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Price Transmission and the Effect of Indonesia's Export Tax on Crude Palm Oil (CPO) Prices

Ramiaji Kusumawardhana
PhD Student, Asia University, Taiwan
James K. Chen
Professor, Asia University, Taiwan

Abstract:
Indonesia as the largest Crude Palm Oil (CPO) producer in the world, Indonesia should have control over the price and quantity of CPO. Over the past decade, there have been fluctuations in the global price of CPO. As the price of the world CPO fluctuates, Indonesia lacks alternative markets for its local production of CPO. This has resulted in a unstable in the tax revenue of CPO in Indonesia. To solve this, Government has implemented Indonesia's export tax on CPO in order to maintain stability in the income of the CPO producers. The aims of this research are: (1) to assess the market integration and the price transmission between the international CPO market and the domestic CPO market of Indonesia, (2) to analyze the effects of the Indonesian export tax of CPO on the domestic and on the international prices. This study uses secondary time series data that is obtained from relevant institutions. To investigate the price transmission in international CPO markets with respect to the effects of Indonesia's export tax, several steps of this analysis consist in examining the data by using e.g. the Unit Root Test, the co-integration Test, and estimation of the Error Correction Model (ECM). The results of the price transmission analysis show that the domestic CPO market of Indonesia is integrated with the international market. In the long run, a fluctuation of price in international market will be responded by the domestic CPO market in Indonesia. In addition, although the imposition of the export tax of CPO in Indonesia makes it possible to prevent the instability of the domestic price of CPO, the level of influence is still small.

Keywords: *CPO, ECM, export tax, market integration, price transmission*

1. Introduction

1.1Background

The crop sector serves as one of the sources of foreign exchange in Indonesia and also contributes to the development of the Indonesian economy. Indonesia is the biggest producer and exporter of CPO in the world, followed by Malaysia. During 2001-2016, world CPO's export to all countries reached 7.05 Billion USD on average per year, 56 per cent or around 3.96 Billion USD coming from Indonesia (UN COMTRADE 2017). In addition, the economic potential of CPO commodity in Indonesia has a huge impact by providing around 5 million employments within the agribusiness palm oil system.

World palm oil production is dominated by Indonesia and Malaysia. Both countries produce about 85 to 90 per cent of the total world's palm oil. In the long term, the demand of palm oil will continue to increase, in line with the increase in the growth of the world population, which will consequently increase the consumption of palm oil. In 2014 the total world vegetable oil need reached 158 million tons per year, to which Indonesia supplied 31 per cent (Saragih 2015). Over the past decade, there have been fluctuations in the global price of CPO leading to a decrease of 0.8 per cent in prices. CPO's world price reached 1033 USD/Ton in 2011 and declined to about 750 USD/Ton in 2014 (Immanuel *et al.* 2016). These variations in global CPO price are likely to affect the local CPO price as well. In fact, when the price falls, this will distort the export of CPO and its derivative products. The Indonesian CPO as a staple commodity is mostly exported to India, the Netherlands and Malaysia. The imposition of the progressive export tax by the government in 2007 has changed the composition of the export volume in the last nine years. The export tax policy aims to encourage export of value-added products. Indonesia's export tax on CPO was implemented in order to keep the domestic prices stable. However, this has not been achieved yet (Rifin 2014).

Theoretically, export tax aims at increasing the export price and decrease the domestic price of product (Helpman and Krugman1989). Nevertheless, since 2011 the world price of CPO has been fluctuating and reached its lowest level of below 700 USD/Ton at the end of 2014. As the price of the world CPO reduces, Indonesia lacks alternative markets for its local production of CPO. This has resulted in a decrease in the tax revenue of CPO in Indonesia. To solve this, stakeholders have implemented a new export scheme in order to maintain stability in the income of the CPO producers.

This study aims to ascertain how policies implemented by the Indonesian government affect the price transmission of CPO. Thus, to obtain the key for Indonesian CPO market integrated with the international market; how CPO price in the international market transmitted to the domestic market of Indonesia, and the effects of the Indonesian export tax of CPO on both the international market and the domestic market.

