THE EFFECT OF EXCHANGE RATE ON INDONESIA-CHINA BALANCE OF TRADE

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ABSTRACT

In several developing countries, serious deficits on balance of trade and capital have caused international monetary reserve depletion, currency instability, and economic growth deceleration. One of the prominent variables for the surplus or the deficit of the balance is exchange rate. As China has been Indonesia's largest trading partner, Indonesia's balance of trade is highly influenced by China. The objectives of this research are to identify the effect of exchange rate on Indonesia-China's balance of trade and to identify any asymmetrical pattern in the relations. This study finds that, in the short term, Indonesia-China real exchange rate significantly and positively affects the balance at lag one, yet, in the long term, the rate has significant and negative effects on the balance. Furthermore, asymmetry was found in the effect of real exchange rate on the balance in the long term. The effect is stronger in NEG, i.e. during appreciation rather than during depreciation. In addition, asymmetry was not found in the effect of exchange rate on the balance in the short term.

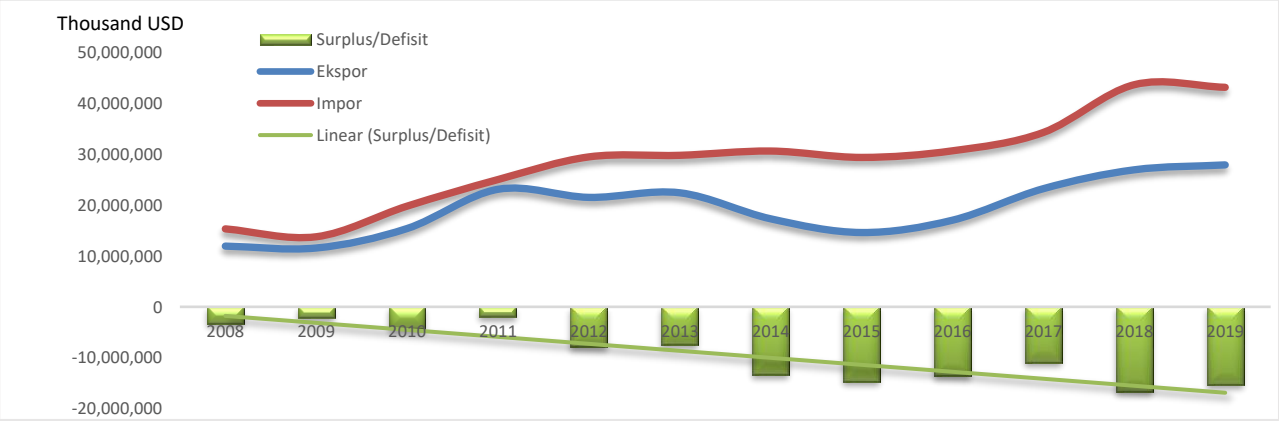
Keywords: exchange rate, balance of trade, linear ARDL, non-linear ARDL.

INTRODUCTION

During the last few decades, the world economy has been increasingly connected through expanding international trade in services, primary and manufactured goods, portfolio investment such as international loans and stock trades, and foreign direct investment, particularly in parts of major multinational corporations (Todaro & Smith, 2015). Globalization is one of the most frequently used words in discussions about development, trade and international political economy. For some people, globalization raises concerns about possible inequality between countries, environmental degradation, expanding and joint-locking domination of wealthier countries, and marginalized societies and territories. In globalization, international trade frequently plays a central role in the historical experience of developing countries.

However, for most developing countries, import demand exceeds their capacity to generate sufficient revenue from their exports. It leads to serious deficits in their balance of payments as compared to the rest of the world, while deficits in their balance of trade (i.e. the excess payments from imports over on exports of goods and services) are compensated on their balance of payments with the surplus on their balance sheet (the receipts of foreign private and public investment and investments exceeding the payment of the previous loans with their interest and previous investments). The burden to repay previous loans and international investments frequently becomes overwhelming. In a number of developing countries, serious deficits in the current / trade and capital accounts have resulted in depletion of international monetary reserves, currency instability and slowing economic growth. Concerning the trade activities between Indonesia and China, Figure 1 shows that, during the last 10 years, Indonesia's imports from China have always been higher than its exports. In other words, Indonesia was experiencing a balance of trade deficit with China, with widening gap even after 2011.

Figure 1. Indonesia-China Balance of Trade from 2008 – 2019



Source: Bank Indonesia, multi-years (processed)

The condition of a country's balance of trade depends on its economic activity, the world's economic activity, and the exchange rate; all of which are in real forms (Bahmani & Fariditavana, 2015). One of the important variables affecting the surplus or deficit of such balance is exchange rate. A country's currency is valued based on another country's currency through exchange rates. The currencies are exchanged to facilitate international transactions. The exchange rates of most currencies fluctuate over time due to market forces and the related country's government. If the value of a country's currency begins to rise, appreciating against other currencies, the country's balance of trade will decrease, ceteris paribus. At that time, the goods exported by that country will become more expensive for the importing countries; thus, the demand for the goods will decrease (Madura, 2018).

