

## FACTORS AFFECTING FOREST PRODUCT EXPORTS

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**Abstract:** Large-scale companies carry out forestry industry export activities. PT SLJ Global Tbk is one of the actors in this activity. The research's objectives are to analyze the factors that affect the company's plywood exports and to identify the managerial policies of the company's plywood exports. This research uses secondary data in the form of monthly time series data from January 2014 to December 2020. The Error Correction Model (ECM) is used to analyze the factors that affect the company's plywood export volume. The factors that have a positive and significant effect in the long-term model are the production volume and the previous period's production volume. The factors that have a positive and significant effect on the short-term model are production volume, export prices, international prices, and production volumes for the previous period. The managerial implications are increasing productivity, maintaining production stability, increasing plywood quality, and increasing export marketing. Suggestions for company are to maintain the stability of raw materials, innovate products, increase investment, require new markets, and analyze and evaluate marketing and its correlation with the company's production aspects.

**Keywords:** ECM, export, forestry, managerial, plywood

**Abstrak:** Perusahaan-perusahaan berskala besar melakukan kegiatan ekspor industri kehutanan. PT SLJ Global Tbk merupakan salah satu pelaku dalam kegiatan tersebut. Tujuan penelitian adalah menganalisis faktor-faktor yang memengaruhi ekspor kayu lapis perusahaan dan mengidentifikasi kebijakan manajerial ekspor kayu lapis perusahaan. Penelitian ini menggunakan data sekunder berbentuk data deret waktu bulanan periode Januari 2014 hingga Desember 2020. Error Correction Model (ECM) digunakan untuk menganalisis faktor-faktor yang memengaruhi volume ekspor kayu lapis perusahaan. Faktor-faktor yang berpengaruh positif dan signifikan dalam model jangka panjang adalah volume produksi dan volume produksi periode sebelumnya. Faktor-faktor yang berpengaruh positif dan signifikan pada model jangka pendek adalah volume produksi, harga ekspor, harga internasional, dan volume produksi periode sebelumnya. Kebijakan manajerial adalah peningkatan produktivitas, penjagaan stabilitas produksi, peningkatan kualitas kayu lapis, dan peningkatan pemasaran ekspor. Saran bagi perusahaan adalah menjaga kestabilan bahan baku, melakukan inovasi produk, menambah investasi, memerlukan pasar baru, dan menganalisis dan mengevaluasi pemasaran, serta korelasinya dengan aspek produksi perusahaan.

**Kata kunci:** ECM, ekspor, kayu lapis, kehutanan, manajerial

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## INTRODUCTION

Export is one of the activities carried out by many companies in running their business activities. There are several reasons companies enter foreign markets (Ball et al. 2008), namely the desire to increase profits and sales or protect themselves so that competitors do not defeat the company. In addition, exports are essential to economic growth (Fujii-Gambero and García-Ramos, 2015), where foreign exchange earnings can increase (Siba and Gebreyesus, 2017). On the other hand, exports help in the absorption of labor, the expansion of the business industry, and the expansion of production (Buturac et al. 2019). Exports play an essential role in facilitating investment and technology transfer that can accelerate globalization (Sultanuzzaman et al. 2019). This is especially so if a country exports a particular product, then this condition indicates a competitive advantage and proves that the country has the necessary capabilities to produce products from that sector (Saltarelli et al. 2020).

The forestry sector is one sector that has a vital role in the Indonesian economy (Mutaqin et al. 2022). This sector can improve export performance by producing wood products. The development of this commodity export trend in 2017-2021 was 2.62% (Kemendag, 2022). This shows that the effect of natural resources on increasing exports depends on the type of resources involved (Zhu and Fu, 2013). In the context of the forestry sector, forest products already provide an essential source of income and welfare for farming communities throughout the tropics (Hermans-Neumann et al. 2016). For example, Vietnam has become an example for developing countries in the tropics about how forestry and the wood product sector can increase development and become national income (Nambiar, 2021). Another interest in researching timber forest products is that globally these products are essential in the characteristics of a renewable economy, with the largest exporter in the world being China (Cao et al. 2018). If forest products are integrated and efficient, they can fully play the role of market forces in the supply of ecological products (Song et al. 2022). In the current era, the forestry industry is also trying to expand its product coverage and is aiming at new geographic markets (Hurmekoski et al. 2018).

Large companies carry out the export of forestry products. There are several factors related to export of forestry product. According to Bekteshi (2020), a strong positive relationship exists between company size measured by the number of employees and the company's export performance. In addition, through private companies, state-owned companies, and small farmers, countries such as Indonesia and Malaysia can obtain supplies of forestry commodities such as palm oil, whose market is global (Purnomo et al. 2020). Based on the research of Ismail et al. (2019) regarding Malaysia, it was found that effective export management can play an essential role in increasing economic growth. Meanwhile, the production of forest commodities in tropical countries has long been a global concern, ranging from the work systems, labor conditions, prices, and deforestation (Byerlee and Rueda, 2015). Meanwhile, deforestation and forest degradation continue to occur globally on a large scale, with timber extraction as a significant cause (Pirard et al. 2016).

