirable condition, where market share is lost and products are not dynamic (Wardani and Mulatsih, 2017). The placement of the 4 categories can be seen in Figure 4.

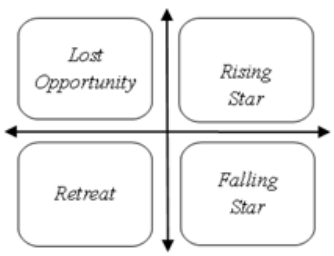

Figure 4. Quadrant of export product dynamic market position (Esterhuizen, 2006)

The X-Model aims to see the potential for commodity development in importing countries. This method is a combination of the RCA and EPD methods. Grouping of x-models as seen from Table 1.

Table 1. X-Model Clustering

RCA	EPD	Market Development
>1	Rising Star	Optimist
	Lost Opportunity	Potential
	Falling Star	Potential
	Retreat	Less Potential
<1	Rising Star	Potential
	Lost Opportunity	Less Potential
	Falling Star	Less Potential
	Retreat	Unpotential

Regression analysis is used to analyze the factors affecting Indonesia's plywood export volume. There are 3 types of ways to estimate model analysis including pooled least square, fixed effect model, and random effect model. The tests that can be carried out include the Chow test, Hausman test, and Lagrange Multiplier (LM) test. The model formulation used in this study is as follows:

$$\ln volume_{it} = \beta_0 + \beta_1 \ln gdp_{it} + \beta_2 \ln population_{it} + \beta_3 lprice_{it} + \beta_4 \ln rer_{it} + \beta_5 \ln harga_{it} + \varepsilon_{it}$$

Description: Volume (Export volume of commodity i to the importing country in year t (tons); gdp (Real GDP of the importing country in year t (USD)); population (Population of the importing country in year t (thousand inhabitants)); rer (Real exchange rate of the importing country in year t (IDR/LCU)); price (Commodity price in the importing country in year t (USD/Ton)); lrca (RCA value in the importing country in year t); β0 (intercept); βn (Parameters of each independent variable); i (Cross section of importing countries (ASEAN+3 countries)); t (Time series (2015 - 2022)); ε (Error term); ln (Natural logarithm).

Figure 5 illustrates the research framework used in this study. Indonesia and China are the world's main exporters of plywood and one of the destination countries is the ASEAN+3 region. These two countries compete for market share in each country. In general, Indonesia has a plywood export value that tends to be lower than China in the world market, but on the other hand, the volume of Indonesian plywood exports in several countries, especially the ASEAN+3 region, tends to be greater. Therefore, this study aims to

compare the competitiveness of Indonesian and Chinese plywood exports in the ASEAN+3 market and see the factors that affect the volume of Indonesian plywood exports. This study analyzes competitiveness using Revealed Comparative Advantage (RCA) and Export Product Dynamic (EPD), then uses X-Model to see the development of export markets and uses regression analysis to see the factors that affect Indonesian plywood exports.

RESULTS

Trademap data shows that by 2022, Indonesia and China will be the largest plywood exporters in the world with a market share of 40.6 percent. From 2015-2022, both countries competed in the global market, especially in ASEAN+3 which has a 20 percent share of world imports. Indonesia controls 54.1 percent of the plywood market in ASEAN+3, larger than China's 25.7 percent. Japan is the largest importer of Indonesian plywood with 759.833 tons (32.3 percent) in 2022. The Philippines imported USD 575 million worth of plywood, with USD 410 million coming from China (OEC, 2023). The value of plywood exports to Japan had decreased due to the declining price of oil in the global market and the demographics of Japan's population of young people compared to old people old age (Widyanti et al. 2018).

