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DOES BIODIESEL INITIATIVE SAVE THE STATE BUDGET?

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Abstract. The Indonesian government has taken the initiative to gradually convert fossil based diesel fuels into biodiesel. This initiative aims to save the state budget as well as to encourage the use of renewable and environmentally friendly alternative energy. This study aims to analyze the effectiveness of the initiatives through investigating the effect of crude oil prices and implementation of the initiative on the price of crude palm oil as the raw material of biodiesel. The results of the study revealed that the crude palm oil increase as the crude oil price increase and the initiative in force, but not as much as the increase in the crude oil. The results imply that the initiative, at a certain level, able to save the state budget from subsidies for energy. This study used ordinary least square to analyze data from 2004, January until 2019, March.

Keywords: Crude Palm Oil (CPO), Crude Oil, Biodiesel (B20)

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JEL Classifications: Q01, L25

1. Introduction

Energy consumption increased in the word together with increase of population and scale of economic activities.

Energy consumption in Indonesia, similarly, increases rapidly in line with economic and population growth. Currently, Indonesia is still very much dependent on fossil fuel for its energy source and the non fossil alternative renewable energy has not been utilized optimally. Data of fossil energy reserves from Ministry of Energy and Mineral Resources (MEMR) shows that the proven reserve of oil is about 7,251.11 MMSTB and with an average production rate of 338 million barrels in 2016. Reserve oil will end in 9 years.

Crude oil import will increase in 2016, crude oil import amounted to 148 million barrels and will increase by 6.4 times to 953 million barrels in 2050. Oil import has become a top priority domestic oil fuels. Government should make sure it doesn't impact to types and oil fuels products that are expected. In 2016, oil fuel is mostly consumed by transportation sector (80.7%), followed by industrial sector (8.1%), power plant (5.5%), others (3.9%), households (1.0%) and commercial (0.8%).

Currently, the largest share of oil fuels import is gasoline by 68.6%, followed by diesel oil (25.3%), avtur (4.4%), fuel oil (1.1%), and the rest is kerosene. Oil fuels import will increase from 3.64 million kl in 2016 to 29.14 million kl in 2050 or more than eight times in 34 years.

The data also shows that Indonesian's final energy demand is still depend on oil. This data form Energy and Mineral state that energy demand will increase from 795 million BOE in 2016 to 4.569 million BOE by 2050. By 2050, the largest share of final energy demand is oil fuels at 40.1% from all energy.

Oil fuels (including biodiesel) demand increases with an average growth of 4.7% per year. In 2016 the demand reached 69.1 million kl and will increase to 326.6 million kl in 2050. This demand is mostly met by imports. Oil fuels import in 2016 reached 22.9 million kl and will increase by 6.3% per year to 182.3 million kl in 2050.

Change of international crude oil and fuel price impacts economic state of both, oil importing and exporting countries (e.g. Humbatova et al., 2019; Masood et al., 2019). When the crude oil price stays at around US$125 per barrel, Indonesia has to provide around 240 trillion Rupiah just for fuel subsidy. This will result in reduced government capacity to finance development programs in needed sectors such as health, education, basic human services, and infrastructures either in rural or in urban areas. It means that the government has very limited resources to stimulate and maintain productivity and economic growth.

In case to reduce fossil fuels, the Government would prepare a road map of the use of biofuels on the transportation of land, sea, air and rail transportation until 2050. The target of biofuels mixing in RUEN is consistent to the Biofuel Mandatory determined in Minister of Energy and Mineral Resources Regulation no. 12 of 2015. As a follow-up to the efforts energy diversification for the transportation sector, the Ministry of Energy and Mineral Resources issued Ministerial Regulation no. 25 of 2017 on the Acceleration of Gas Fuel Utilization for Road Transportation.

Main objective of the policy on the use of efficient technology and fuel substitution is to reduce oil fuels consumption, which, in the last few years, has played a major role in draining the country's foreign exchange due to fuel imports. This paper seeks if this B20 policy effective to save staate budget during crude oil consumption change with palm-oil-based biodiesel in Indonesia (as well see e.g. Areiqat et al, 2019).

2. Literature Review

The need for fuel in 2050 will decrease by 45% against the baseline. The decline was around 69% contributed by the use of efficient technology followed by mass transportation (15%), electricity costs (8%) and the rest almost the same between CNG and befouls. This shows that the use of efficient technology is very influential on reducing fuel consumption. Therefore, the government needs to establish the standard for fuel consumption according to the type of vehicle.

The second biggest renewable power capacity is biomass, with 1.8 GW of installed capacity as of 2016, out of an estimated total potential of 50 GW. Most of the plants (94%) are not connected to the grid (PwC, 2017). Biomass utilisation outside the electricity sector is in the form of biodiesel, of which about 3.7 billion litres were produced in 2016. Indonesia ranks as the 4th leading biodiesel producer in the world (Statista, 2018), of which some 90% is produced from palm sludge oil (USDA, 2017). Biofuel production and domestic consumption are encouraged through the "biofuel mandatory programme".

