

# *Pandemic Covid-19 Impact On Indonesian Palm Oil Trade*

Azwar Annas<sup>1</sup>, Imama Nurus Izaati<sup>2</sup>

<sup>1,2</sup>Agribusiness Study Program

Muhammadiyah Banyuwangi Institute of Technology and Business

Banyuwangi, Indonesia

<sup>1</sup>azwar.ann@itbmb.ac.id

<sup>2</sup>imama01@itbmb.ac.id



**Abstract** – Palm oil in Indonesia still become one of the most valuable agricultural commodities to trade globally. Since the pandemic Covid-19, many countries treat their home with domestic mobility restrictions to protect their community. Moreover, many countries have reduced their international trade due to the fear of covid-19 infection from other countries. This condition leads to the decline of global GDP as well as the global trade for agricultural commodities. This study aims to analyze the impact of the Covid-19 pandemic on the palm oil trade as the biggest agricultural export commodity of Indonesia. This study uses the gravity model for international trade with Poisson Pseudo Maximum Likelihood (PPML) estimation. The result of this study is based on two main products of palm oil, refined palm oil (RPO) and crude palm oil (CPO). The results show that the import of CPO significantly increases although the gross domestic of importing countries decreases. The variable of Covid-19 active cases in the importing countries shows a significant negative impact on RPO but a significant positive on CPO trade. It means that the CPO import will increase when the Covid-19 infection raise in importing countries. However, the Covid-19 active cases occur in the exporting country, Indonesia, only negative on CPO trade.

**Keywords** – covid-19 active cases; mobility restriction; gravity model

## I. INTRODUCTION

The Covid-19 pandemic had a broad impact on the world economy. Data from the International Monetary Fund (IMF) said that in 2020 there was a decline in Gross Domestic Product (GDP) almost in all countries [1]. This condition occurs due to the drop in global consumption and the public mobility restrictions policy during the Covid-19 pandemic, including international trade restrictions. Public consumption has decreased along with people's fear of the presence of the virus [2]. The social mobility restrictions result in consumers being obliged to carry out activities at home from school to work and people's consumption changes tend to buy online [3]. Mobility restrictions in trade routes change the trade patterns that make producers have to meet certain conditions to enter a country. As a result, global trade commodities have experienced a decline, ranging from trading in durable products such as machinery and electronic equipment [4] to the trade of agricultural commodities [5], [6], [7].

The agricultural commodities trade in many countries has decreased during the Covid-19 pandemic. China experienced a decline in exports and imports of fish trade due to fear of virus transmission through agricultural commodities [8]. The decline in livestock commodities sales occurred nationally in Indonesia due to social mobility restrictions in several areas with high Covid-19 infections [9]. The global trade decline is not only because of mobility restriction policy but also in line with the level of cases and deaths in a country [2]. The higher the number of Covid-19 infections and deaths in a country, the level of trade will be worst. However, the decrease in global trade only occurred in the early days of the Covid-19 pandemic which soon returned to almost normal, including the trade in agricultural commodities [10]. This pattern occurs because countries have done better to comply with the new regulations during pandemics or the business actors have adapted to existing health protocols for trade. Developed countries that have good infrastructure are able to deal with the conditions quickly, while countries that do not have good enough

health infrastructure, will be slower in overcoming the Covid-19 pandemic protocols. In ASEAN, Indonesia is a country that has good health facilities so that it can quickly overcome the new regulation protocols [11] so that the trade logistics performance of Indonesia is better compared to other ASEAN countries [12].

Indonesia is one of the countries that experienced a decline in the value of agricultural commodities trade during the Covid-19 pandemic. Several primary commodities from Indonesia experienced a decline in trade which was marked by a decrease in selling prices due to restrictions on mobility [13], [14]. However, in some cases, the Indonesian agricultural commodities trade has increased such as frozen shrimp [15] and the sub-sector of the plantation, especially palm oil [16]. Palm oil is still the largest export commodity of the agricultural sector in Indonesia [17]. At the beginning of 2020, palm oil experienced a decline in exports, especially to China as one of the main buyers decrease its purchasing. Then there was a significant decrease in trade globally during the first wave of the Covid-19 pandemic which resulted in Indonesia's palm oil exports dropping drastically until April 2020 [18]. However, similar to the majority of commodities trade, the decline in palm oil exports only occurred in the first wave of the Covid-19 pandemic [5]. As in [5] and [6], the trade in palm oil tends to increase because the world's need for glycerin is increasing as a raw material for hygiene goods. This condition leads to increasing in palm oil production to 73.95% in 2019 and was able to increase the workforce up to 82% [16].

The Covid-19 pandemic that had occurred since the beginning of 2020 has had a huge impact on international trade, including the trade of Indonesian palm oil. The changes in global consumption patterns and the occurrence of mobility restriction policy as a response to the pandemic have the potential to reduce palm oil global consumption. However, there is a potential increase in global demand for palm oil as a raw material for medicines as the number of victims of the Covid-19 pandemic increases. This study aims to analyze the impact of the Covid-19 pandemic on the palm oil trade as the biggest agricultural export commodity of Indonesia.