Many problems are separated from forestry products export activities. Dwiprabowo (2009) said that the Indonesian plywood industry market experienced several things, namely the high demand for the export market, the payment system, and the reduced number of competitors from similar products. In addition, another problem is forest certification which has increased company costs and affected international trade in wood products (Guan and Sheong, 2019). Large-scale production of wood and palm oil raises the issue of deforestation (Austin et al. 2019) which is a particular problem in the export of forestry commodities. Import and export of timber forest products can cause pollution and environmental impacts that are of great concern (Tian et al. 2021) including the second largest source of greenhouse gas emissions (Pendrill et al. 2019) and reduced biodiversity (Green et al. 2019).

This research uses a case study at PT SLJ Global Tbk. This company is one of the actors in exporting forestry products, namely the export of plywood products. The research aims to analyze the influencing factors and identify the managerial policies of the company's plywood exports.

## METHODS

This research is a case study and uses secondary data. Secondary data sources are collected from the company, the World Bank web page, and the Center for Data and Information Systems (PDSI) from the Ministry of Trade. The research core data is quantitative secondary data from the company and the World Bank in the form of monthly time series data from January 2014 to December 2020. Additional research data is quantitative secondary data from the World Bank and PDSI Ministry of Trade for December 2013. The company's plywood, the company's plywood production volume, the company's plywood export price, the United States dollar to the rupiah exchange rate by company, the company's domestic plywood price, the company's domestic plywood volume, the World Bank's international plywood price, and the United States dollar to the rupiah exchange rate according to the PDSI of the Ministry of Trade.

The method of processing data and information is based on quantitative analysis. The factors influencing the company's plywood exports to destination countries are studied using quantitative analysis, using the Error Correction Model (ECM) method. This quantitative analysis was done using Microsoft Excel 2019 and EViews 12 software.

The type of data tested in the research is time series data. Juanda and Junaidi (2012) stated that all-time series data are generated from stochastic processes. A stochastic process generates a set of random variable values representing the state of the data behaving in various contexts.

The stationarity test determines whether the processed data is stationary or not. This test uses the unit root method, the Augmented Dickey-Fuller Test (ADF Test). Stationarity testing is done at the level. If the P-value < 5% significance level, it can be concluded that the data is stationary. However, this must be different if the P-value > 5% significance level.

Cointegration testing can identify long-term and short-term correlations between economic variables. Two or more variables in the time series data are not stationary. If the combinations are linearly parallel with time, these variables can be stationary at the first difference level.

Granger's Representation Theorem is essential. In Gujarati and Porter (2018), this theorem confirms that when two independent and dependent variables are cointegrated, the relationship can be expressed as an Error Correction Model (ECM).

The Error Correction Model (ECM) was introduced by Sargan, developed by Hendry (Firdaus, 2018), and popularized by Engle and Granger. This model is needed to correct imbalance (Gujarati and Porter, 2018), namely imbalance in the short term. This model has a fixed equilibrium for the long-term, but there is a proportion from one period corrected in the next period (Engle and Granger, 1987).

Error Correction Model (ECM) is used as a balance between long-term and short-term behavior. The spurious regression problem can be solved through differencing variables fixed in the modeling, but this will not eliminate long-term information due to the use of data in the form of the first difference (Engle and Yoo, 1987).

This research has developed hypotheses. The hypotheses are:

1. PT SLJ Global Tbk's plywood export volume is affected by several factors: production volume, export prices, exchange rate of the United States dollar to the rupiah, domestic prices, international prices, previous period's export volume, previous period's production volume, and previous period's international prices.
2. PT SLJ Global Tbk's plywood production volume has a positive influence on the company's plywood export volume.
3. PT SLJ Global Tbk's plywood export price has a positive influence on the company's plywood export volume.
4. The exchange rate of the United States dollar to the rupiah has a positive influence on PT SLJ Global Tbk's plywood export volume.
5. PT SLJ Global Tbk's plywood domestic price has a negative influence on the company's plywood export volume.
6. The international price of plywood has a positive influence on PT SLJ Global Tbk's plywood export volume.
7. PT SLJ Global Tbk's plywood export volume in the previous period has a positive influence on the company's plywood export volume.

8. PT SLJ Global Tbk's plywood production volume in the previous period has a positive influence on the company's plywood export volume.
9. The international price of plywood in the previous period has a positive influence on PT SLJ Global Tbk's plywood export volume.

