Analyzing global competitiveness of Indonesian palm oil

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Abstract. Indonesia is the largest producer and exporter of palm oil in the world vegetable oil market. However, Indonesia export share had decreasing trend and there is an emerging competition from South America and African palm oil producer. Another issue is a non-competitive strategy from European countries for limiting palm oil import. This study aims to seek the pricing behavior of Indonesian exporter in the world palm oil market. This study shows Indonesian exporter apply Local Currency Price Stabilization Strategy to European countries but more competitive behavior to other importing countries. The LCPS strategy to European countries might be induced by more elastic palm oil demand on that region. The opposite with India and China that might have less elastic palm oil demand schedule. However, Indonesian exporter should have more awareness of future competition in the palm oil market and its pricing strategy, especially to emerging demand from India and China.

1. Introduction
Indonesia is the largest producer and exporter of palm oil in the world palm oil market followed by Malaysia as the second largest. Palm oil products of Indonesia and Malaysia is complementary rather than substitute [1]. Palm oil industry is not only giving significant export revenue to Indonesian economy but also have a significant contribution to absorb the labor, which made the Industry is central for Indonesian economic foundation. Indonesia palm oil export is important for the world as the reduction of export may led to food insecurity especially is South Asian countries [2]. Both Indonesia and Malaysia produce at least 70\% of total world palm oil export. However, after the peak of Indonesia palm oil export in 2009, export share of 72\% and export quantity of 9.8 million metric tons, the trend of Palm oil export and export share seems declining. The export share of Indonesian palm oil reduces to only 50\% in 2019.

Palm oil industry is more efficient compared to other vegetable oil industries (e.g. sunflower oil, soybean oil, rapeseed oil, and olive oil). The palm oil industry has significantly higher productivity which result in low production cost and higher price competitiveness. This condition seems very advantageous for Indonesia palm Indonesia industry to expanding the plantation and increasing the export volume to world vegetable oil market. However, non-price competition strategy from other vegetable oil industries has altered the pricing strategy of Indonesian palm oil exporter to sustain the export volume and export value.

India, China, and European countries are the three major countries destinations for Indonesian palm oil export. The European export share is around 14\% of total Indonesian palm oil export, making European countries as very strategic trading countries. The disruption of European demand will have a significant negative impact to Indonesian palm industry as well as to Indonesia economy. Another
challenge is that palm oil considered as a closed substitute product for European vegetable oil in the world market. Palm oil pricing strategy can be very sensitive to change in demand and any other non-competitive pricing strategy from European countries.

The European resolution on palm oil and deforestation of rainforest in Indonesia and Malaysia cause challenges and disruption in palm oil demand. The resolution also had shaped the palm oil industry to focus more on sustainability rather than on productivity that will increase the production cost. The European resolution and change in production cost will alter the pricing strategy of Indonesian palm oil exporter to maintain its competitiveness and export volume especially to European countries. Another challenge for Indonesian palm oil producer and exporter is the growing acreage of palm oil plantation especially in South America and Africa (e.g., Colombia, Ecuador, Guatemala, and Nigeria). The acreage increase of palm oil plantation in South America and Africa is mainly derived by the strong growing domestic demand of edible vegetable oil which also result to the expansion of those countries in palm oil international market. Indonesian exporter should take into account its pricing strategy in accordance with the rising of other palm oil exporter and closed competition from second biggest palm oil exporter, Malaysia.

This study aims to explore the Indonesia exporter behavior and pricing strategy in accordance with the decrease in Indonesian export share and less concentrated palm oil market. Additionally, the European resolution on palm oil import in relation with rainforest deforestation might motivate price discrimination strategy of Indonesian exporter. This study tries to find whether Indonesian exporter have more emphasis on identical export-price adjustment behavior across all export destination countries or amplifying price discrimination strategy with exporting destination specific-price adjustment.

