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The Determinants of Biodiesel Export in Indonesia

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Abstract

This study investigates the competitiveness of Indonesian biodiesel export among the top seven of biodiesel trader countries in the world, as well as the factors that determine export for Indonesian biodiesel. Applying Revealed Comparative Advantage (RCA) analysis, the results show that Indonesia has good competitiveness of biodiesel in the world. Using secondary data, the results of the gravity model indicate that distance of trade destination countries harms the Indonesian biodiesel export. Meanwhile, price, exchange rate, and GDP have a positive effect on the export. Based on the results of this study, the government of Indonesia should focus on the development of the biodiesel industry, since the increasing importance of biodiesel as alternative energy in the world.

Keywords: biodiesel, export, competitiveness

Abstrak

Penelitian ini mengidentifikasi bagaimana daya saing ekspor biodiesel Indonesia diantara tujuh eksportir biodiesel di dunia, serta faktor-faktor yang memengaruhi ekspor biodiesel di Indonesia. Dengan mengaplikasikan analisis Revealed Comparative Advantage (RCA), hasil penelitian menunjukkan bahwa Indonesia memiliki daya saing yang baik diantara eksportir biodiesel di dunia. Dengan menggunakan data-data sekunder, hasil dari model gravitasi menunjukkan bahwa jarak negara tujuan memiliki dampak negatif terhadap ekspor. Sementara itu, harga, nilai tukar, dan PDB berpengaruh positif yang kuat terhadap ekspor. Berdasarkan hasil-hasil dari penelitian ini, Pemerintah Indonesia perlu fokus dalam pengembangan industri biodiesel, karena semakin pentingnya biodiesel sebagai energi alternatif di dunia.

Kata Kunci: biodiesel, ekspor, daya saing

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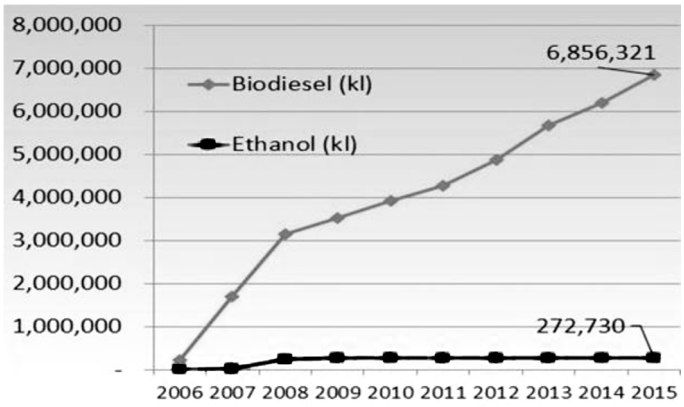
Introduction

One of the alternative energy sources as a substitute for fossil fuel (gasoline and diesel fuel) is an energy resource from plants or known as biofuel. Biofuel is a fuel processed from crops or plantations such as palm oil, corn oil, and castor oil. Two types of biofuels are developed and already relatively widely used, namely bioethanol and biodiesel. They are environmentally friendly and renewable biofuels made into a solution scarcity of fossil energy in the future. Moreover, the primary source, palm oil has relatively low production cost because of low fertilizer, water, and pesticide needed for the plantation, and has higher production yield (Mekhilef et al., 2011).

Across countries, the significant growth of renewable energy use had stimulated by national policies in several countries, rising oil prices, and environmental issues. Precisely, it is predicted that bioenergy would become the single most important renewable resource in 2030, which can account up to 60% of total final renewable energy use (Nakada et al., 2014). Such a transition to bioenergy is expected to generate new employment, environmental protection, and economic diversification. Besides, export opportunities from this green sector can also create positive socioeconomic impacts at local and national levels, especially in rural communities (Junginger et al., 2008). Admittedly, these bioenergy potentials need a reliable supply and demand at bioenergy trade on the global market.