2. Review of Related Literature

2.1. Distortion in International Trade

The limitations in resources, such as production inputs have resulted in the trade of products and services between countries including Indonesia. Some previous studies described 4 international trade such as Josling et al. (2010); Ekanayeke and Mukherjee (2010); Dilanchiev (2012); Pujiati (2014). All of the researchers above use similar concept from Heckscjer-Ohlin, which explains that a country should produce and export commodities in which it has a lower production cost and also is able to produce in higher quantities. Conversely, a country should import commodities in which it has a higher level of production cost and possess fewer production factors (Salvatore 1997). The trading of products and services among countries has two barriers: tariff and non-tariff barrier. One type of tariff barrier is export tax. Deese and Reeder (2007) analyzed issues relating to export tax of Soy which is a primary commodity in Argentina. Meanwhile, a similar study that was conducted by Westcott and Liefert (2015), tested the influence of export tax on wheat commodity in the United States. Priyatno (2003) examined government policies related to beef import program by analyzing its supply and demand in Indonesia. Similarly, Hastuti (2012) evaluated the impact of tariffs and import quotas policy on supply and demand of wheat and wheat flour in Indonesia.

2.2. Export Tax on Crude Palm Oil

The main purpose of export tax basically is to restrict the volume of products exported to foreign countries due to the higher prices of the commodity in global level. This regulation intends to save potential short supply of raw materials for the domestic industry. Consequently, this has the potential to boost the price of the product in domestic markets. In general, the export tax ensures price stability by changing the composition of the product to be exported more to the downstream product or derived products. In order to increase revenue from fiscal instrument, government is not willing to abolish the export tax. Obado et al. (2009) investigated the impact of the CPO export tax on Indonesian CPO industry and particularly focuses on domestic price, investment, production, consumption, export, employment, added-value, cooking oil price, government revenue, producer surplus and consumer surplus. Obado et al. (2009) revealed that implementation of export tax suppressed the competitiveness of Indonesia's export of CPO product. Sulistyanto and Akyuwen (2011) analyzed factors, which affect the performance of Indonesia's CPO Export. Purba (2012) found that the application of export tax not only reduced the competitiveness of export but also delivered negative impact to farmers because they receive low prices for their CPO. A similar study by, Syadullah (2014) also analyzed how the changes of the world's. CPO price, exchange rate, and export tax of the CPO affected the quantity of export of Indonesia's CPO. Abdulla et al. (2014) summarized the export levy of palm oil in Malaysia. They concluded that, the higher of tariff of CPO export tax shifted the export composition into derivative products. In other words, both countries have similar objective of achieving higher revenues from tax. This is done by changing the structure of export volume from raw material to added-value products.

2.3. Price Volatility on Agricultural Commodities

The volatility of the prices of agriculture products occurs often, especially in developing countries which mainly export upstream line up products. Price volatility might affect economic and social welfare (Bustaman 2003 in Khotimah 2013). The root cause of the instability in Agricultural commodity prices may be as a result of both their supply and demand (Kohls and Uhl 2002). Price changes in a market might affect the efficiency of resource allocation, and this phenomenon can be transmitted between one market to another. The stability of palm oil price, especially CPO, can be achieved by (1) building market forces through the formation of monopolistic markets of palm oil producers, (2) forming producer cartels, and (3) international agreements of commodities between buyers and sellers. If price volatility can be minimized then the palm oil industry will be more profitable and can contribute more to the producer country. Hafizah (2009); Muzendi (2014) analyzed the influence of Agricultural commodity prices that are affected by price changes in the commodity benchmark market, while Rifin (2010); Rachman (2012); Yustiningsih (2012); investigated the impact of export policies on agricultural products and changes in commodity prices in the domestic market. Agriculture products sensitively influence the equilibrium of their supply and demand. In case of palm oil product from the crop sector, this equilibrium is mostly based on the seasonality of production as well as on the biological cycle of crop.