2. Materials and methods

2.1 Materials
This study uses annual data of Indonesian palm oil export price to 11 importing countries which provided by UNComtrade [3]. The dataset includes 201 annual cross section time series observation from 2001 to 2019. The exchange rate data were obtained from World Bank for 11 importing countries and Indonesia as a sole exporting country [4]. Other data set, likewise, export unit-value, export quantity, all country export quantity was obtained from UNComtrade database published.

2.2 Methods
The empirical model used in this study is followed the empirical framework developed by Knetter [5,6]. Model proposed by Knetter inspired by price discrimination framework of monopolist countries to selling in several exporting destination countries with the adjustment of export price accordance to the change in exchange rate between importing and exporting countries [5,6]. Knetter states that the export price in destination country comprises two components namely change in marginal cost and change in mark price over marginal cost [5,6] which can be shown below:

\[ P_{it} = MC_{t} \left( \frac{\sigma_{it}}{\sigma_{it} - 1} \right) \quad i = 1, \ldots, N \quad and \ t = 1, \ldots, N \]

Where \( MC_{t} \) equal the marginal cost of production at period \( t \) and \( \sigma_{it} \) correspond to elasticity of demand respect to importing country local currency. Equation (1) states that the markup export price over marginal cost determined by the demand elasticity of importing countries. In order to find the effect of marginal cost over markup price, the model should be able to estimate the change in marginal cost of exporting countries over time. Goldberg and Knetter mention that as demand schedule become more inelastic, the exporting countries has higher market power over importing country [7].

To expose the export pricing behavior from equation (1), this study use empirical framework that employ two way fixed effect regression model [6,8] shown by equation 2 below:

\[ \ln P_{it} = \partial_{t} + \alpha_{i} + \mu_{i} \ln \text{Ex}_{it} + \epsilon_{it} \quad i = 1, \ldots, N \quad and \ t = 1, \ldots, N \]
∂_t is a time effect that shows marginal cost movement at exporting country. The market power and non-competitive pricing strategy is measured by α_i and μ_i. α_i is a country effect that shows price discrimination or markup over various importing countries imposed by exporting country. P_{it} is the export price of Crude Palm Oil. E_{xt} is the exchange rate in units of export destination market currency per unit of the exporter’s currency. μ_i shows how exporting country make an adjustment of markup price over marginal cost upon the change in exchange rate.

The empirical model in equation (2) shows three possible form of pricing behavior comprises: competitive price behavior, price discrimination across importer with constant elasticity of demand, and price discrimination with non-constant elasticity of demand. The competitive behavior will be shown by α_i and μ_i equal to zero. α_i ≠ 0 indicates price discrimination across importing countries and μ_i ≠ 0 express non-constant elasticity of demand.

3. Results and discussion
The Herfindahl index shows the market were much more concentrated from 2001 to 2010, which mainly driven by the expansion of palm oil plantation in Indonesia and Malaysia, however market concentration was become more dispersed from 2011 to 2019 (Figure 1). Less concentrated market result in more competitive market and pricing. Major palm oil producer should have less market power for price discrimination across importing countries. Even though, the Herfindahl index (Figure 1) shows the trend of less concentrated market but Indonesia and Malaysia as major palm oil producer and exporter still have at least 70% of total export share (Figure 2).

![Figure 1: Herfindahl Index 2001-2019 [4]](image_url)

The fluctuation and uncertainty on agricultural product prices influenced by risk behavior may affect farmer decision on input usage and production decision [9,10]. Most palm oil plantation in Indonesia owned by public with low acreage, so that the fluctuation in prices may heavily have significant negative impact on their wealth (Figure 3). Figure 3 also shows variation in Indonesia palm oil export prices across importing countries. The variation in export prices might be an indication of adjustment of markup in response to change in exchange rate between importing and exporting countries which has been referred as pricing-to-market (PTM) [5]. Pricing-to-market is price discrimination strategy that depends on the demand convexity from particular importing countries [6,11]. Exporting country may conduct price stabilizing strategy, which referred as local-currency price stability (LCPS), or increasing the markup price. Knetter [5] mentions that the additional competitor or less concentrated market will increase the likelihood of exporter to conduct LCPS strategy.
The pricing behavior of Indonesian exporter are shown in Table 1. The result shows non-competitive behavior of Indonesia exporter across importing countries. The critical finding is the non-competitive pricing strategy of Indonesia exporter applied only for countries at European region, e.g. Germany, Netherland, and Italy. The country specific effects show Indonesian exporter charged lower palm oil prices to European countries compared to other importing countries. However other importing countries had a competitive export price from Indonesian exporter, shown by not significant country effect.

