Maintain Sustainable Development Environment: Exports of Crude Petroleum, Coal, Natural Gas and Gross Domestic Product in Indonesia

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Abstract. The utilization of crude petroleum, coal and natural gas becomes an interesting topic because it does not only imply the national sustainable development goals (SDGs) but also becomes a source of state revenue in the form of exports to finance the state budget (in Indonesian, APBN), as in Indonesia. The objectives of the research are: (1) to examine the contribution of crude petroleum export value to GDP; (2) to examine the contribution of coal export value to GDP and (3) to examine the contribution of natural gas export value to Indonesia's GDP. This study uses quantitative approach under the type of associative research. The main data source of the study used in this research is secondary data published annually by the Asian Development Bank (ADB) in 1981-2014. To test the contribution of independent variable to the dependent variable, multiple linear regression analysis tools is used based on the value of Standardized Coefficients Beta. The results showed that with One-Sample Kolmogorov-Smirnov Test, the data was normally distributed. The classical autocorrelation assumption test obtained the result of Durbin-Watson that was 1,275 so that there is no autocorrelation in the data. The VIF value of each independent variable was less than 10 with tolerance value bigger than 0.01 so it did not contain multicollinearity problems. Heteroskedasticity test using Spearman's rho obtained result that data free from assumption of heteroscedasticity. The Heteroskedasticity test using Spearman's rho resulted that the data was free from the assumption of heteroscedasticity. Meanwhile, the results of the hypothesis testing are: (1) there is a positive contribution of export value of crude petroleum to GDP, but not significant; (2) there is a positive and significant contribution of coal exports to GDP and (3) natural gas has an insignificant negative contribution to GDP. These results indicate that Indonesian coal has a comparative and competitive advantage, and the opportunity to meet the international market remains wide open. In contrast to crude petroleum, crude petroleum exporting countries incorporated in the Organization of the Petroleum Exporting Countries (OPEC) limit the amount of production to maintain international price stability.

Keywords: *crude petroleum, coal, natural gas, exports, environment, GDP*.

1. Introduction

When we talk about life and humans as social beings, it cannot be separated from environmental aspects. This environment is what drives people to interact with one another to fulfill their life needs. The environment is complex and universal which is usually associated with human life which forms a system of mutual interaction and need. The environment is not only interpreted as a household environment or household community but also other variables that surround humans and are needed for human life. As a whole, the environment also includes air, gas, water, land or land, crude petroleum, coal, natural gas, plants, animals, culture and so on whose existence is needed by humans.

In general, the environment is divided into two that is the natural environment and artificial environment. The extent of the study of the environment and the aspects that influence it, the study is limited to the study of environmental use in the narrow sense of the natural environment. This aspect is a creation of God Almighty and is granted to meet the needs of human life which is unlimited. The natural environment in question is crude petroleum, coal and natural gas. This type of natural resource is essentially unlimited. Yet, due to the limitations of human knowledge to explore it, its nature is limited for all.

Regarding natural resources in the form of crude petroleum, studies in the United States found that there are many crude petroleum drilling companies that have a negative impact on polluting the soil, water and surrounding ecosystems both in the short and long term. Other problems are the use of coal which has an impact on the environment at a regional or global scale [13]. Crude petroleum production also contributes positively to Domestic Product Gorss (GDP) in Canada. However, this crude petroleum exploration creates socio-cultural problems and is faced with the problem of environmental risk in the northern boreal forest area [7]. Environmental pollution as an implication of crude petroleum exploration and coal use that does not conduct an analysis of environmental impacts can lead to environmental costs, which are not only related to financial but also non-financial, such as pollution of water and land ecosystems.

Then, studies in Turkey found extraordinary economic growth in the last 4 decades caused by the energy industry. The energy industry, especially coal, encourages an increase in economic growth in Turkey. Other economic achievements affect the budget deficit decreased from more than 10% to less than 3% [1]. Turkey's economy has experienced a significant increase as a result of coal exports, even able to reduce the budget deficit. This is certainly an economic achievement that needs to be watched out because natural resource exploration is very vulnerable to environmental problems.

Short issues related to the production of crude petroleum, coal and natural gas above provide insight that energy production in many countries not only has a negative impact on the natural environment both on land and in the water but also has an impact on increasing GDP, especially in Indonesia. GDP describes the total output of goods and services of a country and is used to measure the overall economic performance of a country in the fields of consumption, investment, government expenditure, exports and imports [9]. This consumption, investment, government expenditure, exports and imports are components in GDP [4]. While Indonesia's GDP in the period 1981 to 2014 can be seen in the figure 1.

