Import demand potential for Indonesian rubber products in ASEAN countries

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Abstract

Increasing imports of rubber products from Indonesia is the key to the success of the downstream policy of rubber products to gain added value and job opportunities in the country. The rubber product market in ASEAN is more dynamic, and Indonesia must focus on strengthening competitiveness and exploiting potential markets. This paper aims to describe the potential demand for imports of Indonesian rubber products in ASEAN countries, especially Malaysia, Singapore, Thailand, the Philippines, and Vietnam. The flow of imports of rubber products uses the stochastic frontier panel data model to determine the potential demand for imports of Indonesian rubber products. Indonesian rubber products compete fiercely with similar industries in importing and exporting countries from East Asia. Indonesia mostly exports rubber products with HS codes 4015 and 4016 in the form of gloves, mittens, and mitts, rubber cellular, floor coverings and mats, erasers, gaskets and rings, boats, and fender docks to all markets in ASEAN countries. They were followed by rubber products with HS code 4010 in the form of conveyor belts or transmission belts from vulcanized rubber. The potential for import demand for other types of Indonesian rubber products (code HS4014, 4009, 4008) in ASEAN countries is relatively small and is growing slowly. Overall, the potential demand for imports of Indonesian rubber products tends to decline in ASEAN countries, as well as the actual imports of rubber products from Indonesia compared to their potential, which also declines slowly.

***Keywords**: ASEAN, Import potential, Indonesia, Rubber products*

JEL Classification: F14, L52, L65

INTRODUCTION

The natural rubber has elasticity, toughness, and resilience properties, making it an important commercial aspect of rubber processing products. Exports and domestic demand are slowly driving Indonesia's rubber product industry. Indonesia exported rubber products, especially HS codes 4008, 4009, 4010, 4014, 4015, and 4016, to various countries, reaching an average of 374 million dollars in the 2001 to 2018 period. Exports of these rubber products to ASEAN countries reached 61.19 million dollars, or 16.99 percent (UN Comtrade, 2020).

Singapore is the largest export destination country for Indonesian rubber products, with a share of 50.73 percent in the 2001 to 2018 period. Thailand followed them at 16.07 percent, Malaysia at 13.41 percent, Vietnam at 10.24 percent, and the Philippines

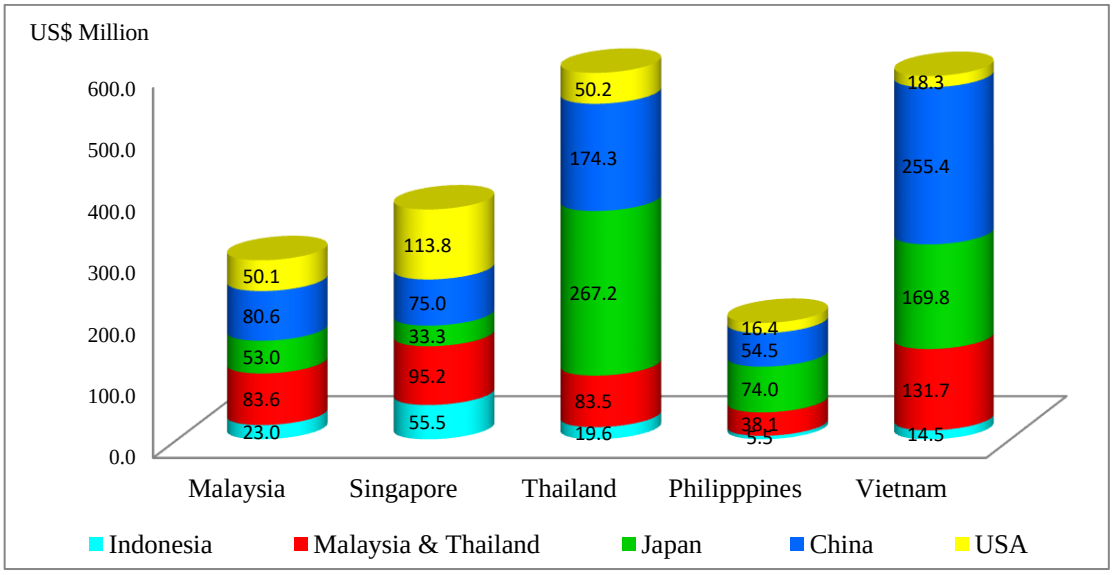
at 5.55 percent (U.N Comtrade, 2020). The rubber products demanded by the Singapore market are relatively complete, starting from the product groups with the HS4008, 4009, 4010, 4014, 4015 to 4016 codes. The export market is relatively small for Indonesian rubber products with HS4014 and 4015 codes in Thailand and the Philippines. The export market for Indonesian rubber products with the HS code 4014 is also relatively small in Malaysia and Vietnam.

The rubber products exported include HS code 4008 in the form of plates, sheets, strips, rods, and other profiles made of vulcanized rubber. Then rubber products with HS code 4009 are in the form of tubes, pipes, and hoses made of vulcanized rubber with or without the accessories, and rubber products with HS code 4010 in the form of conveyor belts or transmission belts from vulcanized rubber. Indonesia also exports rubber products with HS code 4014 (pharmaceutical rubber products) in smaller quantities than other rubber products. These rubber products are hygienic or pharmaceutical goods (including pacifiers) made of vulcanized rubber, with or without joints of hard rubber, such as hot water bottles, ice bags, rubber sheathed contraceptives, and male contraceptives.

Other processed products made of rubber that experienced a relatively weak export trend (1.73 percent) were clothing products and clothing accessories made of vulcanized rubber, including various types of gloves (gloves, mittens, and mitts) with the HS code 4015 (Articles of apparel) & clothing accessories of vulcanized rubber. Indonesia exports a relatively large number of rubber products with HS code 4016 (articles of vulcanized rubber other than hard rubber) in the form of other articles of vulcanized rubber consisting of cellular rubber, floor coverings, and rubber mats (floor coverings and mats), erasers, gaskets and rings for engine components (gaskets and rings), boats and fender piers.

Indonesia exports relatively large numbers of rubber products with HS codes 4011, 4016, and 4015, followed by HS codes 4014, 4013, 4010, 4009, and 4008. Partner countries come from ASEAN and other countries from East Asia, the European Union, and the United States. For more than two decades of developing the rubber product industry, natural rubber producing countries, including Indonesia, only rank 6 to 12 of the largest rubber products exporting countries, while the ranks 1 to 5 are occupied by China, Japan, the United States, Germany, and South Korea. Indonesian rubber products and Malaysia and Thailand compete with other major rubber product exporting countries in the world market (Zainuddin et al. 2019).

