


THE DETERMINANTS OF INDONESIA'S COAL EXPORTS DEMAND TO SIX ASIAN COUNTRIES

 Deni Aditya Susanto* ¹ 

 Randy Admi²
¹Master of Economics Development, Universitas Gadjah Mada, Indonesia

²Master of Economics Development, Universitas Gadjah Mada, Indonesia

ABSTRACT

Coal is one of the most needed commodities globally because of its power plants and industrial machinery. According to World Coal Institute (2018), the world coal trade is dominated by several producing countries, Indonesia (ranked 2nd with 28.21 percent). Indonesia's coal exports are influenced by determinants of demand from export destination countries. This study will test at least four demand determinants in destination countries for their effects on Indonesian exports: exchange rate, foreign exchange reserves, population, and coal production. The study used six Asian countries (Japan, South Korea, India, Thailand, Philippines, and Malaysia) over 2008-2018. The methodology used is multiple linear regression with a series of chow and Hausman tests. Each variable has been tested by t-test (partial) and f test (simultaneous), and R2 test to analyze the percentage of the influence of the model on the dependent variable. This study revealed that the variable foreign exchange reserves and population growth of six Asian countries have a significant positive effect on Indonesia's coal export. Simultaneously, the exchange rate and coal production of the destination countries were not proven to have a negative impact but positively affected coal export. All variables have a significant and partially significant effect so that the model can explain the coal export variable at 93.08 percent (Adjust R-squared).

Keywords: Coal Export, Demand Determinants

JEL Classification: C2, F1, Q31

To cite this document: Susanto, D.A., & Admi, R. (2021). The Determinants of Indonesia's Coal Exports Demand to Six Asian Countries. *JDE (Journal of Developing Economies)*, Vol. 6(1), 66-78

Introduction

Energy is an important part of the industrialization process, especially amid globalization, which requires various countries to carry out different transportation and trade functions (Salvatore, 1997). Furthermore, coal is one of the energy sources used by the majority of countries in the world. Data from World Coal Institute (2018) reports that the world's coal trade is dominated by Australia (34.17 percent) while Indonesia is ranked 2nd with coal's export of 28.21 percent from all the world coal trade. Like one of the coal exporters in the world energy trade, Indonesia has a high export value that is around 565 million tons per year (BPS, 2020). Thus, coal has become a central Indonesia's energy and mineral export commodity.

ARTICLE INFO

 Received: May 2nd, 2020

 Revised: March 8th, 2021

 Accepted: March 9th, 2021

 Online: June 1st, 2021

*Correspondence:
 Deni Aditya Susanto
 E-mail:
 deniaditya.s@gmail.com

Indonesia's coal exports of the largest market share in the world. The International Energy Outlook 2019 (Energy Information Administration, 2019) records that Indonesia dominates 28.21 percent of the world coal market, or just under Australia (34.17 percent). The destination countries for Indonesia's coal exports are China, Hong Kong, India, South Korea, Japan, Thailand, the Philippines, and Malaysia (BPS, 2020). Many factors can determine the factors of quantity demanded in the destination countries of coal export, including the number of energy needs, energy use characteristics, industrialization, and the amount of domestic coal production (Copeland & Taylor, 2004). Therefore, the factors that affect a country importing coal may vary between countries. This research will focus on 6 Asian countries as the leading export destination for Indonesian coal commodities because they are the largest Indonesian coal commodity importer. As the primary market, Japan has an Economic Partnership Agreement (EPA) with Indonesia, which includes cooperation to increase coal demand from Indonesia to Japan. This cooperation's existence due to China as a Japanese coal supplier has limited coal exports to meet domestic energy needs in infrastructure development (World Coal Institute-WCI, 2005).

Another country is South Korea. Svobodova et al. (2020) revealed that South Korea needs large amounts of coal for its power plant fuel needs. Furthermore, Malaysia has also increased the demand for coal by operating power plants. The Philippines and Thailand also experience the need for coal for power plants. By considering an increasing demand in this country, Indonesia is a country that has a strategic position in the international trade of coal in the Asian market, so coal consumers prefer to import coal from Indonesia compared to other coal producers such as Australia, Colombia, and South Africa (World Coal Institute - WCI, 2005).