2.4. Market Integration and Price Transmission in Agricultural Markets

The concept of market integration refers to the existence of price co-movement between markets imposed by the law of one price (LOP). This theory supports the capture of how market works. Hasan, Reed, and Marchant (2001) analyzed the impact of export tax towards the competitiveness of Indonesia's palm oil industry. They investigated the long run relationship between CIF Rotterdam CPO price and Indonesian export price (FOB). As a result, there was no co-integration between them.

Meanwhile, Hafizah (2009) emphasized that was co-integration between CPO prices in three different markets: Rotterdam, Malaysia, and Indonesia. Price transmission is not only useful in capturing the efficiency of markets but also, forecasting prices by examining the volatility of the price inside the reference market. Von Crammon-Taubadel S and Meyer (2004) revealed that, economist who are exploring the topic of market efficiency must investigate price transmission processes. Many studies investigated price transmission between different stages of the marketing chain (vertical transmission) or between different locations for the same product (spatial transmission). Waldegebriel (2004) determined that price transmission in vertically related markets is imperfect. Author developed a model of price transmission where technology of industry is used to characterize variable input proportions while the power of oligopoly and oligopsony still exists.

3. Research Methodology

This study uses secondary time series data that is obtained from relevant institutions e.g. the Ministry of Trade, the Ministry of Agriculture, the Ministry of Energy and Mineral Resources, Statistics Indonesia, the Indonesia Estate-Crop Fund for Palm Oil, the Indonesian Palm Oil Association (GAPKI), and the United Nations Commodity and Trade (UN COMTRADE). The analysis uses 592 weekly observations from January 2005 to May 2017. The palm oil and its fraction product have the Harmonized System (HS) code 1511 and is divided into Crude Palm Oil (HS code: 151110) and Refined Palm Oil but no chemically modified (HS code: 151190). To investigate the price transmission in international CPO markets with respect to the effects of Indonesia's export tax, several steps of this analysis consist in examining the data by using e.g. the Unit Root Test, the co-integration Test, and estimation of the Error Correction Model. Since the number of weekly data is high enough, an econometric approach is provided in this analysis. For processing the data, Excel and the GRETL software are used.

3.1. Testing for Unit Roots

Being the first step in the analysis of market integration and price transmission, the Unit Root Test is an important test to examine whether the data is stationary or not. A stationary time series has a finite mean and variance that do not vary with time; even it requires a constant of variance in higher order moments. The stationary of each series data is necessary to prevent the spurious regression in the model. In other words, the phenomenon of spurious or non-sense regression showed that correlation could persist in non-stationary time series even if the sample very large (Gujarati 2004). As applied in most of the existing literature, this analysis also used Augmented Dickey Fuller test (ADF) to examine the presence of unit root for each variable in the model.

As the situation of the variable of the export tax of CPO has some zero tariff of export tax, there are two options to cope with that issue. Firstly, it is possible to drop all zero values. Secondly, there is the strategy of adding 1 to the dependent variable before the logarithm is taken which is for example followed by Agostino *et al.* (2010) in Kopp *et al.* (2014). This analysis adds a constant value of 1 to the variable of the export tax of CPO before taking logarithms. It is possible to add a new dummy variable after changing the zero observation into the value of 1 which distinguishes the observation periods with the tariff of export tax from those without. However, the coefficient of the dummy export tax of CPO does not give a different sign compared to the export tax of CPO. With the dummy variable it should be possible to confirm that if there is no tariff of the export tax then the price of domestic CPO will increase. Conversely, the export tax of CPO will increase the domestic price of CPO if the tariff of the export tax increases (see Appendix 2).

$$\Delta Yt = \alpha 0 + \alpha 1\ T + \delta t Yt\text{-}i + \Sigma \beta i \Delta Yt\text{-}i + \varepsilon t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