The market for rubber products from Indonesia in ASEAN countries, especially the types of rubber products with HS codes 4008, 4009, 4010, 4014, 4015, and 4016, is in tight competition with similar products from competitor countries from the ASEAN region and the East Asia region. Thailand and Malaysia are strong competitors for rubber products in ASEAN countries. Furthermore, rubber products from Indonesia and other ASEAN countries are also in tight competition with similar products from China and Japan in the ASEAN region. The imports of rubber products from Indonesia by ASEAN countries (especially Malaysia, Singapore, Thailand, Philippines, and Vietnam) only amounted to 13 to 15 percent of the total world imports of rubber products from Indonesia in the last 10 years. In 2018, the import value of rubber products from Indonesia only reached US$ 118.1 million, much lower than competing countries. In the same year, the import value of rubber products from Malaysia and Thailand in ASEAN countries reached US$ 432.1 million. Imports of the same rubber products from Japan amounted to US$ 597.3 million, and the largest import of similar rubber products came from China at US$ 639.8 million, as shown in Figure 1.



Sources: UN Comtrade (2020).

Figure 1. Import value of rubber products from Indonesia and a number of competitors in the ASEAN market (million US$).

To accelerate the downstreaming of Indonesian rubber products, it is necessary to support domestic industrial policies based on natural rubber to produce various rubber products with export promotion and import substitution strategies. Perdana (2019) stated that the development of Indonesia's downstream rubber industry requires government support, including: (1) financial sector support in financing credit to the downstream industrial sector; (2) ease of licensing services, such as business permits, land, and other permits to invite investment; and (3) implementation of trade policies that prioritize the principle of downstream. The increase in exports of Indonesian rubber products, especially to ASEAN countries, needs to be supported by increased demand, especially from the market of destination countries. The export market for rubber products is characterized by high competition between countries in the market of destination countries in dynamic market conditions. The penetration of rubber products in the market of destination countries requires a study of market dynamics. Therefore, the description of demand, especially from the market of destination countries, requires mapping the potential demand for imports of various rubber products, including demand in the markets of several ASEAN countries. This potential information can be analyzed and compared across markets in several ASEAN countries. The potential demand for Indonesian rubber products provides important information and input in policy formulation to increase and develop exports of Indonesian rubber products to countries in the ASEAN region. This article aims to describe the potential demand for imports of Indonesian rubber products (HS codes 4008, 4009, 4010, 4014, 4015, and 4016) in several ASEAN countries.

Research on the demand map for various rubber products (processed rubber) in the ASEAN market is rarely found, even though the rubber product market is growing significantly in ASEAN countries, especially Singapore, Malaysia, Thailand, Vietnam, and the Philippines. The demand for various types of rubber products in the country is driven by the increase in the automotive industry, home appliances, electrical appliances, medical equipment, parts of the infrastructure, and manufacturing equipment. Fulfillment of demand for rubber products is imported from Indonesia and other ASEAN countries, China, Japan, South Korea, and the European Union. Various countries, including ASEAN countries, import various types of Indonesian rubber

products and occupy an important position after tire products. Although Indonesia's rubber products (processed rubber) are not a big country in world trade, the results of this study contribute to the description of the mapping of demand for Indonesian rubber products in many ASEAN countries as an effort to strengthen rubber product export promotion strategies to support the acceleration of natural rubber downstream.

A country will import goods from other countries which, if produced by themselves, will consume higher resources. Exports of commodities from a certain country to another country are the difference between domestic supply and domestic demand, referred to as excess supply, and the excess is import demand for other countries (Fajrin et al. 2015). Imports are carried out as an alternative policy to meeting domestic demand for goods if the domestic production of these goods is inadequate (Pasaribu & Daulay, 2013).

In general, imports bring goods from abroad into the country through trade. The state will increase its welfare by importing high-quality goods and services at lower prices than if they were produced domestically. The reason for importing is the gap between domestic demand and production for a particular product, where domestic production has not been able to meet domestic needs. Amir (2004) states that one of the objectives of importing is to meet the community's needs by bringing in goods that are not yet available domestically from abroad. Reuvid & Sherlock (2011) then argue that there are two methods of controlling imports: import quotas and import duties (tariffs). Import quotas impose limits on the quantity or value of goods that can be imported into the country during a specified period, while importing import duties are intended to reduce demand for commodities by increasing prices to the end-user (consumer). Countries or consumers of an importing country are more prosperous if they buy goods whose price is lower than their willingness to pay (the ability to pay for a product). The greater the difference between the price and the willingness to pay, the more prosperous the country or the consumers of a country are (Sunaryo, 2001).

A country's import demand is the difference between domestic consumption minus domestic production and stock at the end of last year. The import function of a country is also influenced by factors from abroad, namely the exchange rate and import prices. In addition, other factors influence import demand, namely the income of importing countries, population, trade policies, changes in previous stocks, etc.

The function of import demand for rubber products from Indonesia in importing countries can be derived using the neo-classical approach. From the point of view of country j as an importer of rubber products from Indonesia or country k (a competitor), it is faced with an upward sloping residual rubber supply curve from the exporting country of Indonesia or country k. The curve of the residual supply of rubber products from the exporting country of Indonesia to country j (RS_{idn}^{j}) is the same as the domestic supply in Indonesia (S_{idn}^{DOM}), minus domestic demand in Indonesia (D_{idn}^{DOM}), minus exports to other countries not j (XPT_{idn}^{OTH}), minus changes in stock in Indonesia (ΔSTK_{idn}^{DOM}) . Importers of rubber products in country j are faced with a residual supply curve (RS_{idn}^{j}) to maximize profits from importing rubber products from Indonesia by equating marginal revenue (MR^{j}) with marginal costs (MC^{j}) so that the quantity of rubber products imported from Indonesia is $Q_{idn}^{j.IMP}$.