The econometric model of PT SLJ Global Tbk's plywood export volume in the long-term is formulated as follows:

$$\ln Y_t = a_0 + a_1 \ln Q_t + a_2 \ln PX_t + a_3 \ln ER_t + a_4 \ln PD_t + a_5 \ln PIN_t + a_6 \ln Y_{t-1} + a_7 \ln Q_{t-1} + a_8 \ln PIN_{t-1} + et$$

Furthermore, the econometric model of PT SLJ Global Tbk's plywood export volume in the short-term is formulated:

$$\Delta \ln Y_t = b_0 + b_1 \Delta \ln Q_t + b_2 \Delta \ln PX_t + b_3 \Delta \ln ER_t + b_4 \Delta \ln PD_t + b_5 \Delta \ln PIN_t + b_6 \Delta \ln Y_{t-1} + b_7 \Delta \ln Q_{t-1} + b_8 \Delta \ln PIN_{t-1} + \gamma u_{t-1} + et$$

Notes:  $\Delta$  (Difference);  $\ln$  (Natural logarithm);  $Y_t$  (The total export volume of plywood company period t (m<sup>3</sup>));  $Q_t$  (The total plywood production volume company period t (m<sup>3</sup>));  $PX_t$  (The company's plywood export price period t (Rp in thousands/m<sup>3</sup>));  $ER_t$  (The real exchange rate is US\$/Rp period t (US\$/Rp));  $PD_t$  (The company's plywood domestic price period t (Rp in thousands/m<sup>3</sup>));  $PIN_t$  (The international price of plywood period t (Rp in thousands/m<sup>3</sup>));  $Y_{t-1}$  (The total export volume of plywood company period t-1 (m<sup>3</sup>));  $Q_{t-1}$  (The total plywood production volume company period t-1 (m<sup>3</sup>));  $PIN_{t-1}$  (The international price of plywood period t-1 (Rp in thousands/m<sup>3</sup>));  $a_0$  (The constant of the long-term model);  $a_i$  (The regression coefficient of the i-th independent variable long-term model);  $b_0$  (The constant of the short-term model);  $b_i$  (The regression coefficient of the i-th independent variable short-term model);  $\gamma$  (The coefficient of the error term);  $u_{t-1}$  (Error Correction Term (ECT));  $et$  (The short-term model error)

## RESULTS

### Factors Affecting The Exports of Plywood PT SLJ Global Tbk

Stationarity test results at the level with a significance level of 5% (Table 1). The variables of the company's plywood export volume, the company's plywood production volume, the company's domestic plywood price, the company's plywood export volume of the previous period, and the previous period's plywood production volume were stationary at the level. This is because the P-value < 0.05. However, the company's plywood export price variable, the exchange rate of the United States dollar to the rupiah, the international price of plywood, and the international price of plywood in the previous period were not stationary because the P-value > 0.05. Therefore, a first difference condition is needed to obtain stationarity in all variable data.

Table 1. Level stationarity test

Variable	P-value
$Y_t$	0.0001
$Q_t$	0.0004
$PX_t$	0.2493
$ER_t$	0.3468
$PD_t$	0.0185
$PIN_t$	0.5745
$Y_{t-1}$	0.0001
$Q_{t-1}$	0.0002
$PIN_{t-1}$	0.5699

Stationarity test results at the first difference level with a significance level of 5%. It is known that all research variables are stationary at the first difference level. This is because the P-value < 0.05 (Table 2).

Table 2. First difference level stationary test

Variable	P-value
$Y_t$	0.0000
$Q_t$	0.0001
$PX_t$	0.0001
$ER_t$	0.0000
$PD_t$	0.0001
$PIN_t$	0.0000
$Y_{t-1}$	0.0000
$Q_{t-1}$	0.0001
$PIN_{t-1}$	0.0000

A cointegration test was conducted to see if there was a cointegration between the long-term and short-term models. This can be seen from the stationarity of the residual value of the long-term ECM model. In this cointegration test, the residual value is stationary at the level with a significance level of 5%, namely  $0.00 < 0.05$ . Thus, it can be concluded that there is cointegration among the variables in the model. The ECM model can be continued.

In Juanda and Junaidi (2012), cointegration means moving with the same wavelength. The stationary error term coefficient is caused by the trend of the dependent variable cancelling each other with the trend of the independent variable. These variables are integrated in the same order because the dependent and independent variables are stationary at the first difference. Cointegrated variables mean that this has a long-term relationship and is said to be in a state of long-term equilibrium.