According to equation above, represents a first difference of $\Delta Yt = Yt - Yt\text{-}1$, where n is number of lengths. Thus, the hypothesis by using ADF Test:

- Ho: Yt ~ I (1), Unit root exists
- Hi: Yt ~ I (0), Unit root does not exist

3.2. Determination of the Optimum Lag

The objective of this step is to prevent the possibility of residual autocorrelation in the time series data of the CPO prices. The optimal lag length of variable is needed to capture the effect of each variable to others in the model. There are some criteria to choose the appropriate lag length e.g. Akaike Information Criteria (AIC), Schwarz Criteria (SC) and Hannan-Quinn Information Criteria (HQ) particularly, this study used BIC criterion to determine the optimum lag and, in this case, BIC showed the shorter lag length compare with AIC criterion.

3.3. Co integration Test

The purpose of this step is to prove that the variables have a long-term relationship to each other. Two-time series are co-integrated if they are both integrated of the same order, for example if both are I (1) or there is a linear combination of the two series that is I (0), i.e. stationary. Co-integrated series are non-stationary, but they share a common non-stationarity because they are linked by a long-run relationship that does not permit them to drift too far apart. The Granger Representation Theorem states that if two variables are co-integrated, then an Error Correction Model (ECM) must link them. In particular, testing for co-integration with more than two series would be able by applied Johansen's method. Supposed the vector autoregression (VAR) of order p:

$$Yt = A1\ Yt\text{-}1 + \dots + ApYt\text{-}p + B\ Xt + \varepsilon t \quad \dots\dots(3)$$

Where Yt is a k vector of non-stationary I(1) variables, Xt is a d vector of deterministic variables, and εt is a vector of innovations. The VAR equation above can be written as:

$$\Delta Yt = \Pi\ Yt\text{-}1 + \sum_{i}^{p-1} \Delta Yt\text{-}i + B\ Xt + \varepsilon t \quad \dots\dots(4)$$

$$\text{where: } \Pi = \sum_{i=1}^{p} Ai - I \text{ and } I = -\sum_{j=i+1}^{p} Aj$$

The two hypotheses tested for this step:

3.3.1. Rank test 0

- H0: There is no co integrating vector
- H1: There is one co integrating vector

3.3.2. Rank test 1

- H0: There is one co integrating vector
- H1: There are two co integrating vectors

Based on hypotheses above, if eigen value (LR) is bigger than the level of significant or P- value less than critical value (α) then Ho is rejected.

3.4. Stability Analysis

One of the several problems when working with time series data is related to the presence of structural break or structural change. If an observation number or date is given, provides a test for the null hypothesis of no structural break at the given split point. The Chow test is an easy way to test the equivalency of model estimated using different subsets of the sample. This test is used to determine whether the subsamples are really necessary when analyzing the data, we have and to determine whether the regressions were actually equal to one another. The null hypothesis of this test is that the parameters are stable ($\beta 0 = \beta 1 = \beta 2 = \dots = \beta n$) or by writing the hypotheses tested for this step:

H0 : No structural change
H1 : Structural change

We will reject the null hypothesis that the coefficients of the two subsamples are equal if the p-value is less than the desired significance level of the test, α.

3.5 Error Correction Model

The Vector Error Correction Model (VECM) can be seen as an extension of the Vector Autoregression (VAR) models, in which an explanatory variable is added in the VAR (p) specification of the error correction mechanism driving the co-integrated series. An advantage of the VECM is that it enables the researcher to embed a representation of economic equilibrium relationships within a rich time-series specification. This analysis uses the Johansen Maximum Likelihood Error Correction Model with the specification of Error Correction Model and long run model (ECTt-1) as written below:

$$\Delta Yt = \beta 0 + \sum_{i=1}^{n} \beta i \Delta Yt\text{-}i + \sum_{i=0}^{n} \delta i\ \Delta Xt\text{-}i + \varphi Zt\text{-}i + t \quad \dots\dots(5)$$

$$Zt\text{-}I = ECTt\text{-}1 = Yt\text{-}1 - \beta 0 - \beta 1 Xt\text{-}1 \quad \dots\dots(6)$$