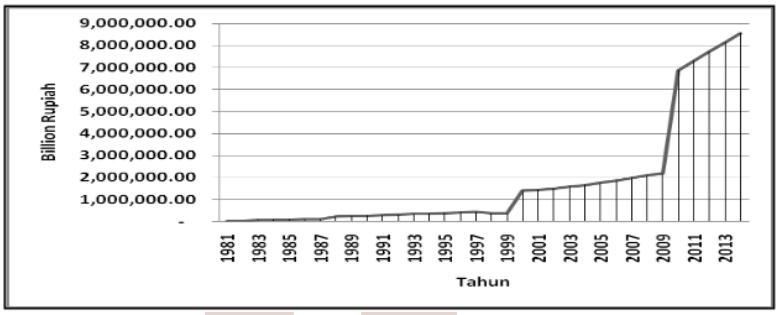

Figure 1. GDP Indonesia 1981–2014

According to figure 1, Indonesia's GDP is based on constant prices using the 2000 and 2010 base years, the tendency to increase. This GDP increase in theory cannot be separated from several components, one of which is exports (especially crude petroleum and gas exports). While the development of Indonesia's crude petroleum and gas exports is as in the figure 2.

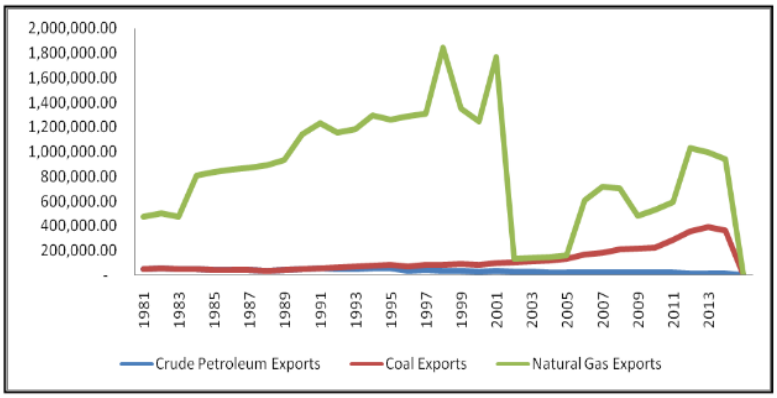

Figure 2. Export Value of Indonesian Crude Petroleum, Coal and Natural Gas 1981-2014

According to figure 2, in the period of 1981-2014 crude petroleum was no longer an Indonesian export commodity. Export commodities are in the form of crude petroleum and natural gas in Indonesia began to shift from crude petroleum to coal and even natural gas. This shift is certainly very beneficial for Indonesia because the environmental risks caused by natural gas are smaller compared to coal and crude petroleum. While the natural gas boom has occurred in 1998, 2001 and 2012. Based on the thoughts and brief observations above can be put forward the research questions, namely: (1) how does the value of crude petroleum exports to GDP contribute?; (2) how does the value of coal exports contribute to GDP? and (3) how is the contribution of natural gas exports to Indonesia's GDP?.

2. Method

The design of this study uses a quantitative approach with the type of associative research. Some considerations using a quantitative approach include: the main data of this study in the form of numbers, using deductive thinking patterns because they are based on general theories or general rules, generalizing samples and testing hypotheses [6]. While the hypotheses to be tested in this study are: (1) there is a significant contribution of the value of crude petroleum exports to GDP; (2) there is a significant contribution to the value of coal exports to GDP and (3) there is a significant contribution to the value of natural gas exports to GDP. This type of associative research was chosen with the consideration that this research was directed at testing the relationship of two variables

The main data source of the study uses annual secondary data or time series published by the Asian Development Bank (ADB) for the period 1981-2014. Considering the statistical method used is parametric statistics, the stages of testing this research data are: (1) data normality test; (2) autocorrelation test (3) multicollinearity test; (4) heteroscedasticity test and (5) multiple linear regression test. Whereas, to examine the contribution of independent variables (exports of crude petroleum, coal and natural gas) on the dependent variable (GDP), multiple linear regression analysis is used based on the value of the Standardized Beta Coefficients.

3. Result

3.1. Residual Normality Test

Residual normality test is an important requirement in parametric statistical tests. Many methods are used to conduct data normality tests, for example One-Sample Kolmogorov-Smirnov Test selected in this study. The results of the residual normality test show that the Asymp value. Sig. (2-tailed) of 0.370. This value is greater than the value of $\alpha = 0.05$ or 5%, so it can be concluded that the data is normally distributed.

3.2. Autocorrelation Test

Autocorrelation test aims to detect the correlation between residuals in multiple linear regression models. If there is a correlation, there is an autocorrelation problem. Whereas to detect the occurrence of correlation between residuals, the Durbin-Watson (DW) test was chosen in this study with the consideration that if the D-W number between -2 to +2 means there is no autocorrelation. Based on the data found that the DW number is 1,275, where this value is in the range of -2 to +2 so it can be concluded that there is no autocorrelation.