Importers of rubber products in country j import ($Q_{idn}^{j.IMP}$) from exporters of rubber products from Indonesia by maximizing the following profits:

$$\text{Max} \quad \pi_j^{idn} = \frac{P^j}{ER^j} Q_{idn}^{j.IMP} - \{(1+t)P_{idn}^{j.IMP}\left(Q_{idn}^{j.IMP}\right) + C_j^{OLH} + C_j^{TRS}\}Q_{idn}^{j.IMP} \quad \text{..... (1)}$$

P^j is the price of rubber products in the domestic market of country j, ER^j is the exchange rate of country j, t is the import tariff for rubber products (ad valorem) in country j. C_j^{TRS} is the transaction cost that is borne by importers of rubber products from Indonesia, and C_j^{OLH} is the cost of distribution of rubber products in country j. Differential equation (1) to the quantity of imported rubber products by country j and simplified results in equation (2).

$$\frac{\partial \pi_j^{idn}}{\partial Q_{idn}^{j.IMP}} = \frac{P^j}{ER^j} - (1+t)\frac{\partial P_{idn}^{j.IMP}}{\partial Q_{idn}^{j.IMP}} * Q_{idn}^{j.IMP} - (1+t)P_{idn}^{j.IMP} - C_j^{OLH} - C_j^{TRS} = 0$$

$$\frac{\frac{P^j}{ER^j} - C_j^{OLH} - C_j^{TRS} - (1+t)P_{idn}^{j.IMP}}{(1+t)P_{idn}^{j.IMP}} = \frac{\partial P_{idn}^{j.IMP}}{\partial Q_{idn}^{j.IMP}} * \frac{Q_{idn}^{j.IMP}}{P_{idn}^{j.IMP}} \quad \text{..... (2)}$$

The left side of equation (2) is similar to Lerner's Index LI = (P-MC)/P. In this case it is defined $\left\{\frac{P^j}{ER^j} - C_j^{OLH} - C_j^{TRS} - (1+t)P_{idn}^{j.IMP}\right\}/(1+t)P_{idn}^{j.IMP}$ The Adjusted Lerner Index can be used to measure the monopsony market power of importers as importers of rubber products in country j (Knetter, 1993; Glauben & Loy, 2003). The relationship between the import price of rubber products from Indonesia ($P_{idn}^{j.IMP}$) in country j with the price of rubber products in the domestic market of country j (P^j) are:

$$P^j = \left\{\left(\frac{\partial P_{idn}^{j.IMP}}{\partial Q_{idn}^{j.IMP}} * \frac{Q_{idn}^{j.IMP}}{P_{idn}^{j.IMP}} + 1\right)(1+t)P_{idn}^{j.IMP} + C_j^{OLH} + C_j^{TRS}\right\} ER^j \quad \text{..... (3)}$$

Assuming that there is one unit of distribution costs and transaction costs for each importer of rubber products in country j as a constant ratio, it can be written as: $\mu_1 = C_j^{OLH}/P_{idn}^{j.IMP}$ and $\mu_2 = C_j^{TRS}/P_{idn}^{j.IMP}$ also, the flexibility of import prices is abbreviated = $\theta_{idn}^{j.IMP} = \frac{\partial P_{idn}^{j.IMP}}{\partial Q_{idn}^{j.IMP}} * \frac{Q_{idn}^{j.IMP}}{P_{idn}^{j.IMP}}$, so that equation (3) can be simplified into equation (4) with regard to $\emptyset^j = \left\{\left(\theta_{idn}^{j.IMP} + 1\right)(1+t) + \mu_1 + \mu_2\right\} ER^j$.

$$P^j = \left\{\left(\theta_{idn}^{j.IMP} + 1\right)(1+t) + \mu_1 + \mu_2\right\} ER^j * P_{idn}^{j.IMP}$$

$$P^j = \emptyset^j * P_{idn}^{j.IMP} \quad \text{..... (4)}$$

Derivation of the model from exporting and importing rubber products can be reconcepted into a model of demand for country j reverse residual rubber products as in equation (5).

$$RD_j^{idn} = D_j^{DOM} - \left(S_j^{DOM} + IMP_j^{OTH} + \Delta STK_j^{DOM}\right) \quad \text{..... (5)}$$

Furthermore, domestic demand and supply of rubber products in country j are conceptualized as equations (6) and (7).

$$D_j^{DOM} = D_j^{DOM}(P^j; Z_j^D) \quad \text{..... (6)}$$

$$S_j^{DOM} = S_j^{DOM}(P^j; Z_j^S) \quad \text{..... (7)}$$

where Z_j^D and Z_j^S is the shifting vector of demand and supply of rubber products in country j. Substituting (6) and (7) into equation (5) results in a demand for residual rubber products for importing country j from Indonesia (RD_j^{idn}) as in equation (8).

$$RD_j^{idn} = RD\left(P^j, Z_j^D, Z_j^S, IMP_j^{OTH}, \Delta STK_j^{DOM}\right) \quad \text{..... (8)}$$

The total demand for imports of rubber products in country j from Indonesia is a function of the producer prices for rubber products in country *j*, various shifts in demand and supply of rubber products in country *j*, imports of rubber products from country *j* from non-Indonesian countries, and the stock of rubber products in country *j*.

Refer to Kalijaran & Findlay (2005) that the trade flow model between countries can be integrated with the stochastic frontier production function model to produce a demand import model in the form of a stochastic frontier as in equation (9):

$$lnX_{ijt} = lnf\left(Y_{ijt}, \beta\right)exp^{v_{ijt}-u_{ijt}} \quad \text{..... (9)}$$

X_{ijt} is the actual export from country i to country *j*, $f\left(Y_{ijt}, \beta\right)$ is a function that determines the export potential, β is a parameter, and the double-sided error term (v_{ijt}) is assumed to be normally distributed with a mean of zero and variance (σ_v^2). If the value u_{ijt} is equal to zero, then the potential export of a product from country *i* to country *j* is obtained.

Battese & Coelli (1988) and Linh et al. (2019) describe the comparison between actual exports and maximum exports when minimum barriers are said to be trade efficiency (exports). Parallel to this concept, the comparison between actual imports and maximum imports in conditions with minimal obstacles is said to be trade efficiency (imports). Armstrong (2008) also explains that the potential for exports (imports) is identical to the acquisition of exports (imports) when the resistance is lowest in trading at certain exchange rates, transportation, and institutional conditions. Furthermore, the econometric approach has been used to estimate the trade flow model between countries and calculate trade potential as Viorica (2015), Kumar & Prabhakar (2017), and Egger (2002). Import potential as the maximum import value (the most open trade conditions) of a product by country *j* from country *i* in year t is determined as in equation (10).

$$Import\ Potential_{ijt} = \left(Import\ Actual^{ijt} / Import\ Efficiency^{ijt}\right) \quad \text{..... (10)}$$

METHODS

Data and variables

This study focuses on the flow of imports of various rubber products from Indonesia to various countries in ASEAN. Types of rubber products are products with HS codes 4008, 4009, 4010, 4014, 4015, and 4016. The data is panel data for five countries importing rubber products from Indonesia from 2009 to 2019. Descriptions for all variables used are listed in Table 1.