From 2015-2022, China's plywood exports to the world averaged 5.7 million tons per year, while Indonesia's exports were around 2 million tons (Trademap, 2024). Within ASEAN+3, China also outperforms Indonesia with an average export of 1.6 million tons per year compared to 1 million tons for Indonesia (Figure 6). China's plywood industry technology is more advanced, allowing for more efficient and high-quality production (Li and Evison, 2018), as well as lower production costs per unit (Marbun et al. 2015). China also has a wider international trade reach than Indonesia, allowing it to reach more global buyers (Pratama, 2022). Nonetheless, Indonesia experienced an upward trend in plywood exports over the period, driven by increasing global demand (Marbun et al. 2015), SVLK implementation, and global economic recovery (Pratama, 2022).

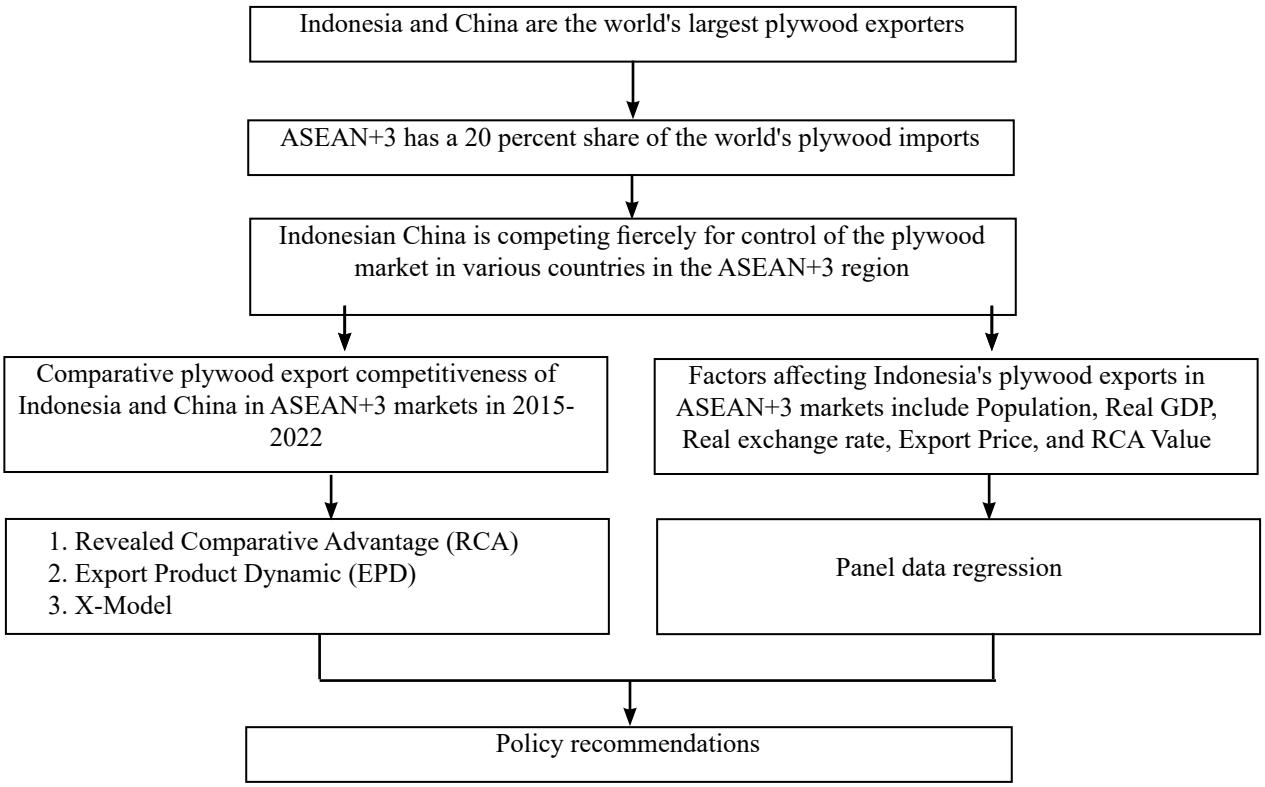

Figure 5. Research framework

The Timber Legality Verification System (SVLK) has been implemented in Indonesia since 2009 to ensure the legality of timber and its trade processes. SVLK improves forest management and the credibility of Indonesian timber exports, and gives customers confidence in the authenticity of Indonesian timber products, increasing export demand (Widyastutik and Arianti, 2014). In China, China's Timber Legality Verification System (CTLVS) issued by CNFPIA in September 2017 regulates timber legality at the forest management and trade levels, applicable to both timber imports and exports (EU FLEGT Facility, 2018). Japan, as one of the largest importers of plywood, implemented the Green Purchasing Act which requires the purchase of wood products from legal logging, in support of environmentally friendly principles (ITPC Osaka, 2018).