Thus, in particular, the ECM in this study is:

1. The domestic price of CPO in Indonesia
   $\Delta PDOMt = \beta \mathbf{01} + \beta \mathbf{11} \Delta PDOMt\text{-}i + \delta \mathbf{21} \Delta PROTt\text{-}i + \mathbf{31} \Delta EXTt\text{-}I + \varphi \mathbf{1} Zt\text{-}i + 1 \quad \dots\dots(7)$
2. The international price of CPO
   $\Delta PROTt = \beta \mathbf{02} + \beta \mathbf{12} \Delta PROTt\text{-}i + \delta \mathbf{22} \Delta PDOMt\text{-}i + \mathbf{32} \Delta EXTt\text{-}I + \varphi \mathbf{2} Zt\text{-}i + 2 \quad \dots\dots(8)$
3. The export tax of CPO in Indonesia
   $\Delta EXTt = \beta \mathbf{03} + \beta \mathbf{13} \Delta EXTt\text{-}i + \delta \mathbf{23} \Delta PDOMt\text{-}i + \mathbf{33} \Delta PROTt\text{-}i + \varphi \mathbf{3} Zt\text{-}i + 3 \quad \dots\dots(9)$

Note:

PDOM	= The domestic price of CPO in Indonesia (USD/Ton)
PROT	= The international price of CPO based on The Rotterdam Stock Market (USD/Ton)
EXT	= The export tax of CPO in Indonesia (USD/Ton)
β, δ,	= The coefficient of dynamic short run
φ	= the coefficient of error correction model
	= Residuals

With a model setting used particularly for a long run estimation, the sign of the coefficient of the international CPO price (i.e. Rotterdam CPO price) is expected to be positive. This means that the domestic price of CPO (i.e. Indonesia CPO price)

will increase as long as there is an increasing of the world CPO price. The export tax of CPO is expected to have a negative sign because it is considered to be a trade barrier which reduces the domestic price of CPO as the tariff of the export tax increases. Lastly, as the exogenous variable, the crude oil price is expected to have a positive sign since CPO has the role of a substitute product in particular for producing the energy source biodiesel. The higher price of crude oil will reduce the demand of crude oil because consumers will prefer to use CPO. Hence, it will increase the demand for CPO product, which increases the domestic price of CPO. Since the prices are expressed in logarithms, the cointegration factor is the long-run elasticity of the domestic price with respect to the international price. Thus, the cointegration factor is the long-run elasticity of price transmission.

There are two possibilities in particular to detect the price shock in symmetric case. Firstly, if there is positive deviation from the long-run equilibrium then the ECT will be < 0. In a second condition, if there is negative deviation from the long-run equilibrium or if the price is shocked in negative direction, the ECT > 0 (Kopp *et al*, 2014). Thus, it is possible to depict the process of relationship between the shocks of prices variable against ECT, which is reflected by two quadrants. Recalling for the first equation of the domestic CPO price, the correction of the positive domestic CPO price shock can be seen in the second quadrant. Meanwhile, the fourth quadrant presents the correction of negative shock of the domestic CPO price.
The new scheme of fund levy of CPO is dedicated to several objectives. One of the most important of these objectives is to promote Indonesia's palm oil product to the International market by enhancing the number of farmer or producer who used a sustainable palm oil certificate such as Roundtable on Sustainable Palm Oil (RSPO) or Indonesia Sustainable Palm Oil (ISPO). This policy could be the right way in particular to match the preferences of the world consumer who ask for a product which meets the criteria of sustainable product.

4. Results and Discussion

4.1. CPO Price Transmission and Market Integration

The vector error correction model is a general framework used to describe the dynamic interrelationship between stationary variables. So, the first step of the analysis is to determine whether the levels of a data set are stationary The Augmented-Dickey-Fuller (ADF) test can be used to test for the stationarity of the data of which all variables are altered into logarithmic form.