Table 1. The description of variables

Variables	Definition	Source
LnXIDNRP	The value of imports of rubber products from Indonesia in the ASEAN market.	UN Comtrade
LnRGDPIDN	The real gross domestic product of Indonesia.	IMF World Economic Outlook Database
LnRGDPC	The real gross domestic product of the export destination country	IMF World Economic Outlook Database
LnDISTANCE	Geographical distance	Center for Prospective Studies and International Information (CEPII)
LnPOPIDN	Indonesian population	The World Bank
LnPOPC	The population of the export destination country	The World Bank
LnREALEXCHC	The real exchange rate of domestic currency to the US dollar in the export destination country	The IMF – International Financial Statistics
TRADEFREE	Trade freedom	The Heritage

The specification of the econometric model

Data analysis uses an econometric model approach, in particular using frontier stochastic analysis to calculate the technical efficiency of imports of rubber products from Indonesia in ASEAN importing countries.

The trade volume between two countries depends directly on the size of their economies and inversely on the distance between them. Economic size represents export supply and import demand (Zheng et al., 2017; Liu et al., 2018). Geographic distances to show transportation costs include time costs, psychic distances, information and research costs, and economic horizons (Linnemann, 1966; Limão & Venables, 2001; Heo & Doanh, 2015). The trade volume between two countries also depends on trade barriers and exchange rates. The impact of trade barriers, as measured by freedom of trade, on trade volume has been frequently cited in the international trade literature. Tariff and non-tariff barriers limit bilateral trade flows because they cause a decrease in the quantity and an increase in the price of imported goods (Khorana & Narayanan, 2017; Cheong et al., 2018). Bilateral trade barriers prevent a country from reaching its potential trade volume.

The import demand for rubber products from Indonesia in ASEAN countries (Malaysia, Singapore, Thailand, Philippines, and Vietnam) uses a model of import demand, which is approached in the form of a stochastic frontier data panel (sfpanel) model. Through this model, the achievement of efficiency and potential demand for imports of Indonesian rubber products is calculated in trade with five countries in the ASEAN region. The import demand model of rubber products in the form of a stochastic frontier using panel data is written as follows:

$$\begin{aligned}\ln\mathrm{XIDNRP}_{ij,t} = {} & \beta_0 + \beta_1 \ln\left(\mathrm{RGDPIDN}_{i,t} \times \mathrm{RGDPC}_{j,t}\right) + \beta_2 \ln\mathrm{DISTANCE}_{ij} \\ & + \beta_3 \ln\left(\mathrm{POPIDN}_{i,t} \times \mathrm{POPC}_{j,t}\right) + \beta_4 \ln\mathrm{REALEXCHC}_{ij,t} \\ & + \beta_5 \mathrm{TRADEFREE}_{ij,t} + \left(v_{ij,t} - u_{ij,t}\right)\end{aligned}$$

The import efficiency of rubber products is equivalent to the ratio of the country's actual import of rubber products from Indonesia in a given year t to the corresponding imports when $u_{ij,t}$ is zero. Thus, the import efficiency of rubber products by importing country can be calculated as follows:

$$\text{Import Demand Potential}_{ijt} = \frac{\ln f\left(Y_{ijt}, \beta\right)\exp(v_{ij,t} - u_{ij,t})}{\ln f\left(Y_{ijt}, \beta\right)\exp(v_{ij,t})} = \exp(-u_{ij,t})$$

The model for import demand for rubber products from Indonesia in ASEAN countries (Malaysia, Singapore, Thailand, Philippines, Vietnam) is estimated using STATA 14 version. The estimation results are evaluated according to statistical criteria to obtain a feasible model to estimate the potential demand for imported rubber products from Indonesia.

RESULTS AND DISCUSSION

As in Table 2, descriptive statistics provide an overview of the data seen from the average value (mean), standard deviation, maximum, minimum, and normality. N or the number of data for each valid variable is 50. The import value of rubber products from

Table 2. Descriptive statistics

Variable	N	Mean	Std Dev	Min	Max	Jarque-Bera
XIDNRP	50	13963.58	10484.11	2247.43	46755.98	5.64 (0.06)
RGDPIDN	50	725816.80	80821.31	567350.90	847664.60	0.88 (0.64)
RGDPC	50	258182.10	84088.44	114210.60	450234.80	0.62 (0,73)
DISTANCE	50	2029.80	860.67	885.00	3008.00	4.83 (0.08)
POPIDN	50	254000000	9432242	239000000	268000000	3.33 (0.18)
POPC	50	58830774	36539224	4987573	107000000	5.31 (0.07)
REALEXCHC	50	3461.20	6971.12	1.1862	19332.33	4.43 (0.11)
TRADEFREE	50	80.01	6.26	63.40	90.00	0.22 (0.89)

Indonesia (HS codes 4008, 4009, 4010, 4013, 4014, 4015, and 4016) in the ASEAN countries market with a median value of USD13963.58 with the range between USD2247.43 to USD46755.98. The mean value of each variable is greater than the standard deviation, or the deviation from the datum of the variable indicates good results for all variables. Data distribution on all variables showed normal distribution according to Jarque-Bera statistics. This shows that the data distribution on each variable is not so different from the standard normal distribution.

Panel unit root test result

The panel unit roots test was used to test the stationarity of the data, as shown in Table 3. Non-stationary panel data can cause false regression where the R-squared value is too high, but the variable is insignificant. If the unit roots are in a data set at the level, then the data set in the first difference changes to stationary. If the data is stationary at the level denoted as I(0) or only stationary after the first difference, it is denoted as I(1). The unit-roots panel test in this study was carried out by Levin et al. (2002), and Breitung (2000) used EViews.