Figure 1. Biofuel production capacity in Indonesia from 2006 to 2015



Source: APROBI (2016)

Indonesia, as an agricultural country, has many resources to supply bioenergy in forms of biofuels (biodiesel and bioethanol). Indonesian biofuels production over the last ten years has been increased significantly, mainly for the biodiesel. In 2015, the biodiesel production reached 6,856,321 kiloliters (APROBI, 2016). The development of biodiesel and bioethanol production show in Figure 1; it appears that biodiesel production has increased significantly from 2006 to 2015. Greater availability of land, stable climate conditions for agriculture, and lower labor costs have become comparative advantages for Indonesia to produce biofuel. It shows that Indonesia has a vast potency to supply biofuel, particularly biodiesel, to the world.

Nowadays, biodiesel has a high potency since it is the best alternative for diesel fuels in diesel engines. Biodiesel has better efficiency than gasoline and also environmental friendly

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(Demirbas, 2007). Biodiesel production in Indonesia is mostly trading abroad (export). Regulations relating to the export of biodiesel are taxes and export prices. Ministry of Finance Regulation No.128/PMK.011/2013 states that oil palm, crude palm oil (CPO), and its derivative products are subject to a progressive export tax. The progressive export tax is intended to encourage industry growth and to increase the exports of its derivative products. Meanwhile, the determination of biodiesel export prices based on the Ministry of Trade Regulation No.54/M-DAG/PER/9/2013. Based on the regulation, Biodiesel Export Price Benchmark shall be determined based on the international price of Chemical Information Service (CIS) Asia.

Furthermore, according to Wijaya (2015), the policy of subsidizing biodiesel producers can increase the rate of biodiesel export in Indonesia. The Indonesia Oil Palm Estate Fund (BPDP) has provided a subsidy to Indonesia's biofuel producers. The agency collects the palm oil export levy and then redistributes it to the biofuels producers who sell their products for B20 mixing. This subsidy was expected to support Indonesian biodiesel industries based on their production capacity in order to meet domestic and export demands.

Although Indonesia's Biodiesel exports are quite high, however, this trade has been threatened by several developments. The European Union (EU), one of the world's largest consumers of biodiesel, implemented new sustainability criteria in 2011 that effectively de-list palm oil biodiesel from several countries as qualifying for its quotas and support policies (Mukherjee & Sovacool, 2014). The policy applied to the production of biodiesel imports from developing countries. The restrictions on land use and the requirement proof made difficulties for developing countries to produce biodiesel for the EU market (Kerr, 2016). With this policy, biodiesel exports from Indonesia to the EU declined. Moreover, the United States banned biodiesel from palm oil the use of reason by the Environmental Protection Agency (EPA). Application of the EPA made palm oil from developing countries not to meet the required binary sustainability threshold (Gorter et al., 2015).

However, Indonesian biodiesel exports have fallen for three consecutive years as demand in China and Europe dried up due to the increasing competitiveness of fossil fuels and changes in duties (USDA Foreign Agricultural Services, 2016). In 2014 exports fell from 1.7 to 1.3 billion liters, and 2015 exports further dropped to 341 million liters. As a result, the expectation that (despite some recovery in oil prices) biodiesel stayed less competitive with fossil diesel. Indonesia's biodiesel exports continued to fall, estimated at 200 million liters in 2016 and 100 million liters in 2017 (USDA Foreign Agricultural Services, 2016). It raises questions about what factors influence Indonesia's biodiesel export to the central destination countries.

The global trade analysis of Indonesian biodiesel industry is still unobserved genuinely. Arip et al., (2013) had investigated Indonesian palm oil competitiveness, but the focused only on micro sectors performance such as the palm oil industry and its strategies for the development. Articles that point out Indonesia global trade issues of palm oil, particularly on biodiesel, are rare. It is, therefore, compulsory to know regarding

the issues. Moreover, it is also crucial to identify the discrepancies between potential estimates and trade statistics of Indonesian palm oil. This paper attempts to analyze a framework of Indonesian biodiesel industry that compromises in terms of non-tariff policy coverage on biodiesel trade. As far as we know, this paper is genuinely analyzed biodiesel trade performance in Indonesia that had approached with such a detailed data set spanning a substantial period. It hopes that a potential assessment in developing selected national green sectors can generate economic diversification, new employment, and export opportunities while promoting sustainable development. This study specifically aims to identify the competitiveness of Indonesian biodiesel export and to analyze the determinants of export for Indonesian biodiesel.