Table 3. Long-term estimation of ECM

Variable	Coefficient	P-value
$Q_t^*$	0.644141	0.0000
$PX_t$	0.381928	0.1464
$ER_t$	- 0.471674	0.5974
$PD_t$	- 0.090993	0.6292
$PIN_t$	0.698762	0.5671
$Y_{t-1}$	-0.176072	0.1188
$Q_{t-1}^*$	0.342975	0.0057
$PIN_{t-1}$	- 0.029356	0.9785
C	-2.528841	0.6468
$R^2_{adj}$	0.703794	
F-statistic	0.000000	

Note: \* significant at 5% significance level

In the estimation results of the long-term model (Table 3), the variable volume of plywood production of PT SLJ Global Tbk has a coefficient value of 0.64. This variable has a positive coefficient. This is consistent with the initial hypothesis that the company's plywood production has a positive relationship with the company's plywood export volume. This is also similar to the findings in Maharani and Rudatin (2014) and Marbun (2015), where plywood production's volume positively relates to plywood exports. The coefficient value of 0.64 means that for every 1% increase in the company's plywood production volume, the company's plywood export volume increases by 0.64%, *ceteris paribus*.

From the research above, the variables of the company's plywood production volume, the company's plywood export price, the international price of plywood, and the company's plywood production volume in the previous period have a positive relationship to the plywood export volume of PT SLJ Global Tbk. The variables of the company's plywood production volume and the company's plywood production volume in the previous period had a significant effect, while the company's plywood export price and international plywood prices had no significant effect in this research.

Therefore, production volume generally plays a vital role in the long-term model. This is supported by research by Maharani and Rudatin (2014) and Marbun (2015). The results in the estimation of this long-term model also mean that PT SLJ Global Tbk can make managerial decisions related to the combination of the total area of forest logged, the volume of plywood production, and the volume of plywood sales, in addition to the limitation of raw wood materials in the production process for long-term.

Table 4. Short-term estimation of ECM

Variable	Coefficient	P-value
$Q_t^*$	0.776134	0.0000
$PX_t^*$	1.835608	0.0011
$ER_t^*$	- 4.966928	0.0069
$PD_t$	0.047718	0.7642
$PIN_t^*$	3.013227	0.0411
$Y_{t-1}$	-0.124530	0.2147
$Q_{t-1}^*$	0.301943	0.0010
$PIN_{t-1}$	-1.537554	0.1242
ECT *	-0.966089	0.0000
C	-0.003158	0.9080
$R^2_{adj}$	0.710079	
F-statistic	0.000000	

Note: \* significant at 5% significance level

All variables in the long-term are differentiated so that all variables can be stated to be stationary in the short-term. The difference between the long-term and short-term models is the addition of the Error Correction Term (ECT) variable.

In the short-term model, the resulting Error Correction Term (ECT) variable with a coefficient of -0.966089 (Table 4). This variable has a negative coefficient and significantly affects the 5% level of significance. Since the ECT value is between -1 and 0, the ECM model is valid and used for both long-term and short-term

models. Gujarati (2011) explains that the ECT value in the model is a speed of adjustment. This means that the velocity determination coefficient in the model can correct the occurrence of errors in the short-term model to achieve equilibrium in the long-term. This also means that the short-term desired by economic actors is the same as what happens during the long-term and the short-term reaches equilibrium. This value of 0.966089 indicates a quick adjustment rate of 96.61% of short-term errors corrected in the long-term.

In the short-term model in the form of the first difference, the coefficient values cannot be interpreted and only positive or negative relationships are seen (Banerjee et al. 1993). The data processing obtained the relationship between the independent variables on the plywood export volume variable of PT SLJ Global Tbk.

In the estimation results of the short-term model, the variable volume of plywood production of PT SLJ Global Tbk has a positive coefficient value. This is consistent with the initial hypothesis that the company's plywood production has a positive relationship with the company's plywood export volume. This is similar to Maharani and Rudatin (2014) and Marbun (2015), where the variable volume of plywood production is positively related to the volume of plywood exports.

From the research above, the variables of the company's plywood production volume, the company's plywood export price, the exchange rate of the United States dollar to the rupiah, the international price of plywood, and the company's plywood production volume in the previous period had a significant effect on the plywood export volume of PT SLJ Global Tbk. The variables of the company's plywood production volume, the company's plywood export price, the international price of plywood, and the company's plywood production volume in the previous period have positive coefficients. In contrast, the variable of the United States dollar to the rupiah exchange rate has a negative coefficient. Therefore, the company's plywood production volume, the company's plywood export price, the international plywood price, and the company's plywood production volume in the previous period have an essential role in the short-term model because these variables have a positive and significant effect.

The results in this short-term model estimate illustrate that PT SLJ Global Tbk should consider entering the good plywood export market. Good sales of products in export markets are expected to generate profits for the company.

When viewed from the long-term and short-term models, the company's plywood production volume and the company's plywood production volume in the previous period appear as variables that have a positive and significant impact on the plywood export volume of PT SLJ Global Tbk. This is also similar to Marbun (2015). Therefore, the company needs to focus on the volume factor of plywood production. This is supported by research conducted by Makkarennu and Nakayasu (2013), which recommends that to meet the potential of the plywood market, increase market share, and develop competitive power in the global market, it is necessary to increase the productivity of the plywood industry, product competitiveness forestry, and the efficiency of the plywood industry.