Table 3. The results of the unit root tests

Variables	Test Statistics			
	Levin, Lin & Chu		Breitung	
	Level	1st diff	Level	1st diff
XIDNRP	-1.7741**	-5.5011***	-2.0060**	-3.0487***
RGDPC	-4.2273***	-2.4749***	-1.5262**	-3.3427***
RGDPIDN	-1.7428**	-3.3974***	-5.1441***	0.4085
POPC	-6.6487***	-9.0445***	2.8023	2.1635
POPIDN	-4.9874***	-8.9897***	-4.0355***	-8.6203***
DISTANCE	-3.4552***	-2.3553**	0.6474	0.1338
REALEXCH	-2.6131***	-7.4842***	0.7271	-6.0177***

Note: Asterisks (***), (**) and (*) denote the statistical significance at the 1%, 5% and 10% levels, respectively.

The results of the unit-roots panel test for all data series show the trend of stationary data at the level. However, the results of the Breitung test show that only some of the data series are still not stationary at level, and it can be concluded that all data series are stationary at level I(0). After all the panel data used in this study showed stationary at level I(0), the stationary data was used to estimate the demand for imports of rubber products from Indonesia in ASEAN countries (Malaysia, Singapore, Thailand, Philippines, and Vietnam).

Panel cointegration test result

Panel cointegration tests are meant to test the cointegration between variables in the model. Kao (1999) and Pedroni (2004) extended the Engle-Granger framework to panel data tests. Kao (1999) tested for cointegration in a homogeneous panel, and the test statistic was calculated by pooling all the residuals of all cross-sections in the panel. It was assumed that all the cointegrating vectors in every cross-section were identical. Pedroni (2004) proposed several tests for cointegration which allowed considerable heterogeneity. Seven cointegration statistics were proposed, which could be classified into 2 categories to capture within and between effects. Table 4 demonstrates the panel cointegration test results of Pedroni (2004) and Kao (1999). Pedroni test results indicate that, out of the seven statistics, there are four statistically significant statistics at $\alpha = 0.01$ and $\alpha = 0.05$ levels, namely the panel PP-statistics, panel ADF-statistics, group PP-statistics, and group ADF-statistics. Kao test result also suggests that the null hypothesis can be rejected at $\alpha = 0.05$ level. Therefore, there is sufficient evidence of the presence of a cointegration relationship between variables in the model.

Table 4. The result of panel cointegration tests

	Pedroni Test	Kao Test	
Panel v-Statistic	-2.6240	ADF	-2.2104**
Panel rho-Statistic	2.3528		
Panel PP-Statistic	-9.9706***		
Panel ADF-Statistic	-1.8854**		
Group rho-Statistic	2.9208		
Group PP-Statistic	-11.8173***		
Group ADF-Statistic	-2.9615***		

Note: Asterisks (***), (**) and (*) denote the statistical significance at the 1%, 5% and 10% levels, respectively.

Estimation of stochastic frontier panel data (sfpanel) model

Demand for imports of rubber products from Indonesia in ASEAN countries is approached by using the stochastic frontier panel data (sfpanel) model. The model is estimated using STATA. The results of the estimated demand for imported rubber products from Indonesia are presented in Table 5. The estimation results of the demand model for imports of rubber products from Indonesia in ASEAN countries show that all coefficients are statistically significant at 1 to 5 percent. The multiplication variable of Indonesia's real GDP with the real GDP of the importing country (LnRGDPIDN*LnRGDPC) shows a positive sign and is significant up to 1 percent. These results are consistent with other studies such as Linh et al. (2019) and Evelyn and Chandran (2019). The variable multiplication of the Indonesian population with the population of the importing country in the previous year (lagLnPOPIDN*LnPOPC) is positive and significant up to 5 percent. These results are consistent with other studies such as Evelyn & Chandran (2019) and Deluna & Edgardo (2014).

Furthermore, the bilateral distance negatively responded to the demand for imports of rubber products from Indonesia in ASEAN countries, thereby reducing trade between the two countries. This variable is a proxy for transportation and other trade costs, such as communication and transaction costs, as well as other costs (Arvis et al. 2012). So the farther the distance, the higher the trade cost. The estimation results align with Memduh et al. (2017) and Deluna & Edgardo (2014). It implies that even with more modern transportation, the distance/cost of trade in various forms still greatly

affects trade between countries. For example, distance can reflect logistical difficulties. It is related to the study conducted by Djankov et al. (2010) revealed that every additional day to move goods from warehouse to ship reduces trade by at least 1%, or equivalent to increasing the distance of 85 km from a country from its trading partners.

Table 5. The Estimated Sfpanel Model of import demand for Indonesian rubber products in the market ASEAN countries.

Variables	Coefficient	Standad error
Constant	17.6567	8.6016**
ln(RGDPIDN x RGDPC)	1.0829	0.1589***
LnDISTANCE	-5.6311	0.9471***
lag(ln(POPIDN x POPC))	0.0075	0.0035**
lnREALEXCHC	0.7654	0.1501***
TRADEFREE	0.0225	0.0108**
Number of obs 49		
Number of groups 5		
Wald chi2(9) 113.28 and Prob > chi2 = 0.0000		
Log likelihood -3.4014774		

Note: Asterisks (***), (**) and (*) denote the statistical significance at the 1%, 5% and 10% levels, respectively.

The real exchange rate of the importing country's currency against the USDollar (LnREALEXCHC) gave a positive and significant response of up to 1 percent. This implies that the increase in the real exchange rate of the importing country's currency against the USDollar increases the demand for imports of rubber products from Indonesia in ASEAN countries. The variable freedom of trade (TRADEFREE) between Indonesia and importing countries in ASEAN has a positive and significant effect of up to 5 percent. This positive influence is in line with Hai & Thang (2017), who explains that ASEAN free trade will improve trade efficiency. The estimation results also align with Niroomand et al. (2014), who state that openness or freedom of trade positively influences trade flows between countries.

The efficiency and potential of import demand for Indonesian rubber products

Based on the estimation results of the model in the form of stochastic frontier panel data (sfpanel), it can be calculated the level of technical efficiency of demand for imports of rubber products from Indonesia in ASEAN countries (Malaysia, Singapore, Thailand, Philippines, Vietnam) as shown in Table 6.