## II. METHODS

### 2.1. Types of Data

The data used for this research is secondary panel data from palm oil trade with HS code 151110 for crude palm oil (CPO) and HS code 151190 for refined palm oil (RPO) from Indonesia. The trade data are data of Indonesia's palm oil imports from various partner countries. The data was obtained from United Nations Commodity Trade (UN Comtrade). Time series data is monthly trading data starting from 2019 to 2020, which is one year before the Covid-19 pandemic to one year during the peak period of the Covid-19 pandemic. The cross-section data consists of palm oil trade data with importing countries in the world. The data needed include data on the gross domestic product (GDP) from importing countries, the import value of palm oil, palm oil production quantity from Indonesia, the distance between exporting countries and importers [19], mobility policies, and the number of active cases [4]. The data sources of these various variables were obtained from different and reliable sources.

### 2.2. Gravity Model Formulation

This study uses the gravity analysis model introduced by Anderson [20]. This gravity model explains the strength of global trade that attracts each other between countries which are explained by the economic strength and various close relationships between countries. This study intends to analyze international trade with a specific commodity namely palm oil. This is different compared to other studies using gravity models. In this study, the economic strength of palm oil-producing countries is only specific to the quantity of palm oil production. This kind of research has been implemented in [19] which also uses the gravity model to analyze the changes in palm oil trade due to changes in regulations in partner countries. This study uses the non-linear regression estimator Poison Pseudo Maximum Likelihood (PPML).

The use of OLS in the gravity model was first used by Anderson [20] and is still used today in various studies such as in [21], [22], and [23]. According to [24], the gravity model using OLS still often occurs in cases of heteroscedasticity, so it is necessary to test the data with several additional tests. Therefore, PPML was introduced by [24] as an alternative in analyzing the gravity model because it does not ignore the case of zero-trading, so PPML is an estimator that can overcome heteroscedasticity. Shepherd [25] said that using the PPML estimator is a better choice than using OLS when analyzing the impact of a policy. Based on research [26], the PPML estimator is always consistent in overcoming the presence of heteroscedasticity and is better than OLS and gamma-pseudo maximum likelihood (GPML) estimators. This study analyzes how much power the changes of trade with the gravity equation by using using a non-linear regression PPML estimator. The PPML equation for this study is as follows:

$$M_{ijt} = \exp(\beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln Prod_{jt} + \beta_3 \ln Dist_{ij} + \beta_4 \ln Mob1_{it} + \beta_5 Mob1_{jt} + \beta_6 \ln Mob2_{jt} + \beta_7 \ln Case1_{it} + \beta_8 \ln Case2_{jt}) \cdot \varepsilon_{ijt} \quad (1)$$

The variable  $M_{ijt}$  is the import value of palm oil from country  $i$  with exporters from country  $j$  in month  $t$  as the economic strength of importing countries. The total of palm oil production,  $Prod_{jt}$ , is the economic strength of Indonesia as an exporting country. Then, there is the distance between countries,  $Dist_{ij}$ , as a factor that has a reducing effect. The mobility restriction policy is the factor that may affect trade between two countries. Hence,  $Mob1_{it}$  is the mobility restriction policy of the importing countries and  $Mob2_{jt}$  is the mobility restriction policy of the exporting country, Indonesia. The number of Covid-19 active cases is considered a factor that can reduce palm oil trade so that  $Case1_{it}$  is the number of Covid-19 active cases in importing countries and  $Case2_{jt}$  million is the number of Covid-19 active cases in exporting countries.

**III. RESULT AND DISCUSSION**

This study involved 11 major importing countries of palm oil from Indonesia. These countries have covered more than 60 percent of Indonesia's palm oil global export market. Compared to the total world market, Indonesia's exports to these 11 countries only cover about 33 percent of global palm oil export. This number may not be enough to represent the real conditions of the palm oil trade, but enough to describe the conditions of the palm oil trade carried out by Indonesia since it already covers more than 50 percent of global trade. The analysis of this study uses the gravity model, which is a model that is often used to describe the role of policies between countries in international trade. The method used is the Poisson Pseudo Maximum Likelihood estimator which can overcome heteroscedasticity due to relatively small trade data when compared to the total trade of all commodities as done in previous references [2] [4] [23]. Palm oil trade data is divided into two HS 6 products, 151110 for crude palm oil (CPO) and 151190 for refined palm oil (RPO). This term is to distinguish the effects clearly due to the different trends of trade of both products. This occurs since the value of Indonesian RPO exports is higher but not for the quantity compared to CPO export [19]. There is a possibility that there will be differences in patterns in the consumption of the two products considering that these products can have different functions as industrial raw materials.