Furthermore, the quantity is influenced by several factors, one of which is foreign exchange reserves. It is an important factor in import demand, especially for developing countries, because foreign exchange is the only medium of exchange on the international market. Moreover, foreign exchange reserves are an obstacle for developing countries to import the goods and services needed (Sagawa & Kolzumi, 2008). On the other hand, many countries use foreign exchange reserves to increase and reduce the amount of imported commodity to avoid a crisis with adequate foreign exchange reserves.

According to Cornot-Gandolphe (2017), the population variable is one of the key factors affecting the quantity demanded of coal imports. Their study revealed domestic electricity consumption with the possibility of coal exports. The increase in population will be in line with the increase in the amount of electricity demanded on the market to affect the amount of coal needed. Finally, the amount of domestic coal production directly affects the amount of coal import to meet the domestic needs (Shah & Vyas, 2015). When a country has a decrease in import commodity, that country should increase its domestic production. Meanwhile, when imports commodities increase, it is suspected that the country has a decline in production. So, in other words, an increase in import volume could be influenced by less domestic production (Ansari & Kumar, 2016).

The demand determinants of export destination countries have various variations. Thus, the study is needed to test several determinants of demand that affect Indonesia's coal exports. The study aims to find the determinant of the demand for export destination countries for Indonesian coal exports. The hypothesis to be tested in this study is that the exchange rate, foreign exchange reserves, and destination countries' population have a significant effect on exports. Meanwhile, the amount of coal production in destination countries hurts Indonesia's

coal exports. Finally, this research contributes to finding the determinants of the demand for export destination countries for coal to be used as a basis for consideration of international trade policies. This study will also add to the theory of international trade with a more specific determinant of demand variables.

Literature Review

Comparative advantage theory compared labor productivity between countries to produce two types of goods (Krugman, Obstfeld, & Melitz, 2005). Countries with relatively many production factors can reduce the cost of production by specializing in producing export goods. In other words that countries can produce export commodities efficiently. Conversely, each country will import certain goods when a domestic production has relatively scarce and has expensive production factors for its production (Salvatore, 1997). International trade is based on various factors, one of which is the demand factor. Salvatore (1997) argued export destination countries have various demand factors such as the number of goods or services needed as indicated by the population, production of goods to be imported, foreign exchange reserves, exchange rates, cooperation agreements, and so on.

Todaro (2003) content that exports are outflows of the number of goods and services from a country to international markets. Exports provide a stimulus in terms of demand for the domestic industries. It has an essential role in the economy, especially for developing countries, including Indonesia (Ansari & Kumar, 2016). The direct benefits of exports include an increase in productivity, and it drives the amount of output produced and economic growth. Moreover, the indirect benefits of exports are an increase in technology usage, the development of innovation, an increase in labor productivity, and the efficiency of production costs. According to Festić, Repina, & Volčjak (2010), exports will generate a foreign exchange rate that will finance import activities and stimulate the development of domestic economic sectors.

In the context of producing oil and gas commodities, coal is the largest export contributor commodity. Thus, coal exports are always maintained to contribute to national income. We can see coal exports as one of the main focuses of exports commodity. There was an increasing trend in terms of production during 2005 and 2015. This rising trend is also predicted to continue to increase. Therefore, coal's expectation as an export commodity will also continue to be a driven factor in increasing foreign exchange reserves' coffers (Ministry of Energy & Mineral Resources of the Republic of Indonesia, 2018). Unfortunately, the volume of Indonesia's coal exports is affected by determinants factors of demand from destination countries. The determinants of demand are closely related to consumer behavior in the destination country for coal exports. Sen (2012) suggests that the role of demand in trade theory, John Stuart Mill formulates the theory which states that the balance of imports between countries is based on the "Reciprocal Demand" (Krugman et al., 2005). Reciprocal demand defines as a response to the theory of supply and real costs. It is the goal to bring a stable balance to influence the demand side in international trade. A literature study found that there are four determinants of demand that affect coal exports. These four factors are described in the following sections.

According to Nopirin (1994), the exchange rate is the exchange between two different currencies, so there will be a comparison of the value/price between the two currencies. In simple terms, exchange rate means the amount of one money needed to buy one unit of another currency. For example, the dollar exchange rate against the rupiah is the same as the amount of required rupiah to buy one United States dollar (USD). Trüby & Paulus (2012), the

country's exchange rate will be one of the primary importing considerations. The weakening exchange rate becomes a limiting factor for importing countries because the prices of goods on the international market are becoming expensive.