Table 6. The efficiency of import demand for Indonesian rubber products

Import country	The efficiency of import demand for rubber products from Indonesia in ASEAN countries								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
Malaysia	0.83	0.82	0.86	0.83	0.79	0.80	0.80	0.81	0.80
Singapore	0.89	0.87	0.85	0.85	0.85	0.84	0.83	0.83	0.82
Thailand	0.95	0.98	1.00	0.99	1.00	0.99	1.00	0.99	0.99
Philippines	0.96	0.94	0.96	0.98	1.00	1.00	1.00	1.00	0.98
Vietnam	0.78	0.83	0.77	0.79	0.76	0.77	0.74	0.71	0.73
Average	0.88	0.89	0.89	0.89	0.88	0.88	0.87	0.87	0.86

The technical efficiency of import demand it shows an upward trend in Malaysia and Thailand and tends to be stable in Singapore. Furthermore, the technical efficiency of demand for imported rubber products from Indonesia shows fluctuations in the Philippines and Vietnam in the 2010 to 2018 data. In general, the technical efficiency of

demand for imported rubber products from Indonesia in ASEAN countries tends to increase but decreases at the end of the period.

The results of the calculation of the technical efficiency of demand for imported rubber products from Indonesia, as shown in Table 5, are used to calculate the estimated potential demand for imports of rubber products from Indonesia (HS codes 4008, 4009, 4010, 4014, 4015, 4016) in ASEAN countries in the data period analysis. The approach used is as equation (10) before. The estimation results of potential demand for imported rubber products from Indonesia in ASEAN countries are presented in Table 7.

Table 7. The potential import demand for Indonesian rubber products in ASEAN countries

Year	Potential of import demand for Indonesian rubber products (US$ thousand)						Actual imports
	Malaysia	Singapore	Thailand	Philippines	Vietnam	Total	(%)
2010	13629	52261	8595	3048	11471	89003	87.99
2011	13824	47290	12929	3024	20407	97476	87.44
2012	21831	37237	16084	3579	12781	91511	87.51
2013	14926	37590	13780	4095	14765	85156	87.01
2014	9869	33783	13786	4379	10452	72269	87.08
2015	10707	28518	12136	4028	11798	67188	86.30
2016	10827	29792	14661	5153	9646	70080	86.67
2017	13832	31260	18052	7091	7527	77762	87.53
2018	14002	31015	19142	5177	8740	78076	86.24

The potential for total import demand for rubber products from Indonesia (HS codes 4008, 4009, 4010, 4013, 4014, 4015, 4016) in ASEAN countries (Malaysia, Singapore, Thailand, Philippines, Vietnam) in the period 2010 to 2018 shows a strong trend decreased. The decline in potential demand for imports of Indonesian rubber products occurred in all importing countries in ASEAN countries except for the markets of Thailand and the Philippines. Meanwhile, the Malaysian market showed stagnant conditions. Factors causing the potential decline may be related to the growth of similar rubber product industries in importing countries in the last 10 years or the decline in the competitiveness of Indonesian rubber products compared to similar products from major competitors such as China, South Korea, Japan, and European countries. However, rubber products from Indonesia have faced a potential decline in import demand in the markets of ASEAN countries in the last 10 years, as evidenced by the potential demand of USD89003 thousand at the beginning of the period and decreased to USD78076 thousand at the end of the period. The potential demand for imports of Indonesian rubber products tends to decline, as well as the actual imports of rubber products from Indonesia compared to their potential, which also declines slowly.

The competitiveness of various Indonesian rubber products in the markets of ASEAN countries is closely related to the competitive environment between Indonesia and ASEAN countries and East Asian countries. Regulations for eliminating regional market barriers, such as the ASEAN-China Free Trade Area Agreement (ACFTA) have had a negative impact, namely the suppression of Indonesian rubber products in the regional markets of ASEAN countries.

Aslam (2018) analyzed the impact of ACFTA on the Indonesian manufacturing sector. Indonesia-China trade is a primary commodity-finished product relationship; namely, Indonesia produces and exports primary commodities to China and imports manufactured goods from China. Indonesia has strong competitiveness in industries included in the primary sector, while China has strong competitiveness in manufacturing finished products. The performance of China's manufacturing industry is

in the form of increased exports which dominate the ASEAN and Indonesia's regional commodity markets. ACFTA has had a negative impact on the performance of the manufacturing sector and Indonesian manufacturing companies. Therefore, this paper supports the argument that ACFTA has to some extent, reduced the competitiveness of Indonesian goods in the ASEAN regional and domestic markets. Nasrudin et al. (2015) concluded that the performance of the agricultural sector is predicted to be under pressure when ACFTA is fully implemented. This is due to competitive pressures and the rigidity of domestic producers. Competitive pressure comes from fellow ASEAN countries, especially Thailand, Malaysia, and Vietnam, because of the similarity of products for the agricultural product category and from China for the manufacturing industry product category.

Meanwhile, the rigidity of domestic producers occurs because production capacity has not been able to respond to demand due to low technology and innovation as well as inefficiencies related to the small scale of business and weak logistics and distribution systems. For ACFTA to positively impact the Indonesian agricultural sector, the government should allocate a large portion of capital expenditures to increase productivity and efficiency, particularly for developing innovation, research, application, and technology. Product diversification must be increased through processing and unique and attractive packaging. Packaging is physical packaging, marketing techniques, and planting a branded or good image of Indonesian agricultural products.

The development of potential demand for Indonesian rubber products in Malaysia, Singapore, and Vietnam markets is more difficult to achieve because the competitiveness of the rubber industry in these countries is also growing fast enough to meet the demands of the domestic market. So that the potential demand for Indonesian rubber products has decreased in recent years. The rubber industry in Malaysia has been able to produce and export various types of rubber products such as gloves, rubber products for household use, industrial rubber made of rubber, and rubber products for health. The Thai rubber industry has also followed the same capability.

Makano (2019) states that the rubber industry in Malaysia and Thailand benefits from state involvement. In Malaysia, the state plays a role in developing high-quality R&D for all segments of the rubber industry. The rubber industry development policy is an integral part of the rural development strategy for the advancement of the Malay economy. Ethnically oriented affirmative action is incorporated into improving the rubber industry. In the downstream segment of the rubber industry in Malaysia, the private sector plays an important role in developing globally competitive products. Local ethnic Chinese entrepreneurs in Malaysia carved out a very lucrative niche in manufacturing gloves as one of the processed rubber products. They created their own approach to technology and management improvement and combined catch-up strategies with bottom-up strategies.