Method

This research uses secondary data. The data used are from 2012 to 2015 that comes from seven countries as the seventh top export destination of Indonesian biodiesel (Australia, Singapore, Spain, USA, China, Netherland, and South Africa). The data obtained from UN COMTRADE, WTO, and other relevant sources. The focused commodities in this study are biofuel/ biodiesel/ bioenergy, HS 6 digit of 382600, particularly HS 12 digit of 3826009010 commodities that have high export values for Indonesia. There are two analysis tools applied in this study. Firstly, analysis of Revealed Comparative Advantage (RCA) is used to identify the competitiveness of Indonesian biofuel trade in international markets. Secondly, a gravity model is applied to analyze the determinants of export for Indonesian biodiesel.

Revealed Comparative Advantage (RCA) is used to evaluate the role of commodity exports to the country's total exports, compared with its share of the world trade. So, the RCA index can measure the export performance of the commodity from a country. The result of export performance determine by the relative competitiveness of similar products from other countries. This result reveals a comparative advantage of a country in international trade (Hillman, 1980; Bender & Li, 2002). There are many empirical studies on trade, especially for palm oil commodities, that devote to the analysis of comparative advantage that based on RCA (Arip et al., 2013; Dewanta et al., 2016). Following those previous studies, RCA calculation method is as follows:

$$RCA = \frac{X_{ia}/X_a}{X_{iw}/X_w} \qquad (1)$$

Where: RCA is Competitiveness level of Indonesian biodiesel in export destination countries; Xia is Export value of Indonesian biodiesel in export destination countries; X^a is The value of Indonesia's total exports in export destination countries; X_{iw} is Export value of world biodiesel in export destination countries; X_w is The value of the world's total exports in export destination countries.

This formula calculates the relative export ratio of a biodiesel commodity against the total export of Indonesia to the relative ratio of the total export of the same commodity against the total export value of the world. If the value of RCA is more

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significant than one (RCA > 1), Indonesia has a comparative advantage or Indonesian competitiveness above the world average for the commodity. If the RCA is less than one (RCA < 1), it means that the comparative advantage is low under the world average or weak competitiveness for the commodity. The higher RCA value indicates a high level of comparative advantage.

One of the most useful frameworks in modeling the development of trade among countries is the gravity model. This model derived from various international trade theories. The gravity equation in international trade is one of the most robust empirical findings in economics: bilateral trade between two countries is proportional to size, measured by GDP, and inversely proportional to the geographic distance between two countries.

Many studies have used gravity models to analyze the variables that affect the export or import of a commodity (Veeramani & Saini, 2010; Anggara & Widyastutik, 2016. Some variables such as national income/expenditure, exchange rate, price, barriers of trade, and environmental indicators commonly used in building international bioenergy trade modeling (Larmers et al., 2011; Larmers et al., 2012; Junginger et al., 2008; Junginger et al., 2011; and Lewis & Wiser, 2007).

This article analyzed the determinants of export for Indonesian Biodiesel (Biodiesel and mixtures not containing or containing less than 70% by weight by petroleum oils or oils obtained from bituminous minerals; HS code: 382600). The factors are real GDP of importer countries for Indonesian biodiesel, the exchange rate of Rupiah to importer country currencies, commodity prices, and non-tariff barriers, as well as geographical distance between Indonesia and importer countries. The tariff had deleted from the initially expected model of the gravity since incomplete data.

In this study, the gravity model is using in a logarithmic natural (Ln) form. So the elasticity of export is a constant concerning the explanatory variables. Elasticity is estimated utilizing an Ordinary Least Square (OLS) cross-country panel regression with random effect. We expected the real GDP to have a positive impact on trade and the distance to have a negative effect. The specific model is as follow:

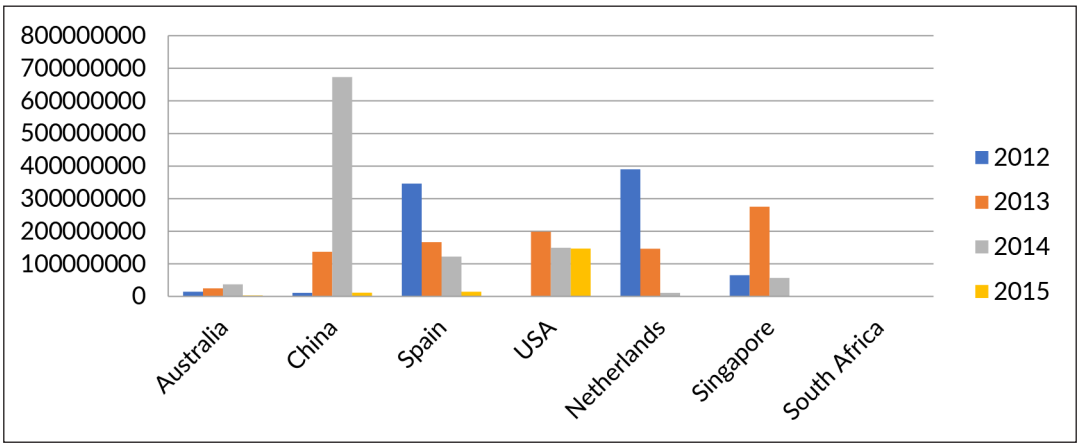
$$Ln\_X_{ijt} = \alpha_0 + \beta_1 Ln\_GDP_{it} + \beta_2 Ln\_DIST_{jt} + \beta_3 Ln\_RER_{jt} + \beta_4 NTM_{ij} + \beta_5 Ln\_P_{jt} + \varepsilon_{ijt.} \quad (2)$$

Where: X_{ijt} is biodiesel export value (US$); GDP is real GDP countries (US$); DIS is geographical distances (km); RER is exchange rate (Rp/Local Currency); NTM is non-tariff barrier (Frequency); P is biodiesel prices (US$).

Results and Discussions

Indonesian export value of biodiesel for all countries in the world goes only to the seven countries i.e., Australia, China, Spain, USA, Netherlands, Singapore, and South Africa. As seen in Figure 2, it is showing that China is the largest of the destination country of biodiesel export in 2014. However, it dramatically dropped in 2015. South Africa is the lowest export values of Indonesian biodiesel.

Figure 2. Export Value of Indonesian Biodiesel to Destination Countries From 2012 to 2015



Source: UN COMTRADE (2017)

Based on data from UN COMTRADE, from 2012 to 2015, Indonesian biodiesel product (HS code: 3826) having strong competitiveness with the value of RCA > 1 index in each export destination country. Table 1 shows the results of measuring the competitiveness of Indonesian biodiesel.

Table 1. Indonesian Biodiesel Competitiveness (RCA) in the International Markets in 2012-2015

Country	Year				Average
	2012	2013	2014	2015	
Australia	37.2	12.0	5.2	1.8	14.1
Singapore	2.5	21.7	14.4	0.0	9.7
Spain	32.4	42.9	59.7	10.1	36.3
USA	0.1	24.1	35.1	23.0	20.6
China	4.9	10.8	11.1	7.3	8.5
Netherlands	22.3	13.9	1.0	0.1	9.3

Note: South Africa cannot be calculated because of uncomplete data

Based on RCA measurement results, the competitiveness of Indonesian biodiesel products in mostly all countries are strongly competitive, which can show from the index of RCA> 1. Only in Singapore and the Netherlands, the Indonesian biodiesel competitiveness was low in 2015 and 2012. Indonesian biodiesel competitiveness is relatively most robust in Spain in which the average of the RCA index was 36.3 from 2012 to 2015. It means that Indonesian biodiesel had a comparative advantage over the average of the world, so it had excellent competitiveness in biodiesel. Following Spain, RCA index value of Australia, and China had an excellent performance since they have RCA index values more than 1 (RCA >1) consistently from 2012 to 2015. Indonesian biodiesel has relatively weak competitiveness in Singapore and the Netherlands.

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The result of the gravity model to analyze factors contributing to the export value of Indonesian biodiesel shows in Table 2. The value of adjusted R-squared shows the correlation between dependent and independent variables as 0.530. It means that all explanatory variables can explain by the model in the level of 53 percent in the condition ceteris paribus. So, it is a relatively strong correlation between dependent and independent variables.