	Level				
	Variable	With Constant		With Constant And Trend	
		ADF Value	P-value	ADF Value	P-value
	Ln CPO Domestic	-2.20	0.21	-2.02	0.59
	Ln CPO Rotterdam	-2.14	0.23	-1.89	0.66
	Ln Crude Oil	-2.14	0.23	-2.31	0.43
	Ln Export Tax	-2.73	0.07	-2.81	0.19

Table 1: Unit Root Test Result in Level

All regressions in first difference reject the null of absence of unit roots at 1% confidence level. Therefore, it is to be concluded that all variables are stationary and valid to use. As the next step it is possible to conduct co integration test by using the Johansen co integration test.

	With Constant		**With Constant and Trend**	
Variable	ADF Value	**P-Value**	ADF Value	P-value
Ln CPO Domestic	-24.38	0.00	-2.02	0.00
Ln CPO Rotterdam	-26.48	0.00	-1.89	0.00
Ln Crude Oil	-27.11	0.00	-2.31	0.00
Ln Export Tax	-25.36	0.00	-25.34	0.00

Table 2: Unit Root Test Result in 1st difference

The second step is identifying the existence of co integration. Co integration only occurs when the variables are not stationer in the level form and stationer after first difference, beside that, two non-stationary series are co integrated if they tend to move together through time. The Johansen test rejects the null hypothesis of no co integration but fails to reject the null hypothesis of one co integrating vector. The table below shows the result from the Johansen test implying the existence of co integration between world and domestic market of CPO product.

	Trace Statistic	P-Value
0	63.57	0.014
1	15.95	0.904
2	4.99	0.901

Table 3: Result of Johansen Test (Criterion BIC)

For the next step as the subsequent process for proving that there is one co integrating vector between all prices, it is necessary to observe the extent of their relationship. Nonetheless, the result of checking the stability analysis is that the model contains the presence of structural changes. The output of the Chow test is presented inside the table 9.

Dummy Series Plot	F-Test	P-Value
drotw4jan15	2.55	0.019
drotw4sept15	3.22	0.007

Table 4: The Result of Chow Test

The Chow test rejects the null hypothesis of no structural change, thus there is a need to apply dummy variable in the standard VECM to obtain a more precise analysis. There are several dummy variables as a restricted exogenous variable which are developed in the analysis: 1) drotw4jan15, which implies the presence of a structural break in the last week of January 2015 for the price CPO Rotterdam; 2) drotw4sept15, which represents the presence of a structural break in the last week of September 2015 for the price of CPO Rotterdam. Besides that, the model has a problem of outliers (spikes) in several series, thus more dummy variables are added in particular for the residual of export tax of CPO in the short run period to cope with the outliers. The last step in this study is investigating the Error Correction Model displaying the short-run dynamics, the adjustment parameter, and the long run equilibrium. The table 10 presents the model.

According to the output above, the coefficient of the Rotterdam CPO price has a positive sign related to the domestic price of Indonesia's CPO. In the long run, if the Rotterdam CPO price increases by 1 per cent, the domestic price of Indonesia's CPO increases by 0.93 per cent on average. Besides that, there is an integrated market between both prices that will influence the long run equilibrium price. Hence, the changing price from CPO Rotterdam might be transmitted to the price of CPO in the domestic market in Indonesia. As opposed to the coefficient of the Rotterdam CPO price, the coefficient of the export tax of CPO of Indonesia has a negative sign, yet it is statistically significant at 10per cent significance level. Interpreting the coefficient of the export tax of CPO it can be said that there is a reduction of the domestic price of CPO Indonesia by 0.009 per cent in the long run period if the export tax of CPO increases by 1 per cent. The expected sign appearing in the model confirms the hypothesis according to which an influence of the CPO price of Rotterdam market on the domestic price of CPO of Indonesia in the same direction is to be expected. Whereas the export tax is expected reduce the domestic price of CPO Indonesia.