Thailand has become the world's top producer and exporter of natural rubber by taking advantage of the expanding demand for tires and industrial goods from China's rubber. The great demand for natural rubber has prompted local rubber companies to concentrate on the upstream segment. Thailand finds it difficult to advance the rubber processing industry in the midstream and downstream segments, so Thailand remains a follower of foreign rubber processing industries. However, the downstream segment of Thailand's rubber industry could be transformed by young, emerging entrepreneurs who appear to be imitating Chinese-Malaysian glove manufacturers.

The potential demand for rubber products from Indonesia and similar products from ASEAN countries is under great pressure from similar products from China,

Japan, and South Korea. The rubber industry in East Asian countries has technological and management advantages so that it is more competitive in the markets of ASEAN countries. The solution for Indonesia and ASEAN countries to strengthen the production base and regional market for rubber products is to upgrade technology and improve management so that the rubber products produced are highly competitive in the regional market. Furthermore, Makano (2019) added that the economic prospects of a resource-rich country in developing the rubber industry. In developing the potential of the rubber industry, it is necessary to choose options to seek technological improvements and better management in resource-based industries, such as the example of glove manufacturing in Malaysia and natural rubber production and processing in Thailand. The rubber industry will likely succeed with a combined public and private R&D strategy, dynamic entrepreneurship, and public-private relations. The rubber industry must innovatively respond to changes in the structure and direction of global demand for natural rubber and rubber-based manufactured goods. The result is how resource-rich developing countries can combine resource advantages with technological improvements and create "niches" such as new products, services, quality, and markets.

CONCLUSIONS AND RECOMMENDATION

Conclusions

This study used stochastic frontier analysis to estimate Indonesia's potential rubber product exports to the ASEAN countries. In addition, a panel data approach was used to analyze the determinant of the estimated potential of demand import for rubber products in Indonesia. Generally, potential rubber products exports of Indonesia to the ASEAN countries have not been high and are on a downward trend from 2010 to 2018 period. The countries with the highest potential for Indonesia's rubber products exports are Singapore, Thailand, and Malaysia, followed by Vietnam and the Philippines. In terms of value, it is possible to increase rubber product's export value to these markets, such as Thailand, Vietnam, and the Philippines, by 15-25 percent. Meanwhile, Malaysia and Singapore have smaller opportunities to increase exports.

Indonesian rubber products compete highly with similar industries in importing countries, and the increasing competition for rubber products from big competitors such as China, Japan, and South Korea. Indonesia mostly exports rubber products with HS codes 4015 and 4016 in the form of gloves, mittens, and mitts, rubber cellular, floor coverings and mats, erasers, gaskets and rings, boats, and fenders docks to all markets in ASEAN countries. Then followed by rubber products code HS 4010 in the form of conveyor belts or transmission belts from vulcanized rubber. The potential for import demand for other types of Indonesian rubber products (code HS4014, 4009, 4008) in ASEAN countries is relatively small and is growing slowly. Potential demand for imported rubber products (HS code 4008, 4009, 4010, 4014, 4015, 4016) by ASEAN countries (Malaysia, Singapore, Thailand, Philippines, Vietnam) in the period 2010 to 2018 shows a downward trend. However, the actual exports of various rubber products from Indonesia are getting closer to their overall potential.

Recommendation

The Indonesian rubber processing industry, especially rubber product manufacturing (HS codes 4008, 4009, 4010, 4014, 4015, 4016) must strengthen product competitiveness to encourage an increase in market share for various rubber products from Indonesia in ASEAN countries. The competitiveness of rubber products in question can be in the form of a more attractive design, reliability due to better quality,

ease of use, easy supply flow, and competitive prices with similar products. The Indonesian rubber product manufacturing industry should strengthen its research and product development division to encourage innovation in winning the tight rubber product market in ASEAN countries. The development of the research and development division is very important to accelerate continuous innovation of rubber products, especially products with HS codes 4008, 4009 and 4010. The three groups of rubber products are faced with stiff competition from similar products from China, Japan, and South Korea.

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REFERENCES

Amir, A. (2004). *Strategi Memasuki Pasar Ekspor*. Jakarta: Lembaga Manajemen PPM dan Penerbit PPM

Armstrong, S. (2008). *Asian Trade Structures and Trade Potential: An initial analysis of South and East Asian Trade*. Paper presented at the Conference on the Micro-Economic Foundation of Economic Policy Performance in Asia, 3-4 April, New Delhi.

Arvis, J. F., Yann, D. Shepherd, B. & Chorthip, U. (2012). *Trade Costs in the Developing World: 1995 – 2010. Asia-Pacific Research and Training Network on Trade*. ARTNeT Working Paper Series. No. 121/December 2012, Bangkok, ESCAP. Available at www.artnetontrade.org.

Aslam, M. (2018). ASEAN China FTA and the impact on Indonesia manufacturing industry. *Jati-Journal of Southeast Asian Studies*, 23(1), 13-46

Battese, G. E. & Coelli, T. J. (1988). Prediction of firm-level technical efficiencies with a generalized frontier production function and panel data. *Journal of Econometrics*, 38(3), 387-399.

Bergstrand, J.H. (1985). The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence. R*eview of Economics and Statistics*, 67(3), 474-481.

Breitung, J. (2000). *The Local Power of Some Unit Root Tests for Panel Data*, in: B. Baltagi (ed.), Nonstationary Panels, Panel Cointegration, and Dynamic Panels, Advances in Econometrics, Amsterdam, 15, 161-178.

Cheong, J., Kwak, D. W., & Tang, K. K. (2018). The trade effects of tariffs and non-tariff changes of preferential trade agreements. *Economic Modelling*, 70, 370-382. doi:10.1016/j.econmod.2017.08.011.

Drysdale., P. D., Y. Huang., & Kalirajan, K. (2000). *China's Trade Efficiency: Measurement and Determinants*, in P. Drysdale, Y. Zhang and L. Song (eds) APEC and Liberalisation of the Chinese economy, Canberra, Asia Pacific Press.

Djankov, S., F. Caroline and Cong, S.P. (2010). Trading on time. *The Review of Economics and Statistics*, 92(1), 166-173.