Second, foreign reserve, according to [Pugel & Lindert \(1995\)](#), foreign exchange reserves are a means of foreign payment in the form of gold, foreign banknotes, and other claims in foreign currency to foreign parties. The position of a country's foreign exchange reserves is usually declared safe if it meets the needs of imports at least three months ([Makhmutova & Mustafin, 2017](#)). Foreign exchange reserves can cause economic difficulties, one of which is in importing goods needed. The dwindling foreign exchange reserves reduce a country's importation because foreign exchange reserves are the primary medium of exchange for international trade. Besides this, [Azar & Aboukhodor \(2017\)](#) argue the depletion of foreign exchange reserves in a country can cause an economic crisis for the country concerned. The influence of foreign exchange reserves is significant for import purposes, debt payments, and safeguarding the country's economy from shocks in the economy.

Third, imports are influenced by domestic production that cannot meet domestic market demand ([WTO, 2013](#)). An increase in the production of a commodity causes a decrease in the volume of that commodity's imports. Conversely, a reduction in production increases the volume of imports of this commodity. In coal trading, an increase in the volume of coal imports is also thought to have occurred due to decreased brick production in export destination countries. Coal shortages are resolved through an import mechanism.

Fourth, [Gries & Grundmann \(2014\)](#), the population is a factor that can affect the demand for imported goods. The increase in population is assumed to be in line with the increase in the market's need for goods. The increase in the number of imports based on an increase in population is based on consumption theory. The population is equal to consumption, so the increase will cause demand to increase and, in this context, an increase in coal imports. Coal, as the world's leading power plant, will certainly continue to grow. It is not only due to electricity consumption but also productivity growth and industrialization.

Data and Research Method

Data

All data on all variables are secondary data obtained from several sites. The data is panel data from 6 countries (Japan, South Korea, India, Thailand, the Philippines, and Malaysia) where Indonesia's export destinations are from 2008 to 2018. This research collects and analyzes data on five variables: the value of Indonesia's exports to 6 Asian countries, exchange rate, foreign exchange reserves, population, and coal production value in 6 Asian countries. The data sources are detailed in the following table:

Table 1: Source of Data

No	Data Definition	Source
1	Indonesia's Coal Export Volume to Japan, South Korea, India, Thailand, Philippines, and Malaysia	UN Comtrade Database and Badan Pusat Statistik
2	Exchange rate of Japan, South Korea, India, Thailand, Philippines, and Malaysia	OFX
3	Foreign exchange reserve of Japan, South Korea, India, Thailand, Philippines, and Malaysia	World Bank

No	Data Definition	Source
4	Amount of coal production of Japan, South Korea, India, Thailand, Philippines, and Malaysia	The Global Economy
5	Population of Japan, South Korea, India, Thailand, Philippines, and Malaysia	World Bank

Research Method

In this study, the analysis tool uses panel data regression because it combines time series data with cross-section data (Gujarati & Porter, 2013). Widarjono (2009) also states that several methods can estimate the regression model with panel data, namely Pooling Least Square (common effect), fixed effect approach, and random effect approach. In the panel data testing technique, the Chow test and Hausman test are used to test the model. Chow test or F statistics test is a statistical test that aims to choose whether it is better to use the Common Effect or Fixed Effect model. This test carried out with the following hypothesis:

H_0 : model Common Effect

H_1 : model Fixed Effect

The basic rules for rejecting the null hypothesis is to use the F statistic (Chow Test), which is formulated in the following equation:

$$F = \frac{\frac{(SSE_1 - SSE_2)}{(N - 1)}}{\frac{SSE_2}{(nt - n - k)}} \tag{1}$$

Explanation:

F = F-statistic

ESS_1 = residual sum square assumption result model fixed effect

ESS_2 = residual sum square assumption result model Common Effect

N = the number of data square cross-section

T = the number of data time series

K = the number of variables

If the value of the chow statistics (F-statistic) is greater than the F-critical value, then there is enough evidence to reject null-hypothesis so that the model used is the fixed effect and vice versa, when accepted null-hypothesis, so the model used is the common effect.