The relationship between crude oil and the domestic price of CPO Indonesia has a positive sign and is statistically significant at 5 per cent and 10 per cent significance level. It means the price of international crude oil will influence the development of the domestic price of CPO Indonesia in the long run period. This is the indirect consequence because biodiesel produced from CPO is the substitute product of crude oil, so the higher price of crude oil will increase the CPO Rotterdam price. Hence, as explained before, if the CPO Rotterdam increases then the domestic price of CPO of Indonesia will increase. If the price of crude oil for instance increases by 1 per cent, this will increase the price of CPO in Indonesia market by 0.06 per cent. By looking at the dummy variables, all of those variables are selected as factors that have encouraged the government of Indonesia to impose the new tariff since July 2015. The price of CPO Rotterdam as a representative of the world CPO price suffered beginning at the end of 2014 and continuing to suffer until several months after the new tariff was applied. Nevertheless, after introducing the dummy variables in the VECM model, this research only finds the significant parameter for dummy in the period of the fourth week of September 2015.

	Dependent Variable	Ln PDOM	Ln PROT	Ln EXT
	ECM t-1	-0.06*	0.07**	0.31**
	LnPDOMt-1	-0.08	0.25***	-0.55
	LnPROT t-1	0.17***	-0.27**	0.45
	LnEXTt-1	0.003	0.003	-0.007
	LnCRU	0.19***	0.17***	0.15
	LnCRUt-1	0.07**	0.07***	-0.01
	Long run			
	Variable	Parameter		
	LnPROTt-1	0.93***		
	LnEXTt-1	- 0.009*		
	LnCRU t-1	0.06**		

	Dependent Variable	Ln PDOM	Ln PROT	Ln EXT
	DPROTW4Jan15 t-1	-0.21		
	DPROTW4Sept15t-1	0.27*		
	Long-run Equilibrium (Crude Oil in Exogenous Variable)			
	LnPDOM t-1 = 0.14 + 0.93 LnPROT t-1 *** - 0.009 LnEXT t-1 *			
		(-0.033)	(0.005)	
	+ 0.06 LnCRU t-1 – 0.21 DPROTW4Jan15 t-1			
		(-0.03)	(0.15)	
	+ 0.27 DPROTW4Sept15 t-1 * + ut-1			
		(-0.16)		

Table 5: The Error Correction Model for the CPO Prices
One (*), Two (**), and Three (***) Asterisks Indicate Rejection Ho: B = 0 At 10%, 5%, and 1% Level of Significance, Respectively, Critical Values for 10% = 1.645; 5% = 1.96; and 1% = 2.576

Based on the results of the short run model presented in the table 10, the domestic price of CPO will respond to the changes of the international price of CPO and the global crude oil price, but not to the remaining variables. In addition to this, the speed of adjustment of the CPO Indonesia price as the measurement level of the speed at which the price of CPO Indonesia returns to equilibrium after a change in the independent variables is quite low by 6 per cent and statistically significant at 10 per cent level of significance. There is a different situation in the short run period regarding the world price of CPO, which will react to changes in all variables except for the export tax of CPO. The speed of adjustment of the global price of CPO is 1 per cent faster than of the domestic price and is statistically significant at 5 per cent and 10 per cent level of significance. Meanwhile, the export tax of CPO does not show any response to the fluctuations of both prices of CPO and of the crude oil price in the short term. The speed of adjustment of the CPO export tax to correct the market disequilibrium amounts to 31 per cent and is statistically significant at 5 per cent and 10 per cent level of significance and is faster than the speed of adjustment of CPO Domestic and Rotterdam prices.

4.2. The Effects of Export Tax of CPO on Market Integration of CPO Commodity

There are mainly three negative consequences of the implementation of the export tax on CPO product. The first one is reducing the opportunity for farmers and CPO producers to derive benefit from the increasing of the international CPO price because the export tax might keep the domestic price stable. The second consequence is the possible reduction of the welfare of farmers and producers of CPO (Susila 2004; Intan K.P.E *et al* 2008, Obado *et al* 2010). As a third consequence, this policy could be disincentive for farmers to enhance the productivity of Fresh Fruit Bunch (FFB) as they might receive a lower price from the CPO producers.