3.3. Multicollinearity Test

The independent variables of this study are exports of crude petroleum, coal and natural gas. Considering the number of variables is more than one, multicollinearity testing is necessary. Meanwhile, to detect the occurrence of multicollinearity based on the Variance Inflating Factor (VIF) value and Tolerance value. If the VIF value is less than 10 and the Tolerance value is greater than 0.01, then there is no multicollinearity problem. The results of the data show that the VIF value of crude petroleum exports (4,138), coal exports (3,751) and exports of natural gas (1,284) are less than 10. Tolerance value of crude petroleum export variables (0,242), coal exports (0,267) and natural gas exports (0.779) greater than 0.01. Thus, the research variables have no multicollinearity problems.

3.4. Heteroscedasticity Test

Heteroscedasticity test is used to predict the model to be built. The method chosen to detect heteroscedasticity in this study is using Spearman's correlation test with guidelines if the value of Sig. (1-tailed) Spearman 's rho <α = 0.05 or 5% then heteroscedasticity does not occur. Sig value. Spearman's (1-tailed) rho crude petroleum exports (0.001), coal exports (0.003), natural gas exports (0.004) and GDP (0.003) <α = 0.05 or 5%, there is no heteroscedasticity.

3.5. Multiple Linear Regression Test

Multiple linear regression tests are carried out when the data is normally distributed and free from the classic assumptions of autocorrelation, multicollinearity and heteroscedasticity. Table 1 below is the result of multiple linear regression test, where to identify the contribution of each independent variable to the dependent variable based on the value of the Standardized Coefficients Beta.

Table 1. Standardized Coefficients Beta Test

Model	Standardized Coefficients Beta	t	Sig.
1	2	3	4
(Constant)		.000	1.000
Zscore: Crude Petroleum Exports	.148	1.298	.204
Zscore: Coal Exports	1.069	9.826	.000
Zscore: Natural Gas Exports	-.017	-.268	.790

[a] Souce: Data Sekunder, Diolah (2018).

In general, table 1 above gives an understanding that the positive contribution of crude petroleum exports to GDP is shown by the positive notation of values in column 2 (Standardized Coefficients Beta), while for column number 4 (Sig.) Shows the significance of the variable contribution of crude petroleum exports to GDP . If the value is less than the specified degree of error that is equal to 5% or α = 5% then the contribution of certain variables to GDP is not significant, and vice versa. Statistical test results (t test Sig) for crude petroleum export variables of 0.204> α = 5% it can be explained that the positive contribution of crude petroleum exports to GDP is not significant or can not be accounted for statistically, so the first hypothesis which is: "there is a contribution significantly the value of crude petroleum exports to Indonesia's GDP " is not tested.

The findings of subsequent studies can be stated that Indonesian coal exports have a positive contribution to GDP. As one of the energy sources besides crude petroleum and natural gas, this coal energy source has a significant role in generating Indonesia's GDP. This is indicated by the Standardized Coefficients Beta value, where coal has a positive coefficient on GDP with a value of t Sig. (= 0,000) <α = 5%. This value implies that coal contributed significantly to increasing Indonesia's GDP in the period 198102014. Thus it can be concluded that, the second hypothesis which reads: "there is a significant contribution to the value of coal exports to Indonesia's GDP" is tested. The third research findings of natural gas has a negative contribution to Indonesia's GDP. This result is based on table 1 in column 2 (Standardized Coefficients Beta) where the coefficient value of this variable is -0.017. This value can be explained that the higher Indonesia's natural gas exports turned out to encourage a decline in GDP in the period 1981-2014. Test the third hypothesis of this study by comparing the value of t Sig = 0.790 with α = 5%. Because the t Sig> α value is not enough statistical evidence that the value of natural gas exports contributes significantly to GDP, the third research hypothesis which reads: "there is a significant contribution to the value of natural gas exports to Indonesia's GDP" is not tested.

4. Discussion

4.1. Contribution of Crude Petroleum Export Value to GDP

Based on the results of the study, it can be explained that the value of Indonesia's crude petroleum exports has a positive contribution to GDP. These results suggest that crude petroleum is still a driver to increase GDP in Indonesia. The contribution of crude petroleum exports to GDP is indicated by the value of the Standardized Coefficients Beta which is positive-positive (table 1). In this study also explained that the contribution or effective contribution of Indonesian crude petroleum exports to positive GDP, which means that if exports increase, it will contribute to the increase in Indonesia's GDP in the period 1981-2014. Despite having a positive contribution, these results are not statistically significant.