### **Managerial Policies**

Based on the results of this research, it has been explained that the variables that affect the export volume of PT SLJ Global Tbk's plywood in the long-term and short-term are the company's plywood production volume and the company's plywood production volume in the previous period. Therefore, the company's managerial policies lead to these variables. The managerial policies are as follows:

#### **1. Increasing productivity**

In Rut and Wołczański (2016), optimization of the production process can affect the efficiency of the manufacturing process. This is an opportunity for the company to improve productivity. In addition, the company has a growing market demand and ensures high-quality products. Based on the above, PT SLJ Global Tbk needs to optimize several production factors to increase productivity. The production factors involved are technology, raw wood materials, and labour.

PT SLJ Global Tbk needs to control production. This can be done by allocating costs and activities for periodic maintenance, maintenance, and even repair machines and production tools. This step is necessary because plywood production activities with a reasonably long

machine life, around 35 years, can reduce the efficiency in using raw wood materials. This inefficiency of using raw wood materials impacts the shrinkage of the number of production outputs than expected.

Increased productivity is also related to labour. It can be done through the arrangement of the wage system. In addition, increased productivity can be pursued through technical factors (adaptability and use of the latest technology), organization (type of organization applied, authority and responsibility of individuals and groups, and division of labour), management (work environment and motivation towards the workforce), personal (skills, quality, training, human resource development, and career opportunities), and government factors (employment regulations).

## 2. Maintaining production stability

PT SLJ Global Tbk needs to maintain production stability. This can be done by ensuring the availability of raw wood materials, capital, technology, and labor.

The concession forest areas can be used as production forests in the long-term if PT SLJ Global Tbk can maintain them. If this happens because of the instability of the amount of raw wood material from this source, it will be difficult for the company to predict and guarantee the volume of plywood produced in the long-term. To overcome this problem, the company needs to take several steps. Steps from Himes et al. (2022) are improving the quality of forest management. Other steps are that the company needs to increase the intensity of carrying out activities related to forest planning, regeneration, and maintenance. This can be pursued through forest rejuvenation or reforestation activities. The company can plant various types of trees that can grow and develop quickly, such as acacia trees, mahogany, etc.

Collecting and delivering raw wood materials from the forest are often risky processes in production. This is due to unpredictable weather conditions. Uncertain weather conditions can cause delays in delivering raw wood materials from the forest to the operational office of PT SLJ Global Tbk. This also has an impact on delays in plywood production at the factory. Therefore, the company needs to make business activity management plans early and mature. Thus, the company can anticipate or reduce the time of the delay.

PT SLJ Global Tbk also needs to be aware of this if this occurs in a prolonged dry season. The condition of the season is one of the causes of forest fires.

If PT SLJ Global Tbk experiences a shortage of raw wood materials from concession forest sources, the company usually purchases raw wood materials from other concession forest owners and other sources. However, purchasing raw wood materials, especially raw wood materials certified for *Pengelolaan Hutan Produksi Lestari* (PHPL), has a higher price than the cost of taking and shipping raw wood materials from the forest itself. This impacts the increase in production costs and the price of products sold.

By looking at the problems above, several steps can be taken. PT SLJ Global Tbk needs to maintain a stable stock of raw wood materials through cooperation with other parties. The company can find and buy small forest areas regulated in *Hak Pengusahaan Hutan* (HPH). The company also needs to work with the community, the owner of the customary *Hak Pengusahaan Hutan* (HPH) in the vicinity. The company can purchase raw wood materials from the community, either in the form of felled wood or forest areas. The community can experience a prosperous life with the presence of the company.

PT SLJ Global Tbk has used commercial wood species 1 and 2 raw materials from Meranti and Rimba Campuran species. If the company only relies on these two types of wood in the long-term, then the company will experience a limited amount of raw wood materials. Therefore, the company must search, and research new types of wood used as raw materials. An example of this type of wood is acacia trees.

PT SLJ Global Tbk's capital is another production factor that needs to be kept stable in business activities. The company's capital comes not only from selling plywood in the market, but also includes income from subsidiaries, banking institutions, investors, etc. With capital, the company can finance production and non-production activities.

To develop a more significant business, PT SLJ Global Tbk needs to increase capital through investment by third parties or investors. The involvement between the company and third parties or investors is made more accessible because the company is already registered with an Initial Public Offering (IPO) and is included

in the ranks of large companies on the Indonesia Stock Exchange.