Furthermore, the Hausman Test is a statistical test as the basis for our consideration in choosing whether to use the fixed-effect model or using a random effect model. This test is carried out with the following hypotheses:

H_0 : model Common Effect

H_1 : model Fixed Effect

As a basis for rejecting the null hypothesis, Haussmann's statistics are used and compared with Chi-Square. Hausman's statistics are formulated by:

$$m = (\beta - b) (M_0 - M_1)^{-1} (\beta - b) \chi^2 (K) \tag{2}$$

Description:

m	= Hausman's statistic
β	= the vector of variable statistic fixed effect
b	= the vector of variable statistic random effect
(M0)	= Covarian matrix for estimated model fixed effect
(M1)	= Covarian matrix for estimated model random effect
K	= degrees of freedom

As a basic rule for rejecting the null hypothesis, Hausmann's statistics are used and comparing them de If the value of χ^2 - the test result statistics is greater than χ^2 - the table is sufficient evidence to reject null-hypothesis so that the approach used is the fixed-effect model and vice versa when accepted null-hypothesis, so the approach used the random effect model.

The determinants of demand, namely the exchange rate, foreign exchange reserves, population, and the number of coal production of the destination country towards Indonesia's coal exports to 6 Asian countries, obtained 66 observations. In panel data, the same cross-section units are surveyed over time so that the equation of the model using panel data can be written as follows:

$$EXPCOAL = \beta_0 + \beta_1 X1_{it} + \beta_2 X2_{it} + \beta_3 X3_{it} + \beta_4 X4_{it} + e_{it} \quad (3)$$

From this equation, β_0 is defined as the Constanta Regression, while β_1 , β_2 , β_3 , and β_4 are the Regression Coefficient. Next, e is the error term about the variable not taken into account in the model. As a multiple linear regression model with panel data, i is a cross-term marker of cross-section data, while t is a marker of time series data. On the other hand, the variable definition in the model, EXPCOAL, is Coal Export as the dependent variable. Meanwhile, X represents the independent variable consisting of 4 variables, namely X1, X2, X3, and X4. The independent variable is assessed based on the conditions of the export destination countries. X1 stands for Exchange Rate, X2 stands for Foreign Exchange Reserve, X3 stands for Population, while X4 represents Coal Production.

The equation of the econometric model 3 is then transformed into a natural logarithm to convert data that is not normally distributed to or close to normal distribution. The following forms the logarithmic transformation from the previous model.

$$\text{Ln_EXPCOAL}_{it} = \beta_0 + \beta_1 \text{Ln_X1}_{it} + \beta_2 \text{Ln_X2}_{it} + \beta_3 \text{Ln_X3}_{it} + \beta_4 \text{Ln_X4}_{it} + e_{it} \quad (4)$$

The Ln in the model is a natural logarithm that transforms the original value into a percentage value. Hence, Ln_EXPCOAL reflects Indonesia's natural Logarithm's Coal Exports (%). Meanwhile, Ln_X1 is Logarithm natural Exchange Rate (%), Ln_X2 is Logarithm natural Foreign Exchange Reserve (%), Ln_X3 is Logarithm natural Population (%), and Ln_X4 is Logarithm natural Coal Production (%).

In using panel data, several regression models can be used. According to [Gujarati & Porter \(2013\)](#), there are at least the data regressions that are Common Effect Model, Fixed Effect Model, and Random Effect Model.

[Gujarati & Porter \(2013\)](#) state that the significance test is a procedure used to test the truth or error of the null hypothesis results from a sample. The basic idea underlying the significance test is the statistical test (estimator) of the sample distribution of statistics under the

null hypothesis. The decision to process H0 is based on statistical test values obtained from existing data. Statistical tests consist of the Partial Significance Test (t-test), joint test (F-test), and Goodness of Fit Test (R2 test).

The significance test of individual parameters (t-test value) is done to see the significance of the independent variables' influence on the independent variables individually and assume other variables are constant. Calculate the value of statistics against β_1 and look for critical t values from the t distribution table. Then the t-value can be found with the following formula:

$$t = \frac{\beta - \beta_i}{S_e \beta_1} \quad (5)$$

Definition:

t = T statistic value

Se β_1 = Standard error β_1

β_1 = Coefficient regression

a. Positive Hypotheses Test

When t statistical value less than t-critical value, then null-hypothesis is accepted, meaning that the independent variable does not have a positive and significant effect on the dependent variable. Whereas, When t statistical value less than t-critical value, then null-hypothesis is rejected, meaning that the independent variable has a positive and significant effect on the dependent variable.

b. Negative Hypotheses Test

If the value of when a negative value of t statistic greater than a negative value of t critical, then H0 is accepted, meaning that the independent variable has no negative and significant effect on the dependent variable. Then, if a negative value of t statistic greater than a negative value of t critical means, then null-hypothesis is accepted, meaning that the independent variable has a negative and significant effect on the dependent variable.