The result in Table 1 shows that Indonesian exporter apply local-currency price stability (LCPS) to Germany, Netherland, Italy and Spain. Surprisingly Indonesian exporter did not apply LCPS to India and China, even though those two countries were the two largest importers for palm oil product for Indonesia. This finding is contradictory with previous research that found exporter are more likely applying LCPS to the main importer for maintaining the import demand [12,13].

Figure 2: Palm oil export quantity (tons) and share (%) 2001-2019 [4]

Figure 3: Indonesian palm oil export prices (USD) 2001-2019 [4]
### Table 1. PTM estimation for Indonesian palm oil exporter 2001-2019

| Country     | Country effect | Exchange rate |
|-------------|----------------|---------------|
| Bangladesh  | 0              | 0.018         |
| China       | 0.442          | 0.084         |
| Germany     | -1.99*         | -0.202**      |
| India       | 0.321          | 0.078         |
| Italy       | -1.986*        | -0.198**      |
| Malaysia    | 0.706          | 0.103         |
| Netherlands | -1.866*        | -0.187**      |
| Pakistan    | -0.008         | 0.019         |
| Singapore   | -0.742         | -0.072        |
| Spain       | -1.626         | -0.160*       |
| Vietnam     | 0.005          | -0.148        |

*significant at 10%; **significant at 5%

Even though there is no significant negative impact of Indonesia palm oil import ban by European Union to national and sectoral of palm oil industry [14] but Indonesia exporter still applying the price stabilization strategy to European market. The application of LCPS to European countries might be because European countries is major vegetable oil producer and palm oil is the main substitute product. Another fact would be because of European resolution on limiting palm oil import due to deforestation issue so that Indonesia exporter are less likely applying aggressive or competitive pricing behavior on European countries that may result bigger losses on palm oil export share.

The competitive behavior of Indonesia exporter to India and China might be stimulated by less elastic palm oil demand schedule. The less elastic demand schedule for India and China may be derived from high import demand of vegetable oil due to low vegetable oil production domestically, high population and low potential agricultural land for producing sufficient vegetable oil. This fact may present a greater export potential for Indonesian palm oil. However Indonesian exporter should also have more awareness to the increase in competition among other palm oil exporter as shown in lower market concentration ratio at Figure 1. Other major exporting countries, especially emerging exporting countries from South America and Africa, would likely targeting more on vast potential of India and China market.

Plot an index of estimated time effect for palm oil export 2001-2019 (Figure 4). The time effect has an upward trend from 2001 to 2011 and followed by larger shift in 2012 with the more stable downward trend until 2019. There is high volatility in 2001-2011 and increase in marginal cost. The less volatility of marginal cost index in 2012-2019 shows the marginal cost are more stable.
Figure 4. Estimated time effect as a measure of marginal cost-Indonesian palm oil export 2001-2019

4. Conclusions
Indonesia is the largest producer and exporter of palm oil in world vegetable oil market. The competition among palm oil producer is increasing because of the emergence of South America and African palm oil producer. Another issue is other vegetable oil competing industry which mainly from European countries, one of Indonesian major importing destination region, may apply non-competitive strategy for limiting palm oil import. This study shows Indonesia exporter apply Local Currency Price Stabilization Strategy to European countries but more competitive behavior to other importing countries. The LCPS strategy to European countries might be induced by more elastic palm oil demand on that region. The opposite with India and China that might have less elastic of palm oil demand schedule. However, Indonesia exporter should have more awareness on future competition in palm oil market and its pricing strategy, especially to emerging demand from India and China.

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