The combination of raw wood materials, capital, technology, and labor factors can affect the system for maintaining production stability. The workforce can work effectively if raw wood materials and technology are always available to be processed and operated. The regulation of the wage system and other factors becomes easier to measure and regulate by PT SLJ Global Tbk. If PT SLJ Global Tbk experiences conditions that require it to increase or decrease its plywood production volume than usual, this will have several impacts. If the company must increase the volume of plywood production, this will have an impact on increasing production costs. The workforce should be paid for overtime work and technology should be operationalized at a higher cost. If the company has to reduce the amount of plywood produced and even stop production activities, the company needs to pay the cost of laying off the workers concerned.

### 3. Increasing plywood quality

The export price of PT SLJ Global Tbk's plywood is higher than the domestic price. The price of the company's plywood sold to the export market can be higher because the company can add value to the cost of production, high quality, and delivery of the product, in addition to the average price in the destination market. In addition to the higher export price of PT SLJ Global Tbk's plywood, the company is more oriented toward the export market by developing the exchange rate of the United States dollar to the rupiah. The rupiah exchange rate can affect a country's export competitiveness (Ratana et al. 2012). In this research, the exchange rate is negatively related to the company's plywood export volume in the long-term and the short-term. Even so, the relationship between the two does not significantly affect the long-term.

However, PT SLJ Global Tbk cannot deliver all its plywood production. This is because some plywood products fail and cannot meet export standards. Although several plywood products fail in production, PT SLJ Global Tbk still utilizes these products to be sold to the domestic market. However, selling the company's plywood to the domestic market was not profitable in the long-term.

Since PT SLJ Global Tbk is more oriented toward the export market, the company focuses on increasing the volume of plywood exported. According to Yamamoto et al. (2014), the product must meet several standards for the company's plywood to be exported to destination countries. One of the standards is quality. Therefore, it is necessary to improve the quality of the company's plywood. To improve the quality of plywood, PT SLJ Global Tbk needs to evaluate whether to upgrade the machine or add production equipment. With this consideration, the company is expected to minimize the number of plywood products that fail to export. This is because the company has been using production machines since 1987. These old machines can increase the potential for defects in the company's plywood products.

PT SLJ Global Tbk needs to improve quality through product innovation. The company can produce finishing products for doors, floors, walls, ceilings, and others with coatings from teak wood, teak wood, etc. The company can acquire and expand the target market with this product innovation. The company can also attract and lure investors into helping with capital and production.

### 4. Increasing export marketing

The export market is still a mainstay for PT SLJ Global Tbk. The company can increase its plywood supply to all export markets to sell more products. PT SLJ Global Tbk needs to add new marketing networks or agents to increase plywood supply to the export market. This is better if the network or new marketing agencies are potential buyers. The company also has a more apparent market.

### Managerial Implications

Research has indicated that the company's plywood export volume and the company's plywood export volume in the previous period are variables that need to be considered by PT SLJ Global Tbk in the long-term and short-term models. Thus, companies need to increase productivity, maintain production stability, increase plywood quality, and increase export marketing.



## CONCLUSIONS AND RECOMMENDATIONS

### Conclusions

Factors thought to affect PT SLJ Global Tbk's plywood exports were analyzed using the Error Correction Model (ECM). The Error Correction Model (ECM) is used as a balance between long-term and short-term behavior. The results of the analysis shows that the factors that positively and significantly impact the company's plywood export volume in the long-term model are the production volume and the previous period's production volume. The factors that positively and significantly impact the company's plywood export volume in the short-term model are production volume, export price, international price, and production volume in the previous period. The variable exchange rate of the United States dollar to the rupiah has a negative and significant effect.

When viewed from the long-term and short-term models, the company's plywood production volume and the company's plywood production volume in the previous period appear as variables that have a positive and significant impact on the plywood export volume of PT SLJ Global Tbk. This is similar to Marbun (2015), where production volume has a positive and significant effect on plywood export volume. Therefore, the company need to focus on the volume factor of plywood production. The company's managerial policies lead to these variables. The managerial policies are increasing productivity, maintaining production stability, increasing plywood quality, and increasing export marketing.

### Recommendations

Based on the research results, PT SLJ Global Tbk is advised to take several steps. First, PT SLJ Global Tbk needs to maintain a stable stock of raw wood materials. In the short-term, the company needs to cooperate with other parties. The company can find and buy small forest areas regulated in *Hak Pengusahaan Hutan* (HPH). For the medium and long-term, the company needs to do forest rejuvenation or reforestation. Second, PT SLJ Global Tbk needs to make production innovations, namely finishing products with premium wood coatings for doors, floors, walls, ceilings, etc. Third, PT SLJ Global Tbk needs to increase investment by cooperating with investors to renovate machines and add production equipment. Fourth, PT SLJ Global Tbk

needs new markets by expanding its network or export marketing agents. Fifth, PT SLJ Global Tbk needs to analyze and evaluate more deeply about the marketing aspect, as well as its correlation with the company's production aspect.