Competitiveness of Indonesian and Chinese Plywood Exports in ASEAN+3 Markets

The results of the RCA calculations show that in the 2015-2022 period, Indonesian plywood commodities are strongly competitive in many ASEAN+3 countries with RCA values > 1 such as Brunei, Japan, Korea, Malaysia, Singapore, Thailand, and Vietnam. These findings are supported by the results of previous research, namely that Indonesian plywood is strongly competitive in the main export destination countries including Japan, the United States, South Korea, Saudi Arabia, Chinese Taipei, Malaysia, and Australia (Malau et al. 2022). On the other hand, Indonesian plywood is not strongly competitive in Cambodia, Myanmar, and the Philippines. The highest RCA value of Indonesian plywood exports aims at the Korean market with a value of 18.01. China's plywood exports in the ASEAN+3 region are no less good because the commodity has a comparative advantage in seven countries such as Cambodia, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam. Whereas in Japan and Brunei, Chinese plywood is not strongly competitive. China's plywood exports have the highest comparative advantage in Cambodia at 3.61 (Table 2).

Compared to China, Indonesian plywood exports have a comparative advantage in South Korea and Japan, with annual average RCA values of 18.01 and 12.85 respectively. Meanwhile, China's plywood exports in the same markets are less competitive, with RCA values of 0.75 and 0.77. Korea and Japan are among the destination countries for Indonesian plywood exports. The increase in the competitiveness of plywood from Indonesia in the Korean and Japanese markets since 2010 was partly due to the implementation of the SVLK in 2009 which resulted in the volume of plywood exports to these countries increasing (Puruwita and Oktora, 2019).

Indonesia has a very weak plywood competitiveness in the Cambodian market as seen from the RCA value which is less than one. In 2016-2017 the RCA value in Cambodia was zero which indicates that Indonesia did not export to Cambodia in that year, while in other years Indonesia had exported but with a small value so that its competitiveness was weak. China has strong competitiveness in the Cambodian market with an average RCA value of 3.61. Although China is fairly competitive, when viewed from the value of each year, China's RCA value has continued to decline since 2015-2022.

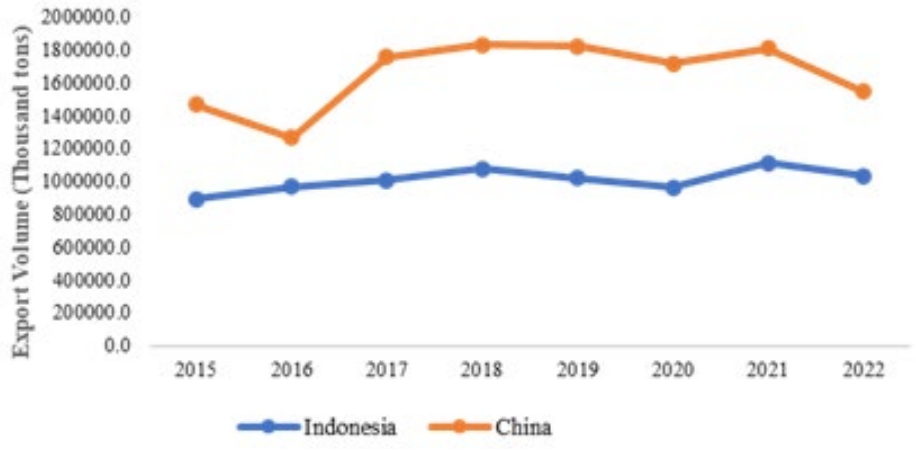

Figure 6. Export volume of plywood (HS 4112) in Indonesia and China in the ASEAN+3 Region (WITS 2024)