The F test shows whether all variables are as follows:

$$F_{\text{statistic}} = \frac{R^2(k-1)}{(1-R^2)(n-k)} \quad (6)$$

Where:

F_{statistic} : F statistic value

R2 : Determinant Coefficient

k : The number of Independent Variabel

n : The total number of Observation

When the value of F statistic less than or equal to F critical value, then accept null-hypothesis, meaning that simultaneously the independent variable does not affect the dependent variable. When the value of F statistic less than or equal to F critical value, then reject null-hypothesis, which means that simultaneously the independent variable influences the dependent variable.

The last, the R² (R-Square) test, explains how large a model is. The variation of independent variables influences the dependent variable (Gujarati & Porter, 2013). Where 0 < R² < 1 can be concluded as follows:

- When the value of R^2 is small or close to zero, it means the ability of independent variables in explaining the dependent variable is very limited or small.
- When the value of R^2 is large or close to one, it means that the independent variable provides almost all the information needed to identify the variation of the dependent variable.

Finding and Discussion

Result of Data Analysis

The first step of panel data analysis requires choosing between a fixed-effect model or a common effect model by conducting a Chow test. The rules of the chow test can be performed by looking at the p-value of the chow test. When the p-value is less than 5%, the chow test is significant, so the Fixed Effect model is preferable. Conversely, if the p-value of the chow test is greater than 5 percent, so will choose the Common Effect estimation model.

Table 2: Result of the Chow-test

Redundant Fixed Effects Tests			
Pool: EXPCOAL			
Test cross-section fixed effects			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	31.294464	(5,56)	0.0000
Cross-section Chi-square	88.008362	5	0.0000

Source: Author Calculation

According to the Chow Test results in table 2, the F test statistic distribution value obtained from the calculation is 31.24464 with a probability of 0.0000. So alternative hypothesis is accepted and rejects null-hypothesis statistically. The estimated Chow Test results for the right model is the Fixed Effect model.

The next format test is the Hausman Test. The Hausman test selects the model used between the Fixed Effect estimation model or the Random Effect estimation model. Before the Hausman test is carried out, it is necessary to make the following hypothesis:

H_0 : choose to use the estimated model Random Effect.

H_1 : choose to use the estimated model Fixed Effect.

This Hausman test can be done by looking at the p-value of the Hausman Test. If the p-value of the Hausman Test less than 5 percent, the Hausman Test is significant, so then the model used is Fixed Effect. The p-value is greater than 5 percent, which means the Hausman Test is not significant, so that the random effect estimation model will be chosen.

Table 3: Result of the Hausman Test

Correlated Random Effects - Hausman Test			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	46.833938	4	0.0000

Source: Author Calculation

Hausman Test results obtained from the Chi-Square statistical distribution from the above calculation of 46.83 with a probability of 0.00, statistically, null-hypothesis is rejected, and the alternative hypothesis is accepted, the model used is the Fixed Effect estimation model.

Table 4: Result of Regression Estimated of Panel Data by Fixed Effect Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constanta	-78.13732	20.20550	-3.867132	0.0003
LN Exchange Rate (X_1)	1.003882	0.270996	3.704418	0.0005
LN Foreign Reserves (X_2)	0.525322	0.134864	3.895207	0.0003
LN Population (X_3)	4.170973	1.213897	3.436020	0.0011
LN Coal Production (X_4)	0.066673	0.126741	0.526055	0.6009

Source: Author Calculation

According to the chow test and the Hausman test, the panel data estimation in this study uses a fixed effect regression model. This fixed effect model is that an object of observation has constant magnitude for various periods. The regression coefficient will remain large over time (time-invariant) (Hill, Griffiths, & Lim, 2011). Table 3 shows the results of the relevant panel data regression estimation in the Fixed Effect model.

Based on the panel data regression estimation results in table 4. The next step is to test partial significance partially. The t-test was conducted to see the significance of each independent variable's effect on the dependent variable. The t-critical value is determined by looking at the degree of freedom. The degree of freedom can be found by the formula $n-k$, where n is the number of observations (data). K is the number of variables (free and bound), so the degree of freedom of this model is $61(n = 66 - k = 5)$, and the t-critical value can be found in the t table with alpha 5 %, and it is equal to 1,99. This information allows a t-test for the main regression of the Fixed Effect model in Table 3.