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### REFERENCES

- Austin KG, Schwantes A, Gu Y, Kasibhatla PS. 2019. What causes deforestation in Indonesia?. *Environmental Research Letters* 14(2):1-9. <https://doi.org/10.1088/1748-9326/aaf6db>
- Ball DA, Geringer JM, Minor MS, McNett JM. 2008. *International Business: The Challenge of Global Competition*. Ed ke-12. New Jersey: The McGraw-Hill Companies, Inc.
- Banerjee A, Dolado J, Galbraith JW, Hendry DF. 1993. *Co-Integration, Error Correction, and The Econometric Analysis of Non-Stationary Data: Advanced Texts in Econometrics*. New York: Oxford University Press. <https://doi.org/10.1093/0198288107.001.0001>
- Bekteshi SA. 2020. Firm size related to export performance. *International Journal of Economics and Business Administration* 8(1):51-61. <https://doi.org/10.35808/ijeba/408>
- Buturac G, Mikulić D, Palić P. 2019. Sources of export growth and development of manufacturing industry: empirical evidence from Croatia. *Economic Research-Ekonomska Istrazivanja* 32(1):101-127. <https://doi.org/10.1080/1331677X.2018.1550003>
- Byerlee D, Rueda X. 2015. From public to private standards for tropical commodities: a century of global discourse on land governance on the forest frontier. *Forests* 6(4):1301-1324. <https://doi.org/10.3390/f6041301>
- Cao X, Yang S, Huang X, Tong J. 2018. Dynamic decomposition of factors influencing the export growth of China's wood forest products. *Sustainability (Switzerland)* 10(8):1-16. <https://doi.org/10.3390/su10082780>
- Dwiprabowo H. 2009. Kebijakan penurunan bea masuk

- impor kayu lapis ke Indonesia. *Jurnal Analisis Kebijakan Kehutanan* 6(1):1-11. <https://doi.org/10.20886/jakk.2010.7.1.1-11>
- Engle RF, Granger CWJ. 1987. Co-integration and error correction : representation, estimation, and testing. *Econometrica* 55(2):251-276. <https://doi.org/10.2307/1913236>
- Engle RF, Yoo BS. 1987. Forecasting and testing in co-integrated system. *Journal of Econometrics* 35(February 1986):143-159. [https://doi.org/10.1016/0304-4076\(87\)90085-6](https://doi.org/10.1016/0304-4076(87)90085-6)
- Firdaus M. 2018. *Aplikasi Ekonometrika untuk Data Panel dan Time Series*. Bogor: IPB Press.
- Fujii-Gambero G, Garcia-Ramos M. 2015. Revisiting the quality of exports. *Journal of Economic Structures* 4(1):1-17. <https://doi.org/10.1186/s40008-015-0029-0>
- Green JMH et al. 2019. Linking Global Drivers of Agricultural Trade to On-The-Ground Impacts on Biodiversity. Di dalam: *Proceedings of the National Academy of Sciences of the United States of America*; Valdivia, 28 Okt 2019. Stockholm: Royal Swedish Academy of Sciences. hlm 23202-23208.
- Guan Z, Sheong JKFIP. 2019. The restricting effects of forest certification on the international trade of wood products. *Journal of Sustainable Forestry* 38(8):1-18. <https://doi.org/10.1080/10549811.2019.1607756>
- Gujarati DN. 2011. *Econometrics by Example*. Hampshire: Palgrave Macmillan.
- Gujarati DN, Porter DC. 2018. *Dasar-dasar Ekonometrika*. Ed ke-5. DA Halim, editor. Jakarta: Penerbit Salemba Empat.
- Hermans-Neumann K, Gerstner K, Geijzendorffer IR, Herold M, Seppelt R, Wunder S. 2016. Why do forest products become less available? a pan-tropical comparison of drivers of forest-resource degradation. *Environmental Research Letters* 11(12):1-14. <https://doi.org/10.1088/1748-9326/11/12/125010>
- Himes A, Betts M, Messier C, Seymour R. 2022. Perspectives: thirty years of triad forestry, a critical clarification of theory and recommendations for implementation and testing. *Forest Ecology and Management* 510(February):1-9. <https://doi.org/10.1016/j.foreco.2022.120103>
- Hurmekoski E, Jonsson R, Korhonen J, Jänis J, Mäkinen M, Leskinen P, Hetemäki L. 2018. Diversification of the forest industries: role of new wood-based products. *Canadian Journal of Forest Research* 48(12):1417-1432. <https://doi.org/10.1139/cjfr-2018-0116>
- Ismail NA, Talib BA, Mokhtar A. 2019. Export analysis of major commodities in Malaysia. *IOP Conference Series: Earth and Environmental Science* 327(1):1-12. <https://doi.org/10.1088/1755-1315/327/1/012002>
- Juanda B, Junaidi. 2012. *Ekonometrika Deret Waktu: Teori & Aplikasi*. Bogor: IPB Press.
- [Kemendag] Pusat Data dan Sistem Informasi, Kementerian Perdagangan Republik Indonesia. 2022. Perkembangan ekspor nonmigas (komoditi). <https://satudata.kemendag.go.id>. [04 Juli 2022].
- Maharani P, Rudatin A. 2014. Analisis Faktor-faktor yang Mempengaruhi Ekspor Kayu Lapis Indonesia Tahun 1992-2011. Di dalam: *Prosiding Seminar Nasional: Penelitian Ekonomi, Bisnis dan Keuangan Pemberdayaan Perekonomian Nasional 2014*; Sleman, 17-18 Nov 2014. Sleman: Universitas Islam Indonesia. hlm 93-108.
- Makkarennu, Nakayasu A. 2013. Prospective Indonesian plywood in the global market. *Journal of Life Sciences and Technologies* 1(3) 190-195. <https://doi.org/10.12720/jolst.1.3.190-195>
- Marbun L. 2015. Pengaruh produksi, kurs dan gross domestic product (gdp) terhadap ekspor kayu lapis. *Economic Development Analysis Journal* 4(2):129-136.
- Mutaqin DJ, Nurhayani FO, Rahayu NH. 2022. Performa industri hutan kayu dan strategi pemulihan pascapandemi Covid-19. *Bappenas Working Papers* 5(1):48-62. <https://doi.org/10.47266/bwp.v5i1.111>
- Nambiar EKS. 2021. Strengthening Vietnam's forestry sectors and rural development: higher productivity, value, and access to fairer markets are needed to support small forest growers. *Trees, Forests and People* 3(November 2020):100052. <https://doi.org/10.1016/j.tfp.2020.100052>
- Pendrill F, Persson UM, Godar J, Kastner T, Moran D, Schmidt S, Wood R. 2019. Agricultural and forestry trade drives large share of tropical deforestation emissions. *Global Environmental Change* 56(March):1-10. <https://doi.org/10.1016/j.gloenvcha.2019.03.002>
- Pirard R, Secco LD, Warman R. 2016. Do timber plantations contribute to forest conservation?. *Environmental Science and Policy* 57:122-130. <https://doi.org/10.1016/j.envsci.2015.12.010>