The results of this study support studies in Nigeria, it is stated that more than 90% of the economy is highly dependent on crude petroleum commodities that have a strong relationship to economic growth. Large-scale crude petroleum exports carried out by Nigeria are not without problems, because the challenges of crude petroleum exports are very large such as environmental issues and capital flight abroad. Therefore, it is recommended to diversify its export base in the form of export of local economic production [3]. The concept of crude petroleum exports in Nigeria is different from that in Indonesia, where in Nigeria crude petroleum is a superior factor because natural resources in the form of crude petroleum are on land so that the cost of exploration is low. However, Nigeria is aware that crude petroleum is limited and there are environmental issues, so diversification is needed. The results of this study were previous researchers who explained that the discussion of GDP became a strategic issue, considering the tendency of increasing the value of GDP would encourage an increase in economic growth of a nation. While empirically Indonesia's economic growth is driven by the value of crude petroleum exports [8].

4.2. Contribution of the Coal Exports Value to GDP

Coal is a leading commodity in Indonesia in encouraging an increase in GDP. The results of this study support the research in the United Kingdom where the government issues a policy that ensures that energy supply is safe and takes into account the environment as well as reducing imports of fuel from coal sources to reduce trade deficits. Coal energy provides a strategic contribution to medium and long-term energy needs in the UK as well as other energy mixes, ensuring the safety of production, reducing dependence on imports and negative implications on the balance of payments [2]. A trade deficit occurs when the value of exports is lower than the value of imports. This high import implies a decline in national foreign exchange reserves which in turn could endanger the rupiah exchange rate against foreign currencies.

The positive and significant contribution of coal to GDP in Indonesia was contributed by the Province of East Kalimantan which has coal reserves reaching 37.5 billion tons. However, coal mining in this province is quite complex because there are problems or conflicts in the field. The problem of coal mining in forest areas is due to poor management of mining permits, lack of cross-sectoral coordination of investors, local and central government and weak supervision and law enforcement regarding mining governance in Indonesia [10].

4.3. Contribution of Natural Gas Exports Value to GDP

Negative contribution to the value of natural gas exports to GDP in Indonesia is at least caused by two things: (1) the majority of natural gas production centers in Indonesia are in the sea or offshore such as in Arun (Aceh), Bontang (East Kalimantan, Tangguh (Papua) and of course Natuna so that it requires high investment and production costs and the results are enjoyed in the long term and (2) the high level of domestic natural gas consumption for the fertilizer, petrochemical, steel, cement and other industries. confirms that natural gas exports such as Liquified Natural Gas for the case in Indonesia have a negative contribution to GDP. This result is relevant to previous research that the United States the increase in natural gas exports causes a reduction in GDP of around 0.04% to 0, 17% Higher exports also increase greenhouse gas emissions and electricity prices in the United States are around 1.1% to 7.2 % [5].

If there is a sale of natural gas abroad or exports, it can reduce Indonesia's GDP, this research is relevant to the results of studies that limit the export of natural gas to meet the domestic market can increase GDP. Thus, Indonesia's zero export gas policy contributes greatly to the national economy compared to international trade policies in the form of gas exports. Indonesia's zero export gas policy is expected to generate a national foreign exchange savings of US $ 4.9 billion per year during the 2013-2030 periods. This scenario can be implemented when the Indonesian government is able to stop all international trade agreements in the form of buying and selling long-term natural gas with foreign countries [6]. Besides exports, international trade which also affects GDP is imports. The results of studies in low- and middle-income countries can be stated that there is a negative relationship between imports and GDP per capita [12].

5. Conclusion

Exploration of natural resources such as crude petroleum, coal and natural gas always presents two things, environmental benefits and problems. The advantage if viewed from the macroeconomic aspect is interpreted in the form of increasing GDP, while environmental issues related to issues about environmental pollution and health which naturally creates environmental costs. The increase in GDP is the performance of a country which is driven by an increase in its components such as exports of crude petroleum, coal and natural gas. Indonesia's crude petroleum exports are able to boost GDP as well as exports of natural gas although it is not statistically significant. Meanwhile, coal exports significantly boosted Indonesia's GDP in the interval 1981-2014.

It is recommended for all parties to take strategic steps in finding new export commodities other than crude petroleum and natural gas. Besides, it is necessary to implement the 1945 Constitution article 33 paragraph 3 which states "Earth and water and the natural resources contained therein are controlled by the state and used for prosperity of the people ". The prosperity of the people can be realized when the people are able to buy crude petroleum and gas provided by the government. High exports related to crude petroleum and gases have no meaning when domestic consumers cannot afford it. This is what is meant by the economic sovereignty of the Indonesian.

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