This study analyzes the impact of the Covid-19 pandemic on the Indonesian palm oil trade. Therefore, the data involved include government policies on community mobility and the number of active cases infected by the Covid-19 virus in the country. The data of GDP from importing countries is used to describe the magnitude of economic power from the importer side. The economic magnitude of the exporting country is described by the amount of palm oil production. The GDP of exporters is not used to represent the economic power of palm oil exporting country since it is too large to describe individual trade of palm oil commodities. The amount of production is expected to illustrate the export power of palm oil because palm oil is an export commodity of Indonesia whose domestic needs are very small.

**3.1. PPML Estimation Results**

Poisson Pseudo Maximum Likelihood (PPML) was introduced by [24] to overcome the presence of heteroscedasticity in international trade data. The PPML method for the gravity model to analyze trade per commodity has not been widely applied. However, the results of the analysis seem more able to describe the phenomenon of this study. The application of the PPML method in per-commodity trading is still being carried out by [19]. The results of the PPML method of this study can be seen in Table I.

TABLE I. POISSON PSEUDO MAXIMUM LIKELIHOOD ESTIMATION RESULTS

	Dependent variable			
	RPO $M_{ij}$		CPO $M_{ij}$	
$GDP_i$	0,215	***	- 0,187	***
	(0,074)		(0,069)	
$Prod_j$	2,135		1,391	
	(10,650)		(28,560)	
$Dist_{ij}$	- 13,590	***	- 19,990	***

	(1,520)		(2,714)	
<i>Mob1<sub>i</sub></i>	- 0,046		- 0,376	
	(0,179)		(0,353)	
<i>Mob2<sub>j</sub></i>	0,004		- 0,053	
	(0,211)		(0,345)	
<i>Case1<sub>i</sub></i>	- 0,060	*	0,155	**
	(0,088)		(0,071)	
<i>Case2<sub>j</sub></i>	- 0,057		- 0,134	***
	(0,037)		(0,051)	
Constant	9,436		44,593	
	(162,131)		(432,858)	
Observations	264		264	
Residual Std. Error	6699 on (df = 256)		8270 on (df = 256)	

Note: \* $p < 0,1$ ; \*\* $p < 0,05$ ; \*\*\* $p < 0,01$

The results of the analysis using the PPML method are better to describe the impact of various estimated international trade variables [19] [23]. It is normal in the gravity model that variable which represents economic power, the GDP and palm oil production, will have a positive impact on the trade. On the opposite, distance usually has a negative impact on trade. Both variables will be significant variables in determining the occurrence of international trade. In the variable  $GDP_i$ , it is clear that the GDP of importing countries has a positive force on RPO trade. The potential of RPO trade will be higher when the GDP of the importing country is higher and vice-versa. However, this study finds an interesting impact of GDP on CPO trade that has a negative value. This means that when the GDP of an importing country increases, the CPO import will be decreased, and vice-versa. For the situation in this study, the Covid-19 pandemic has made the GDP of many importing countries decrease while the consumption of CPO increases. It is possible that the consumption of CPO has increased since the production of medicine and hygiene goods is increasing, as well as said in [16]. The variable of  $Dist_{ij}$  has a negative value following the previous reference that the distance between countries has a negative impact. In the PPML analysis results, a greater negative effect is shown by CPO products.

The variable  $Prod_j$  as a substitute for the GDP value of the exporting country has no significant value. The variable  $Prod_j$  probably is not enough to represent the economic power although the results have positive impacts on both products. This could be because the value of palm oil production from Indonesia alone is disabled to describe world conditions. The research on international trade for commodity-specific needs to be carried out by taking into account other countries that are also main producers of palm oil. The variable of Covid-19 active cases of importing countries ( $Case1_i$ ) has significant results on both palm oil products although the effect is different. The CPO product has a positive effect, contrary to the RPO product has a negative effect. The case of a decreasing number of trades due to the high number of Covid-19 cases is in line with the case of RPO trade [2]. However, the CPO trade may increase due to the increasing demand for raw materials from the medicines and hygiene industries. The  $Case2_j$  variable which represents the number of Covid-19 active cases in palm oil exporting country gives a negative significant result on CPO import. That means the CPO product trade will decrease when the exporting country occurs the increase of Covid-19 active cases. The mobility policy, namely the variables  $Mob1_i$  and  $Mob2_j$ , do not have a significant influence on the trade of palm oil products in both importing countries and exporting country. This means that even though palm oil-consuming and producing countries impose mobility restriction policies, the amount of palm oil consumption does not decrease significantly.

#### IV. CONCLUSIONS

The global trade of Indonesia's palm oil is decreasing at the beginning of the Covid-19 pandemic as well as other commodities in the world. However, palm oil shows an increase in trade, especially for crude palm oil (CPO). References said that the need for medicine and hygiene product increased during the pandemic which leads an increase in palm oil consumption for the raw material product. Even though the most of palm oil importing countries' GDP dropped during the Covid-19 pandemic, the import of CPO raise significantly. This condition did not occur for the refined palm oil (RPO) product. On the other hand, the Covid-19 active cases did not lead the CPO import down because of fear, contrary it significantly increase the import. The mobility restriction on both sides of importing and exporting countries did not have a significant impact on the palm oil trade.

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