Table 2. RCA value of Indonesian and Chinese plywood to ASEAN+3 markets 2015-2022

Country of Destination	Exporting Country	
	Indonesia	China
Brunei Darussalam	8.09	0.56
Cambodia	0.14	3.61
Japan	12.85	0.77
South Korea	18.01	0.75
Malaysia	7.89	1.60
Myanmar	0.32	1.84
Philippines	0.40	2.62
Singapore	8.53	2.15
Thailand	2.19	2.67
Vietnam	3.03	2.54

Indonesian plywood exports to Brunei have an average RCA value of 8.09. Whereas in 2015-2022 China has an average RCA value below one, namely 0.56, which shows that plywood exports from China are not strongly competitive in Brunei. Thailand and Vietnam are among the destination markets for plywood exports from Indonesia and China. This can be seen from the RCA value which is above one, indicating that plywood from both countries can be strongly competitive. With the respective RCA values of Indonesia and China in the Thai market covering 2.19 and 2.67. While the RCA values of Indonesian and Chinese plywood commodities in the Vietnamese market include 3.03 and 2.54.

Export Product Dynamic (EPD) aims to see the competitiveness position and dynamics of Indonesian and Chinese plywood exports in the ASEAN+3 region. The results obtained from the EPD method include Brunei Darussalam, Japan, South Korea, Myanmar, Philippines, Thailand, and Vietnam occupying the best position in a group of rising stars for the competitiveness of Indonesian plywood exports (Table 3). This market position shows an increase in market share and also an increase in demand for Indonesian plywood so plywood is one of the products that can compete in the seven countries in the ASEAN+3 region. Cambodia and Singapore are in the falling star position which indicates an increase in market share growth but no increase in demand for Indonesian plywood. This position is less than ideal because Indonesian plywood does not have an optimal market share in Cambodia and Singapore. The lost opportunity market position is occupied by Malaysia, which means that there is an increase in Indonesian plywood but a decrease in export market share growth. This position indicates that Indonesia can maximize the performance of Indonesian plywood exports to Malaysia because there is a positive growth in export market share. In the ASEAN+3 region, there are no countries that fall into the retreat market position. This position usually occurs due to a decline in market share growth followed by a decline in demand for Indonesian plywood.

Table 4 shows that the countries in the rising star position for Chinese plywood commodities are Japan, Malaysia, Myanmar, and Vietnam. China's plywood exports to Brunei Darussalam are in the falling star position. This position indicates an increase in plywood export market share but a decrease in product share. China's plywood exports are in a lost opportunity position in Cambodia, South Korea, the Philippines, Singapore, and Thailand. This indicates an increase in export market share while the product market has decreased.

The X-Model results in Table 5 show that there is optimistic market development potential for Indonesian plywood exports in several ASEAN+3 countries, including Brunei Darussalam, Japan, South Korea, Thailand, and Vietnam. This optimistic market development indicates that these countries are potential markets to become importing countries for Indonesian plywood exports. Malaysia and Singapore have potential market development potential with RCA more than one and EPD in the lost opportunity and falling star positions. Potential market development also occurs in Myanmar and the Philippines with RCA less than one and EPD in the rising star position. Cambodia has less potential market development because it is in the rising star position but has an RCA value that is less than one. Malaysia, Myanmar, and Vietnam are promising markets for China's plywood exports. This shows that the country has strong competitiveness and is in a rising star position. China's plywood potential market

development positions in Cambodia, Japan, Singapore Philippines, and Thailand. This is seen from the RCA value which is more than one but with the market position in lost opportunity, falling star, or rising star. Brunei Darussalam and South Korea have less potential market development potential due to RCA values below one or if the EPD results are falling star and lost opportunity This is shown in Table 5.