The t-test analysis can be performed as follows. The research hypothesis states the exchange rate variable has a negative and significant effect on Coal Export variables. According to table 3, the t-statistic results on The Exchange Rate variable is 3.70, greater than the t-table value of -1.99, then null-hypothesis is accepted, and the alternative hypothesis is rejected. Thus, The Exchange Rate variables did not have a negative and statistically significant effect on coal export variables in this study.

The second research hypothesis of the t-test states that The Foreign Reserves variable positively and significantly affects Coal Export variables. The results of t-statistics on The Foreign Reserves variable of 3.89 is greater than the t-critical value of 1.99, then null-hypothesis is rejected, and the alternative hypothesis is accepted. So in this study, the Foreign Reserves variable has a positive and statistically significant effect on Coal exports.

To analyze the impact of the population on the coal export. We can measure by conducting the t-test on the population variable. The research hypothesis states that the Population variable has a positive and significant effect on Coal Export variables. In this study, the results of t-statistics on the Population variable amounted to 3.43 greater than the t-critical value of 1.99, then null-hypothesis was rejected, and the alternative hypothesis was accepted. Thus in this study, the Population variable has a positive and statistically significant effect on Coal exports.

The last t-test can be performed on the coal production in destination countries. The

research hypothesis states that The Coal Production of Destination Countries variable has a negative and significant effect on the Coal Export variable. In this study, the results of t-statistics on the coal production variable are 0.52, greater than the t-critical value of -1.99, then null-hypothesis is accepted, and the alternative hypothesis is rejected. Thus in this research model, the Coal Production variable does not have a negative and statistically significant effect on the Coal Export variable.

After conducting a partial test of t-test, a simultaneous test (F test) can be performed by comparing the F-statistic value with the F- critical value. As mentioned before, the F-statistic value's basic rule is that when the F statistic's value is greater than the F-critical value, it shows that simultaneously the independent variables influence the dependent variable. Can find T-critical value by considering the degree of freedom; df_1 (numerator) is $5-1=4$, df_2 (denominator) is $66-4=62$, and the alpha value is 0.05. Thus, the F-table value for this study is 2.52. The hypothesis that has been made:

- a. Null-hypothesis is rejected: When the F statistic value is greater than the F table, it means that simultaneously the independent variables affect the dependent variable.
- b. H_0 is accepted: When the F statistic's value is smaller than the F table, it means that simultaneously the independent variables do not affect the dependent variable.

Table 5: Result of R^2 and F-statistic Estimate

Items	Value
R-squared	0.940440
Adjusted R-squared	0.930868
S.E. of regression	0.192399
F-statistic	98.24753
Prob(F-statistic)	0.000000

Source: Author Calculation

Based on table 5, it can see that the F-statistic value of 98.24 is greater than the F-critical value of 2.52, then the null-hypothesis is rejected. Thus, the independent variables (Exchange Rate, Foreign Reserves, Population, and Coal Production) simultaneously significantly affect the dependent variable Coal Export of Indonesian coal.

Based on the calculation results shown in table 5, the Adjusted R-squared shows independent variables' ability in explaining the dependent variable. Based on table 5, the Adjusted R-squared is 0.93. It can interpret that variations in the exchange rate, foreign exchange reserves, population, and total coal production of the destination countries can explain the variations of independent variables in changes in Indonesian coal exports by 93.08 percent. The remaining 6.92 percent is explained by other variables that do not include in the model.

Discussion

This study indicates that the exchange rate has no negative effect on Indonesian coal exports during 2008-2018. This result contradicts the theory and the hypothesis that claims the exchange rate has a negative and significant effect on Indonesian coal exports (as the theory of Kang & Dagli (2018)). This discrepancy may occur as the exchange rate increases. Indonesian coal will still be chosen as the main export commodity in some trader partners. This is because Indonesian coal prices are likely lower than other coal prices from other coal exporters such as Australia, Colombia, and South Africa. Another reason that can explain this result is relat-

ed to Indonesia's geographical factors. Indonesia has a strategic geographical situation that may cause some other countries to choose Indonesian coal as their main coal import partner. Therefore, when export destination countries' exchange rate weakens against the US dollar, Indonesia's coal exports will increase.