The use of biofuels started in 2006 with the issuance of Presidential Regulation No. 5/2006 concerning the target of biofuels in 2025 amounting to 5% of national energy mix. In 2015, the Government issued MEMR Regulation No. 12/2015 concerning biofuels mandatory as a replacement for the 2 (two) previous MEMR regulations. In the baseline, the use of biodiesel as a substitute for diesel oil has been considered in accordance with the target of biodiesel mixtures inj MEMR Regulation No. 12/2015, which is 20% for the 2016-2025 period and increases to 30% for 2026-2050.

This programme sets progressive biofuel blending targets for the period 2008-25, and forms part of the government's policy to decrease reliance on petroleum-based fuels and reduce GHG emissions. MEMR regulation No.

32 defines the minimum percentage of biofuel to be mixed into fossil diesel in transportation, in industrial and commercial use, and for electricity generation. Since 2008, the blending mandate regulation has been revised several times, most recently through MEMR No.12 in 2015, raising biodiesel blending targets from 10% to 15% for transportation and industrial uses, and to 25% for electricity generation.

Oil fuels substitution case is a case of increasing penetration of biodiesel and BBG in land transportation. On baseline of diesel oil demand for land transportation in Indonesia (including Jabodetabek), the potential for biodiesel penetration as a substitute for diesel oil follows biofuels mandatory stated in MEMR Regulation 12/2015. In this regulation, biodiesel utilization in 2020 is 30% of biosolar (a mixture of diesel oil with biodiesel) and is considered constant until 2050. In the case of substitution of oil fuels with biodiesel, the biodiesel mix in biosolar is assumed to increase to 35% starting 2030. Increasing the use of B30 to B35 starting in 2030 will reduce diesel oil demand from 82 thousand kl in 2030 to 219 thousand kl in 2050.

Biodiesel will not be absorbed optimally if the price is higher than diesel oil. In addition, the current vehicle specifications in Indonesia are difficult to use B-20 because it will increase vehicle operating costs. However, increased use of biodiesel will reduce the import of diesel oil and saving the country's foreign exchange. For this reason, the Government needs to create formulas and policies that do not burden biodiesel users and automotive manufacturers.

Increase the use of biofuels based on palm oil. Palm oil productivity is higher compared to other raw materials also soil and climate conditions in Indonesia have proven to be suitable for oil palm plantations. Based on Palm Oil Analytics, Indonesia is the largest palm oil producers in 2016. Beside that, Indonesia also number one exportir in world with domination 56% of total production CPO in the world and 57% from total export to all nations in the world.

Spending on fossil fuel and electricity subsidies put pressure on the country's fiscal capacity and, until recently, it was a major contributor to its fiscal deficit (IEA, 2016). Additionally, the burden of energy subsidies has made it difficult for the government to allocate its budget to long-term investments in essential public services – such as infrastructure, education, health, and social protection – that are beneficial for economic growth and development (Indonesian Administration, 2017).

Mainly as a result of high spending on energy subsidies, the Indonesian government's expenditure on priority areas has been low, especially compared with other countries. Between 2000 and 2013, Indonesia spent an average of 3.6% of GDP per annum on public investments and public private partnerships in infrastructure, compared with 17.7% in China, 11.3% in Malaysia and 6.3% in Thailand. The shares of health and social assistance expenditure in GDP have also been significantly lower than both the average for Southeast Asian countries and the low and medium income countries averages.21 Low revenue collection is also a major cause of underspending on priority sectors (The World Bank, 2018).

From 2014 onwards, falling energy prices and substantial reforms adopted by the new government have allowed significant reduction in the energy subsidy bill. In one year, between 2014 and 2015, the government saved IDR 120 trillion (USD 9 billion) as fossilfuel subsidy outlays dropped from IDR 240 trillion (USD 20 billion) to IDR 60 trillion (USD 4.5 billion). The share of fossil fuels and electricity subsidies in total government expenditure fell by 12.5 percentage points, while their share in GDP decreased from 4% to 1.5%.

This important cut in energy subsidies enabled the government to reallocate spending towards productive sectors. In 2015, more than 60% of fossil-fuel subsidy savings were invested in infrastructure and rural and regional development projects. The rest was split among social welfare programmes (12%), health and education (2% and 5% respectively), and agricultural subsidies (14%). Savings have mainly been allocated through transfers to ministries, state-owned enterprises, and regions and villages.22 Overall, between 2014 and 2015, the share of health, education and infrastructure spending in total government expenditure increased by 0.7, 1.5, and 5.5 percentage points respectively.

3. Research Methodology

A Logarithmic Multiple Regression using Ordinary Least Squares (OLS) method was employed with crude oil price as the dependent variable and the other variables as independent variables. Least square approach was used to determine a line of best fit by minimising the sum of squares created by a mathematical function. A "square" is determined by squaring the distance between a data point and the regression line. The least square approach limits the distance between a function and the data points that a function is trying to explain (Ray, 2015).