- Purnomo H, Okarda B, Dermawan A, Ilham QP, Pacheco P, Nurfatriani F, Suhendang E. 2020. Reconciling oil palm economic development and environmental conservation in Indonesia: a value chain dynamic approach. *Forest Policy and Economics* 111(January):1-12. <https://doi.org/10.1016/j.forpol.2020.102089>
- Ratana DSR, Achsani NAA, Andati T. 2012. Dampak perubahan nilai tukar mata uang terhadap ekspor Indonesia. *Jurnal Manajemen & Agribisnis* 9(3):154-162.
- Rut J, Wołczański T. 2016. Improving efficiency through optimization of the production process. *Organizacja I Zarządzanie* 12:1841-1844.
- Saltarelli F, Cimini V, Tacchella A, Zaccaria A, Cristelli M. 2020. Is export a probe for domestic production?. *Frontiers in Physics* 8(June):1-11. <https://doi.org/10.3389/fphy.2020.00180>
- Siba E, Gebreyesus M. 2017. Learning to export and learning from exporting: the case of Ethiopian manufacturing. *Journal of African Economies* 26(1):1-23. <https://doi.org/10.1093/jae/ejw022>
- Song L, Wang H, Song W, Yang C. 2022. Integration level and influencing factors' analysis of forest product market based on the mathematical model. *Mathematical Problems in Engineering* 2022:1-10. <https://doi.org/10.1155/2022/9650328>
- Sultanuzzaman MR, Fan H, Mohamued EA, Hossain MI, Islam MA. 2019. Effects of export and technology on economic growth: selected emerging Asian economies. *Economic Research-Ekonomika Istrazivanja* 32(1):2515-2531. <https://doi.org/10.1080/1331677X.2019.1650656>
- Tian G, Yu W, Vu TTH, Ma G. 2021. Green assessment of imports and exports of wooden forest products based on forest processing industry: a case study of China. *Forests* 12(2):1-17. <https://doi.org/10.3390/f12020166>
- Yamamoto Y, Takeuchi K, Shinkuma T. 2014. Is there a price premium for certified wood? empirical evidence from log auction data in Japan. *Forest Policy and Economics* 38(August):168-172. <https://doi.org/10.1016/j.forpol.2013.07.002>
- Zhu S, Fu X. 2013. Drivers of export upgrading. *World Development* 51:221-233. <https://doi.org/10.1016/j.worlddev.2013.05.017>