The foreign exchange reserve variable shows a positive and significant effect on Indonesian coal exports in 2008-2018. This foreign exchange reserve variable is consistent with theories and hypotheses, which state that foreign exchange reserves positively and significantly affect Indonesian coal exports (Arize & Malindretos, 2012). This result shows that Foreign exchange reserves are an important factor in import demand for Indonesia. The coefficient of foreign exchange reserves has a value of 0.525, meaning that a one percent increase in foreign exchange reserves will increase Indonesia's coal exports to destination countries by 0.525 percent. This shows that if the destination country experiences an increase in foreign exchange reserves, the quantity demanded of coal from Indonesia in the international market will increase to meet the destination country's energy needs.

Another noticeable determinant factor is the population variable. It has a positive and significant effect on Indonesia's coal exports in 2008-2018. This variable is by the theory and hypothesis, which states that the population positively and significantly affects Indonesian coal exports (Rahman & Vu, 2017). The estimation results state that the population of the destination country is 4.170. This means that if a one percent increase in the population, coal exports will increase by 4.170 percent. This is also consistent with the results of Gries & Grundmann (2014). The population is one of the factors that can affect the demand for the commodity. Can assume an increase in population in line with the increase in the number of consumers in the market, and it will cause an increase in demand at the same time. Thus, the increase in population will lead to a rise in the quantity demanded of coal in destination countries, thereby increasing Indonesia's coal exports.

Finally, this study's results indicate that the amount of coal produced in destination countries has no negative effect on Indonesian coal exports in 2008-2018. This result contradicts the theory and hypothesis, which states that coal production in the destination countries has a negative and significant effect on Indonesian coal exports (Xiaoqing, Haizhong, & Hai, 2014). This result may contradict the theory because the amount of coal production in the destination countries is relatively scarce and unable to meet domestic needs, especially as fuel to run their power plants. As the large quantity demanded of coal, Indonesian coal has become their main supplier source to meet their need of coals—the goal in meeting those needs. The shortage of domestic coal supply will encourage countries to import. This happens because the demand from the population is higher than the available coal stock.

Conclusion

Based on the discussion that has been explained in the previous section, can be drawn some conclusions. First, the exchange rate positively and significantly affects Indonesia's coal exports to 6 Asian Countries (Japan, South Korea, Thailand, Philippines, Vietnam, and Malaysia) during 2008-2018. This study suspects that the strengthening of the exchange rate of destination countries does not reduce Indonesian exports. Because Indonesia is still a major partner in the international coal industry for those countries. Second, foreign exchange reserves positively and significantly affect Indonesia's coal exports to 6 Asian countries in 2008-2018. The population also shows a positive and significant effect on Indonesia's coal exports to 6 Asian countries in 2008-2018. The last determinant factor is the amount of production variable. It has no negative effect on exports to Indonesia's coal exports to 6 Asian countries

in 2008-2018. This is because of an increase in the destination country's coal production capacity not fully meeting domestic needs. Indonesia's coal export policy must take into account some of the most significant demand factors. These factors include population, exchange rate, and foreign exchange reserves of export destination countries. Meanwhile, the export destination country's total coal production factor does not need to be heeded because it does not affect coal exports. In the future, Indonesia's coal exports can use this analysis to increase export targets.