Factors Affecting Indonesian and Chinese Plywood Exports in ASEAN+3 Markets

The panel data regression method used in this study aims to analyze variables as factors that can affect the volume of Indonesian plywood exports. The independent variables used include the real GDP of importing countries, population and export prices, RCA values of importing countries, and real exchange rates of importing countries with the dependent variable being the volume of Indonesian plywood exports. The data was analyzed using the panel data regression method while the time series is eight years (2015-2022) and the cross-section is ten ASEAN+3 countries including Brunei Darussalam, Cambodia, Japan, South Korea, Malaysia, Myanmar, Philippines, Singapore, Vietnam, Thailand.

The initial stage of the panel data regression method is to estimate the model through three common approaches applied to the model, namely Pooled Least Square (PLS), Fixed Effect Model (FEM), and Random Effect Model (REM). Based on these three approaches, the best model is determined by testing using the Chow test, Hausman test, and Lagrange Multiplier test.

Table 3. EPD estimation results of plywood commodities from Indonesia to ASEAN+3 Region 2015-2022

Country of Destination	EPD		
	export share (percent)	product market share (percent)	Indonesia
Brunei Darussalam	31.83	18.51	Rising Star
Cambodia	437.52	-2.08	Falling Star
Japan	1.74	1.56	Rising Star
South Korea	6.06	2.65	Rising Star
Malaysia	-1.2	3.55	Lost Opportunity
Myanmar	81.85	4.84	Rising Star
Philippines	69.28	10.2	Rising Star
Singapore	0.85	-3.47	Falling Star
Thailand	5.04	0.02	Rising Star
Vietnam	12.22	7.2	Rising Star

Source: WITS processed 2024

Table 4. EPD Estimation Results of Plywood Commodities from China to ASEAN+3 Region 2015-2022

Country of Destination	EPD		
	export share (percent)	product market share (percent)	China
Brunei Darussalam	4.61	-1.89	Falling Star
Cambodia	-2.95	8.5	Lost Opportunity
Japan	2.17	-0.34	Rising Star
South Korea	-11.33	1	Lost Opportunity
Malaysia	2.64	4.4	Rising Star
Myanmar	6.13	1.69	Rising Star
Philippines	-0.77	4.95	Lost Opportunity
Singapore	-5.14	1.91	Lost Opportunity
Thailand	-0.01	4.93	Lost Opportunity
Vietnam	0.89	2.57	Rising Star

Source: WITS processed 2024

Table 5 X-Model analysis results of Indonesian and Chinese plywood in 2015-2022

Importing Country	Indonesia X-Model	China X-Model
Brunei Darussalam	Optimistic market development	Less potential market development
Cambodia	Less potential market development	Potential market development
Japan	Optimistic market development	Potential market development
South Korea	Optimistic market development	Less potential market development
Malaysia	Potential market development	Optimistic market development
Myanmar	Potential market development	Optimistic market development
Philippines	Potential market development	Potential market development
Singapore	Potential market development	Potential market development
Thailand	Optimistic market development	Potential market development
Vietnam	Optimistic market development	Optimistic market development

Table 6 Chow test results show a probability value of 0.000 less than the real level of 5 percent, so reject H0. This indicates that the FEM is better to use than the PLS model. Furthermore, the Hausman test does not reject with a probability value of 0.000, indicating that the Random Effects Model (REM) is better used than the Fixed Effect Model (FEM). Furthermore, the Lagrange Multiplier (LM) test rejects H0 with a probability value of 0.000 which is smaller than the 5 percent real level, indicating that the Random Effects Model (REM) is better than Pooled Least Square (PLS). From the tests that have been carried out, it can be concluded that the panel data regression in this study uses the Random Effects Model (REM) method.