Deluna, R.J., and Edgardo, C. (2014). Philippine Export Efficiency and Potential: An Application of Stochastic Frontier Gravity Model. MPRA Paper No. 53580, posted 10 Feb 2014 UTC. Online at https://mpra.ub.uni-muenchen.de/53580/

Egger, P. (2002). An econometric view on the estimation of gravity models and the calculation of trade potentials. *The World Economy*, 25(2), 297-312. doi:10.1111/1467-9701.00432

Evelyn S. D & Chandran. V.G.R. (2019). Unlocking the Trade Potential in China-ASEAN Relations. *Journal of Southeast Asian Economies,* 36(3), 380–99.

Fajrin, A., Hartono, S., & Waluyati, L.R. (2015). Permintaan Gula Rafinasi pada Industri Makanan Minuman dan Farmasi di Indonesia. *Agro Ekonomi*, 26(2), 150-158. doi:10.22146/agroekonomi.17267

Glauben, T., Loy, J. P. (2002). Pricing-to-market versus residual demand elacticity analysis of imperfect competition in food exports: Evidence from Germany. *Journal of Agricultural & Food Industrial Organization,* 1(1), 1-21

Heo, Y., & Doanh, N. K. (2015). Trade flows and IPR protection: a dynamic analysis of the experience of ASEAN-6 Countries. *Asian International Studies Review*, 16(1), 59-74. doi:10.16934/isr.16.1.201506.59.

Hai, N. T. H, and Thang, D.N. (2017). The ASEAN Free Trade Agreement and Vietnam's Trade Efficiency. *Asian Social Science*, 13(4), 192-200.

International Trade Centre. (2018). Export potential map. Retrieved, December 8, 2018, from http://www.itc.org/

Knetter, M. M. (1993). International comparisons of pricing-to-market behavior. *American Economic Review*, 83(3), 473–486

Kalirajan., K. & Findlay, C. (2005). *Estimating Potential Trade Using Gravity Models: A Suggested Methodology*, GRIPS-FASID Joint Graduate Programme, Tokyo, Japan.

Khorana, S., & Narayanan, B. G. (2017). Modelling effects of tariff liberalisation on India's key export sectors: analysis of the EU–India Free Trade Agreement. Margin: *The Journal of Applied Economic Research*, 11(1), 1-22. doi:10.1177/0973801016676016.

Kumar, S., & Prabhakar, P. (2017). India's trade potential and free trade agreements: a stochastic frontier gravity approach. *Global Economy Journal*, 17(1), 1-19. doi:10.1515/gej-2016- 0074

Linnemann, H. (1966). *An Econometric Study of International Trade Flows*. Amsterdam: North-Holland Publishing Company.

Limão, N., & Venables, A. J. (2001). Infrastructure, geographical disadvantage, transport costs, and trade. *The World Bank Economic Review*, 15(3), 451-479. doi:10.1093/wber/15.3.451.

Levin, A, Lin, C. F & Chu, C. S. J (2002). Unit root tests in panel data: Asymptotic and finite sample properties. *Journal of Econometrics*, 108, 1-24.

Lairson, T.D. & Skidmore, D. (2017). *International Political Economy: The Struggle for Power and Wealth*. New York (USA): Routledge.

Linh, P.H, Doanh, N.K & Quynh, N.N (2019). Determinants of Vietnam's Potential Trade: A Case Study of Agricultural Exports to the European Union. *Asian Journal of Agriculture and Rural Development*, 9(1), 33-46.

Liu, A., Lu, C., & Wang, Z. (2020). The roles of cultural and institutional distance in international trade: Evidence from China's trade with the Belt and Road countries. *China Economic Review*, 61, 1-17. doi:10.1016/j.chieco.2018.10.001.

Memduh, A. D., B. Mustafa, and Utku, U. (2017). The Impact of Competitiveness on Trade Efficiency: The Asian Experience by Using the Stochastic Frontier Gravity Model. *Eurasian Journal of Economics and Finance*, 5(4), 1-15.

Makano, M. (2019). Changing Resource-Based Manufacturing Industry: The Case of the Rubber Industry in Malaysia and Thailand, in Emerging States at Crossroads,

ed. Keiichi Tsunekawa and Yasuyuki Todo (Editors). *Emerging-Economy State and International Policy Studies*. 145-162. Springer Link.

Niroomand, F., M. Hajilee., & Al Nasser, O. M (2014). Financial market development and trade openness: evidence from emerging economies. *Applied Economics*, 46(13), 1490-1498.

Nasrudin, Sinaga, B.M., Firdaus, M., Walujadi, D. 2015. Dampak ASEAN-China Free Trade Agreement (ACFTA) Terhadap Kinerja Perekonomian dan Sektor Pertanian Indonesia. *Buletin Ilmiah Litbang perdagangan*, 9(1), 1-23

Pasaribu, T.W., & Daulay, M. (2013). Analisis Permintaan Impor Bawang Merah di Indonesia. *Jurnal Ekonomi dan Keuangan*, 1(4), 14-26

Perdana, R.P.(2019). Kinerja Ekonomi Karet dan Strategi Pengembangan Hilirisasinya di Indonesia. *Forum Penelitian Agro Ekonomi*, 37(1), 25-39.

Sunaryo, S. (2001). *Ekonomi Manajerial Aplikasi Teori Ekonomi Mikro*. Jakarta: Erlangga

Sherlock, J., and Reuvid, J. (2011). *International trade: An Essential Guide to the principles and Practice of Export*. London. England: Kogan Page Limited.

Viorica, E. D. (2015). Econometric analysis of foreign trade efficiency of E.U. Members Using Gravity Equations. *Procedia Economics and Finance*, 20, 670-678. doi:10.1016/s2212- 5671(15)00122-7.

United Nation & World Trade Organization (2012). *A practical guide to trade policy analysis.* Available online: http://vi.unctad.org/tpa.

United Nation Comtrade. (2020). *Comtrade Database Statistic*. Available online: http://www.comtrade.org/

Zheng, Y., Shao, Y., & Wang, S. (2017). The determinants of Chinese nonferrous metals imports and exports. *Resources Policy*, 53, 238-246. doi:10.1016/j.resourpol.2017.06.003.

Zainuddin, Z., Sinaga, B.M., Hartoyo, S., & Erwidodo, E. (2019). Dampak Penurunan Tarif Impor, Investasi dan Relokasi Industri Ban Terhadap Perdagangan Karet Alam dan ban Indonesia di Pasar Dunia. *Buletin Ilimiah Litbang Perdagangan,* 13(1), 71- 98. doi**:** https://doi.org/10.30908/bilp.v13i1.341