Amarfio, E. M. et al. 2017 using OLS to analyze employed a log-log multiple regression with oil price as the response variable and the other factors mentioned as predictor variables. The results from the regression analysis were complemented with trend analysis of these factors with oil prices. It was revealed from the results that all explanatory variables examined save natural gas consumption and wars were found to have significant impact in the oil price determination.

A, Norhidayu. et al. 2017 using Least Square (LS) and robustness check to empirically test the CobbDouglas (C-D) production function for the palm oil production sector in Malaysia with the validity of C-D's assumptions. The significance of factors such as capital, labour and utilisation rate in the production of Crude Palm Oil (CPO) is also tested in the study. he results show a positive and significant relationship between the production of CPO and labour, capital, and the utilisation rate.

The dependent variable is global crude palm oil price and denoted as PCPO. The independent variables were; global crude oil price that denoted as PCRUDE OIL, Industrial production index that denoted as IPI, and dummy variable shows implementation of B20 policy.

Model spesification:
Log regression model tha applies; it is expressed mathematically as:

$$\ln(P_{CPO}) = C + \beta 1 \ln(P_{CRUDE\ OIL)} + \beta 2 \ln(IPI) + D1$$

Hypotheses:

H1: all independent variables are significant influence dependent variables

H0: all independent variables are not significant influence dependent variables

4. Result and Discussion

The results of computation are presented in Table 1 below.

Table 1. correlation between crude palm oil price and crude oil price

Variable	Coefficient	T-Stat	Prob.
LOIL	0,708691	14,78076	0,0000
LIPI	-0,845260	-4,911967	0,0000
D1	0,292539	6,668416	0,0000
C	7,463296	8,485800	0,0000
R-squared	0,609916	Mean dependent var	6,469918
Adj. R-squared	0,603378	S. D. Dependent var	0,325042
F-statistic	93,29171 (0,0000)		

Based on model spesification above, this model was select because there is correlation between crude palm oil price and crude oil price. The data that writer use is monthly time series from 2004, January until 2019, March. The regression was developed as follow;

$$\ln(P_{CPO}) = 7{,}463 + 0{,}708\ln(P_{CRUDE\ OIL}) - 0{,}845\ \ln(IPI) + 0{,}292D$$

$\ln(P_{CRUDE\ OIL})$ at 1% significance level, crude oil price confirmed as a significant determinant of crude palm oil price. With a coefficient of 0,708, it indicates that an increase in crude oil price by 1% will leads to increasing crude palm oil price. This confirms with economic theory where an increase in the demand for a good drive it prices upward (demand and prices are directly related). According to Möbert (2007), the upward trend of oil prices at the spot market are as a result of increasing demand in emerging markets.

ln(*IPI*) at 1% significance level, industrial production index confirmed as a significant determinant of crude palm oil price. With a coefficient of 0,845, it indicates that an increase in industrial production index by 1% will leads to decreasing crude palm oil price. This variable set as control variable.

Dummy variabel at 1% significance level, implementation B20 policy confirmed as a significant determinant of crude palm oil price. With a coefficient of 0,292, it indicates that implementing B20 policy will leads to increasing crude palm oil price. B20 change all fossil fuels consumption into biodiesel because it's obligation based on MEMR Regulation 12/2015. Consumption will increase demand, as the theory for a good drive it prices upward (demand and prices are directly related).

Three independent variables are important to influence crude palm oil price. Crude oil price have positive and strong correlation to dependent variables because if crude oil price increase all people will look into crude palm oil and the demand will rise as price rise also. People will look crude oil and crude palm oil as subtitution goods, when the nature of subitution goods is when demand other goods rise, it will increase subtitution goods.

Examining the goodness of fit statistics, the null hypothesis of the F test is rejected at 1 % significance level (p value of 0.000) proving the model generated is statistically significant. The results also indicated that about 60.3 % of the variation in oil price is caused by the factors present in the regression equation. With a relatively low p value of 0,325042, this model provides a very good fit for the available data values. The average distance of observed logged oil price values from that generated by the fitted plot is approximately 0,325042. The p value of the normality test for residuals was 0.045** ≈ 0.005, ** at 95 % confidence level as this approximation will have a negligible effect on the accuracy of the values generated. This regression model is thus appropriate in the analysis of the crude oil price determinants.

Conclusions

Four different factors were evaluated in this research using regression models. The evaluated factors were shown to behave in accordance with hyphothesis of the research even though a single method proved some factors such as industrial production index to be significant but negative correlation. From the analysis, it can be proven that, all independent variables are significant to dependent variables. Crude oil price and policyB20 are significant with positive correlation, it means when both independent variables are increased, crude palm oil price will also increase, ceteris paribus. Industrial production index have negative correlation with dependent variables that mean if industrial production index increase, crude palm oil price will decrease. It shows that policy about B20 can save state budget that knows by coefficient of crude oil. The difference of number between coefficient and variable crude oil price state that state can save some money by using biodiesel if crude oil price increase.

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