Table 7 shows that the variables that have an influence on the volume of Indonesian plywood exports are export prices, population, real exchange rates, RCA values, and real GDP of importing countries. The variables of export price, population, RCA value, and real GDP of importing countries are significant at the 5 percent real level while the real exchange rate of importing countries is significant at the 10 percent level. In the research model, it was found that all independent variables had a positive effect on the volume of Indonesian plywood exports except the export price variable. In the export price variable, the coefficient sign shows a negative sign but still has a significant effect. The model estimation results show the r-squared coefficient of determination of 0.972, which indicates that 97.2 percent of the diversity of the dependent variable can be explained by the independent variables used in the model. Meanwhile, the remaining 2.8 percent is explained by other variables outside the model. Based on the panel data regression estimation results, the model used in the study of Indonesian plywood exports to the ASEAN+3 region is as follows:

$$\ln volume_{it} = -13.89 - 0.67\ \ln price_{it} + 0.45\ \ln population_{it} + 0.14\ \ln rer_{it} + 0.98\ \ln rca_{it} + 0.71\ \ln gdp_{it}$$

Description: Volume (Export volume of commodity i to the importing country in year t (tons)); gdp (Real GDP of the importing country in year t (USD)); population (Population of the importing country in year t (thousand inhabitants)); rer (Real exchange rate of the importing country in year t (IDR/LCU)); price (Commodity price in the importing country in year t (USD/Ton)); lrca (RCA value in the importing country in year t); ln (Natural logarithm).

Effect of Importing Countries' Real GDP on Indonesian Plywood Export Volume

The importer country's real GDP variable has a positive impact on the development of Indonesia's plywood export volume to the importer country. The probability value is 0.00 and the coefficient is 0.707. With this probability value, the importer country's real GDP variable is significant at the 5 percent real level, ceteris paribus. The Effect of Real GDP of Importing Countries on the Export Volume of Indonesian Plywood. A 1 percent increase in the real GDP of the importing country will lead to a 0.707 percent increase in the volume of plywood exports from Indonesia. The real GDP of the importing country represents the purchasing power of its people, which will increase the demand for plywood from the importing country, which in turn will increase the export volume of Indonesian plywood. This indicates that the results of this study are in accordance with the initial hypothesis and consistent with previous research (Firdaus et al. 2022) which found that real GDP has a positive and significant impact on Indonesia's export volume.

Table 6. Hausman Test and Lagrange Multiplier Test Results

Model Test	Prob- Value	Estimated Results
Chow Test	0.000	Reject H0, then FEM
Hausman Test	0.614	Do not reject H0, then REM
Lagrange Multiplier Test	0.000	Reject H0, then REM

Table 7. Random Effect Model Estimation Results

Variabel Dependen: lvolume				
Independent Variable	Coefficient	Std. error	t-Stat	p-Value
lharga	-0.672	0.193	-3.49	0.000***
lpopulasi	0.446	0.214	2.08	0.037**
lrer	0.136	0.076	1.78	0.075*
lrca	0.979	0.055	17.81	0.000***
lgdp	0.707	0.176	4.02	0.000***
c	-13.888	3.036	-4.57	0.000***
R-Squared	0.972			
Prob > chi^2	0.000			

Notes: *significant at 10% level. **significant at 5% level. ***significant at 1% level.

The Effect of Importing Countries' Real Exchange Rates on Indonesia's Plywood Export Volume

Indonesia's plywood export volume is significantly positively affected by the real exchange rate variable (IDR/LCU). At the 10 percent significance level, the real exchange rate of exporting countries has a coefficient of 0.136 and a probability value of 0.075. This value means that if the real currency exchange rate of the exporting country depreciates by 1 percent, it will increase the export volume of Indonesian plywood by 0.136 percent, ceteris paribus. A stronger exchange rate in an importing country signals that goods in that country are more expensive than imported goods, which encourages the importing country to buy cheaper commodities from other countries (Kusuma and Firdaus, 2015). This result is in line with research conducted (Wardani and Mulatsih, 2017) where the real exchange rate has a positive and significant effect on export volume.