The next interesting point related to the output of the VECM estimation is the strong relationship between both prices of CPO in the long-term period. Despite being the biggest exporter of CPO product in the world, Indonesia does not have a robust power to control the price. In most parts of the observation period the domestic price of CPO followed the fluctuation of the world price so that it can be said that the global price of CPO led the dynamic price of CPO in the Indonesian market. It is important for the government of Indonesia to cope with a shortage of supply of CPO product in the domestic market when the international price increases by switching the composition of volume export of palm oil products and encouraging the CPO producers to consider to export derivative products of palm oil i.e. RPO. The table 11 explains the change of the composition of the export of Indonesian palm oil products.

As mentioned before, the key motivation why the Indonesian government intervened regarding the CPO price by applying the export tax is due to the role of CPO as a raw material of cooking oil as one of the nine staple foods in Indonesia, therefore the availability of CPO in the domestic market should be a priority in supporting the cooking oil industry.

Palm Oil and Its Fraction	2001-2007		2008-2016	
	Average (Ton)	Share (%)	Average (Ton)	Share (%)
Palm Oil, Crude	3833169.86	44.26	7836469.13	41.07
Palm Oil, Refined	4828243.71	55.74	11242393	58.93
Total	8661413.57		19078862.13	

Table 6: Structure of Indonesia's Palm Oil and Its Fraction Export

The next challenge for the government of Indonesia is to make sure that the domestic market is capable to absorb the stock of CPO from producers and farmers as they faced one restriction to export CPO. The policy maker has applied the current policy in particular to construct the system of agribusiness of CPO commodity by establishing the Indonesia Estate-Crop Fund Body (BPDPKS). This institution takes a role to give subsidies for the production of biodiesel in the domestic area to which all CPO producers are able to supply their stock of CPO while the international price of CPO goes down. Regarding the strategy of enhancing the downstream industry of CPO i.e. the biodiesel industry, the government of Indonesia succeeded to create a

domestic market for CPO product. Nevertheless, the upstream industry also needs support primarily due to the fact that the main producers (41.55 per cent) of CPO product in Indonesia are smallholder farmers (Statistic of Indonesia 2017).

5. Conclusion

The results of the price transmission analysis show that the domestic CPO market of Indonesia is integrated with the international market. In the long run, both prices have a relationship or in other words the volatility price in the international CPO market will be transmitted to the domestic market in Indonesia. In the short run, as the output of Impulse Response Function, the domestic CPO price will respond to a shock of the world CPO price by increasing since a first week of the observation period. It can be inferred that the Rotterdam market as the reflection of the global CPO market has a strong ability to control the price. A fluctuation of price in this market will be quickly responded by the domestic CPO market in Indonesia.
In the long run, although the imposition of the export tax of CPO in Indonesia makes it possible to prevent the instability of the domestic price of CPO, the level of influence is still small. Besides that, this policy is effective to increase the government revenue as a fiscal instrument with the minimum economic loss for the farmers or producers of CPO. The interference on the CPO market by the policy maker, in particular to reach the aim of stock availability of CPO in the domestic market, consisted in changing the composition of export, which is reflected by the growing share of derivative product of palm oil i.e. Refined Palm Oil (RPO) in the export. Essentially, the previously mentioned studies and the theoretical background confirm these insights.
In practice, the policy maker has attempted to reduce the dependency of the Indonesian CPO producers on the world market by creating a demand market under the new format of the export tax of CPO. Nonetheless, the level of competitiveness of Indonesia's CPO product in the international market must also be considered. One option to expand the share export of Indonesia's CPO product in the global market is to establish new market penetrations into other countries. The function of Indonesia's trade representative officer in the importer country as a market intelligence should be optimized in order to extend the market share of the export of CPO from Indonesia.

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