References

- Ansari, M. K., & Kumar, S. (2016). International Trade of Coal in India: Trends, Challenges and Measures for Achieving Trade Balance. *International Journal of Research Granthaalayah*, 4(1), 189–198. <https://doi.org/10.29121/granthaalayah.v4.i1.2016.2864>
- Arize, A. C., & Malindretos, J. (2012). Foreign Exchange Reserves in Asia and Its Impact on Import Demand. *International Journal of Economics and Finance*, 4(3). <https://doi.org/10.5539/ijef.v4n3p21>
- Azar, S. A., & Aboukhodor, W. (2017). Foreign Exchange Reserves and the Macro-economy in the GCC Countries. *Accounting and Finance Research*, 6(3), 72. <https://doi.org/10.5430/afr.v6n3p72>
- BPS. (2020). Statistik Indonesia 2020 Statistical Yearbook of Indonesia 2020. *Statistical Yearbook of Indonesia*.
- Copeland, B. R., & Taylor, M. S. (2004). Trade, Growth, and the Environment. *Journal of Economic Literature*, 42(1), 7–71. <https://doi.org/10.1257/002205104773558047>
- Cornot-Gandolphe, S. (2017). Indonesia's Electricity Demand and the Coal Sector: Export or meet domestic demand? *OIES PAPER: CL 5*, 1–27. Retrieved from <https://www.oxfordenergy.org/wpcms/wp-content/uploads/2017/03/Indonesias-Electricity-Demand-and-the-Coal-Sector-Export-or-meet-domestic-demand-CL-5.pdf>
- Energy Information Administration, U. S. (2019). International Energy Outlook 2019 with projections 2050. *Choice Reviews Online*, 170.
- Festić, M., Repina, S., & Volčjak, R. (2010). Estimating coal price dynamics with the principal components method. *Romanian Journal of Economic Forecasting*, 13(2), 188–212.
- Gries, T., & Grundmann, R. (2014). Trade and fertility in the developing world: The impact of trade and trade structure. *Journal of Population Economics*, 27(4), 1165–1186. <https://doi.org/10.1007/s00148-014-0508-x>
- Gujarati, D. N., & Porter, D. C. (2013). *Dasar-Dasar Ekonometrika Edisi 5*. Jakarta: Salemba Empat.
- Hill, R. C., Griffiths, W. E., & Lim, G. C. (2011). *Principles of Econometrics (Fourth Edition)*. Wiley. New York.
- Kang, J. W., & Dagli, S. (2018). International trade and exchange rates. *Journal of Applied Economics*, 21(1), 84–105. <https://doi.org/10.1080/15140326.2018.1526878>
- Krugman, P. R., Obstfeld, M., & Melitz, M. J. (2005). *International Economics: Theory And Policy, 7/E. Policy*. New York: Pearson Education Inc.

- Makhmutova, D. I., & Mustafin, A. N. (2017). Impact of International Trade on Economic Growth. *International Journal of Scientific Study*, 5(6), 140–144. Retrieved from http://www.ijss-sn.com/uploads/2/0/1/5/20153321/ijss-iran_sep_17_benson_oa29.pdf
- Ministry of Energy & Mineral Resources of the Republic of Indonesia. (2018). *Handbook of Energy and Economic Statistics of Indonesia 2018. Handbook of Energy and Economic Statistics of Indonesia*. Jakarta. Retrieved from <https://www.esdm.go.id/assets/media/content/content-handbook-of-energy-and-economic-statistics-of-indonesia.pdf%0A>
- Nopirin. (1994). *Bisnis Internasional*. Yogyakarta: Badan Penerbitan Fakultas Ekonomi (BPFE).
- Pugel, T. A., & Lindert, P. H. (1995). *International Economics*. McGraw-Hill Higher Education.
- Rahman, M. M., & Vu, X.-B. (2017). Are population and international trade the main factors for environmental damage in China? *Munich Personal RePEc Archive*.
- Sagawa, A., & Kolzumi, K. (2008). The Trend of Coal Export and Imports by China and Its Influence on Asian Coal Markets. *International Economic Environment Journal*. Retrieved from <https://eneken.ieej.or.jp/data/2459.pdf>
- Salvatore, D. (1997). *Ekonomi Internasional*. Jakarta: Erlangga.
- Sen, S. (2012). International Trade Theory and Policy: A Review of the Literature. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.1713843>
- Shah, P. K., & Vyas, S. R. (2015). Examining Trends of Indian Imports during the Period of 2002-2012. *Journal of Economics, Business and Management*, 3(8), 820–825. <https://doi.org/10.7763/joebm.2015.v3.292>
- Svobodova, K., Owen, J. R., Harris, J., & Worden, S. (2020). Complexities and contradictions in the global energy transition: A re-evaluation of country-level factors and dependencies. *Applied Energy*, 265. <https://doi.org/10.1016/j.apenergy.2020.114778>
- Todaro, M. P. (2003). *Pembangunan Ekonomi di Dunia Ketiga*. Jakarta: Erlangga.
- Trüby, J., & Paulus, M. (2012). Market structure scenarios in international steam coal trade. *Energy Journal*, 33(3), 91–123. <https://doi.org/10.5547/01956574.33.3.4>
- Widarjono, A. (2009). *Ekonometrika Teori dan Aplikasi*. Yogyakarta: Ekonisia.
- World Coal Institute - WCI. (2005). *The coal resource a comprehensive overview of coal*. World Coal Institute.
- WTO. (2013). *Fundamental economic factors affecting international trade*.
- Xiaoqing, H., Haizhong, A., & Hai, Q. (2014). Evolution of fossil energy international trade pattern based on complex network. In *Energy Procedia* (pp. 476–479). <https://doi.org/10.1016/j.egypro.2014.11.1152>