The Effect of Importing Countries' Export Prices on Indonesia's Plywood Export Volume

Indonesia's plywood export volume is negatively and significantly affected by export prices. With a coefficient value of -0.672, export prices have a significant impact at the 5 percent level, as indicated by the probability value of 0.000. This can be explained that if there is a 1 percent increase in export prices, the export volume of plywood will decrease by 0.672 percent ceteris paribus. The results of this study are in accordance with existing theory, where an increase in prices on the demand side will reduce export demand. This result is in line with research Hamzah and Santoso (2020) and Safitri and Kartiasih (2019), which indicates that importing countries will increase consumption in the country if export prices decline.

The Effect of Importing Country Population on Indonesian Plywood Export Volume

The estimation results in Table 7 show that Indonesia's plywood export volume is positively influenced by population. The population variable is significant at the 5 percent level, with a probability value of 0.000. The coefficient value obtained is 0.446, which means that if there is an increase in population growth by 1 percent, it will increase the export volume of plywood by 0.446 percent ceteris paribus. The population of importing countries illustrates the potential market demand and consumption so that an increase in population will have a positive impact on increasing the volume of Indonesian plywood exports. Similar research results (Malau et al. 2022) and (Budiarti and Anggraeni, 2023) show that Indonesian plywood exports to importing countries are significantly positively influenced by the population in the importing country.

The Effect of Importing Countries' RCA Values on Indonesia's Plywood Export Volume

The volume of plywood exports from Indonesia is significantly influenced by the competitiveness or comparative advantage of plywood commodities. With a probability value of 0.000, the RCA value variable has a real effect at the 5 percent level. The coefficient value obtained from the estimation results of 0.979 can be interpreted that each increase in the RCA value by 1 percent will increase the export volume of plywood by 0.979 percent ceteris paribus. The results of this study are in line with the results of research Puruwita (2019) and Putri (2021) where the calculation of competitiveness using RCA has a significant positive effect on the volume of Indonesian plywood exports.

Manajerial Implications

From the results of this study, it is evident that Indonesia's competitiveness is still lower than China in several countries in the ASEAN+3 region, therefore it is necessary to carry out a market-strengthening strategy in countries where export development is still not optimal such as Cambodia, Malaysia, Myanmar, Philippines, Singapore and maintain market share in countries that have good competitiveness such as South Korea, Japan, Brunei Darussalam, Thailand, Vietnam. One of the increases in Indonesian plywood exports can be supported by improving the quality and innovation of plywood products and the application of certification in order to increase export competitiveness in other countries. In addition, to streamline production, it is necessary to increase the use of technology so that costs can be reduced and export prices can be more competitive in the global market, especially ASEAN+3. Indonesia's plywood is prioritized to be exported to countries that have relatively stable exchange rates and also high purchasing power potential.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The X-Model calculation is a combination of RCA and EPD methods that show the results that Brunei Darussalam, Japan, South Korea, Thailand, and Vietnam have strong competitiveness and have the potential to become optimistic markets for the development of Indonesian plywood exports, while China's plywood exports have the same potential in Malaysia, Myanmar and also Vietnam. From these three competitiveness methods, it can also be concluded that Indonesian plywood exports are better than Chinese plywood exports in the ASEAN+3 market.

The volume of Indonesian plywood exports to the ASEAN+3 region is influenced by several factors including real GDP, population, real exchange rate, and RCA value of importing countries. All of these independent variables have a significant and positive influence on the volume of Indonesian plywood exports, except for the export price variable which has a negative influence on Indonesian plywood.

Recommendations

The results of this study show that although Indonesian plywood is quite competitive in many ASEAN+3 countries, China is a formidable competitor in terms of plywood export competitiveness in the same market so Indonesia needs to strengthen the market in several countries in the ASEAN+3 region that are in a less optimal position or outside the ASEAN+3 region. The strengthening can be done by improving the quality of Indonesian plywood.

Based on the results of the analysis, the variables that affect the volume of Indonesian plywood exports include real GDP, population, real exchange rates, export prices, and RCA values of importing countries. The RCA value and real exchange rate have the highest coefficient, so it is recommended that the government needs to consider countries that have a fairly stable real exchange rate if it wants to increase the export market share of this item.

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