Table 2. Determinant Factors Influencing Export Value of Indonesian Biodiesel

Variables	Coef	Prob
Constant	-55.772** (- 3.55)	0.000
LN_GDP	1.345** (2.86)	0.004
LN_RER	2.465** (3.40)	0.001
LN_P	2.242** (3.80)	0.000
LN_DIST	-1.845* (- 1.63)	0.103
NTM	0.011 (0.05)	0.960
R-sq: within	0.556	
R-sq: between	0.509	
R-sq: overall	0.530	
Prob (F-stat)	0.000	

Note: * and ** refers to significance testing under 15% and 1% significance level

From Table 2 it can also be seen some factors significantly influence the export of Indonesian biodiesel i.e., GDP, the exchange rate (RER), price of biodiesel (P) and distance between Indonesia and the importer countries. If Indonesia aims to maintain the sustainability of biodiesel export, those variables should give more attention. Only variable of non-tariff measurements (NTMs) does not have a significant effect on the biodiesel export. It seems that trade restriction for CPO products, including biodiesel, does not affect the Indonesian export. It might cause Indonesia still has alternative export destinations, and the amount of biodiesel export is relatively still small.

Variable of GDP gives a significant influence on Indonesian export for biodiesel. The coefficient value of GDP is 1.345 means that every increasing 1 percent of GDP of destination countries will increase Indonesian biodiesel exports 1.345%. It makes sense since the high incomes of the nation (GDP) encourage people in the destination countries to demand biodiesel higher.

Similar to GDP, the variable of the exchange rate also gives significant influence to Indonesian export. Every increasing 1 percent of exchange rate will increase Indonesian

exports by 2.465%. In this case of the real exchange rate; the coefficient is positive; it means that a depreciation of the Rupiah against Dollar will increase the Indonesian exports of biodiesel, to the destination countries. In other words, an appreciation of Dollar currency toward Rupiah will increase the countries' import of biodiesel. This finding is parallel to a study by Wulandari (2009) who investigated the correlation between Indonesian export of CPO and exchange rate.

Variable of biodiesel price affects significantly in the level of 99% on Indonesian exports of biodiesel to the destination countries and gives a positive coefficient sign. If the price of biodiesel increases by 1 percent, it means that Indonesian exports of biodiesel to the destination countries will increase by 2.242%. Since the price is at Indonesian borders, the high price of biodiesel will encourage producers to sell abroad. This result has the same result as Wulandari (2009).

Distance variable also has a negative correlation and significant impact on the biodiesel export. The value of the coefficient is -1.845, it means that when the distance of destination countries increases 1 km, Indonesian exports of biodiesel will decrease 1.845 million USD. This result makes sense since the long distance to ship biodiesel, the higher price of transportation, which causes higher biodiesel price. This result of the study is similar to Leduc et al., (2009), which appropriate locations of biodiesel production in India influence the competitiveness, eventually, cause low transportation cost.

The results of this study show that mostly on economy variables influence the export of Indonesian biodiesel. Other researches are needed to investigate the social and environmental aspects of the model deeply. Some studies, for instance, Papilo et al., (2018); Zafeiriou et al., (2014); and Kumar et al., (2013) point out that the social and environmental aspects are essential variables for the sustainability of Indonesian palm oil trade. They have caused disapproval of Indonesian bioenergy products in the global energy market, i.e., the European Union.

Conclusion

Study results showed that Indonesia has relatively high competitiveness in biodiesel in the international market. It is showed by strong competitiveness in Australia, China, Spain, USA, and South Africa as the leading Indonesian export destination. Indonesian biodiesel competitiveness is relatively most robust in Spain followed by Australia, China, and the USA. Conversely, low competitiveness occurs in Singapore and Netherlands markets.

This study also results that factors significantly influence the export of Indonesian biodiesel are GDP, exchange rate, price of biodiesel, and distance of trade partners. If Indonesia aims to maintain the sustainability of biodiesel export, those variables should give more attention. Since the development biodiesel industry gives result in multiplier effects in the country's economy growth (GDP), the government should be more concern with the development of the biodiesel industry both in the downstream and upstream industries. The efficiency of transportation cost should also be considered related to the distance variable that will decrease Indonesian biodiesel export as longer or higher of distances (cost). The higher distances reflect a high transportation cost. In order to decrease transportation cost,

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the government should provide proper infrastructure development of international trade and its facilities for loading and discharge.

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