Real exchange rate is related to balance of trade, where exchange rate is one of the factors for trade. There are many studies about the relationship between real exchange rate and balance of trade. However, their initial assumption is that changes in exchange rates have a symmetrical pattern to the balance of trade. This means that if the exchange rate appreciates by X%, the balance of trade will be affected by, let us say, Y%. On the contrary, if the exchange rate depreciates by X%, the balance of trade will be affected by the same magnitude as when the appreciation occurs, namely Y%. However, in the event of differences occur in information, expectations, and in ways of responding to uncertainty, the impact of exchange rate on balance of trade might be asymmetrical. Bahmani-Oskooee and Fariditavana (2015) suggested that the asymmetric pattern occurs due to price rigidity. When the exchange rate depreciates, producers react quickly to meet the export demand. However, when the exchange rate appreciates, they do not respond quickly by lowering the price (Knetter 1994 in Hanif 2019).

Bahmani-Oskooee and Aftab (2018) indicated that the significant effect of exchange rate on balance of trade in both short and long term is found in both linear and non-linear ARDL models. They used Malaysia-China real exchange, Malaysia's economic activity, and China's economic activity as the independent variables. Arize, Malindretos, and Igwe (2017), directly using the non-linear ARDL model without comparing it with the linear ARDL model, found that there was a significant influence of exchange rate and balance of trade in both the short and long term. They used the same variables used by Bahmani-Oskooee and Aftab (2018). Bahmani-Oskooee, Ghodsi, and Halicioglu (2017) found that the non-linear ARDL model is better than the linear ARDL model in showing the effect of exchange rate on balance of trade. They used the same variables studied by Arize, Malindretos, and Igwe (2017) and Bahmani-Oskooee and Aftab (2018).

In Indonesian context, several studies have provided empirical results. Ginting (2013) examined the effect of exchange rate on Indonesia's exports to several ASEAN, European, and American countries and found that exchange rate, in the short and long term, has a negative and significant effect on Indonesian exports. Sugiharti, Esquivias, and Setyorani (2020), who examined the effect of exchange rates on Indonesia's exports to China, India, Japan, South Korea, and the United States, found that exchange rate has a negative effect on Indonesia's exports to those countries, both in ARDL and NARDL models.

There has not been any research that specifically analyzes Indonesia-China trade relationship, that includes balance of trade at the aggregate level, and that includes the real exchange rate of competitors, which therefore this study includes the exchange rate of Japan, Singapore, United States, South Korea, and Malaysia's currencies. Hence, this study aims to identify the effect of the exchange rate on the Indonesia-China balance of trade and to determine the asymmetric pattern of the effect of the exchange rate on the Indonesia-China balance of trade.

The contribution of this research is divided into two sides. First, the theoretical contribution, providing empirical evidence regarding the effect of the exchange rate on the Indonesia-China trade balance and whether the pattern of influence is symmetrical or not. Second, practical contributions are expected to be of benefit to the government and also as input to the Indonesian central bank. This can be used to formulate strategies in making policies to maintain economic stability, especially in the external secto

EMPIRICAL LITERATURE

The results of previous researches were used as a reference to explore the effect of exchange rate on Indonesia-China balance of trade. There are studies on the effect of exchange rate on balance of trade; some support the finding that the exchange rate affects the balance of trade, others show that exchange rate does not have any significant effect on balance of trade. Bahmani-Oskooee and Aftab (2018) examined the relationship between real exchange rate and balance of trade. They used the export-import ratio (balance of trade) as the dependent variable. The independent variables are Malaysia-China real exchange rate, Malaysia's economic activity, and China's economic activity. They also included the 2008 global financial crisis as one of the variables. They used monthly time-series data from March 2001 to December 2015. They found the significant effect of exchange rate on balance of trade in short and long term in both linear and non-linear ARDL models.

Arize, Malindretos, and Igwe (2017), who directly used the non-linear ARDL model without comparing it with the linear ARDL model, found a significant effect of exchange rate on balance of trade in the short and long term. They used export-import ratio (balance of trade) as the dependent variable, and independent variables used by Bahmani-Oskooee and Aftab (2018) were adopted. Bahmani-Oskooee, Ghodsi, and Halicioglu (2017) found that non-linear ARDL model is better than linear ARDL model in pointing out the effect of exchange rate on balance of trade. Bahmani-Oskooee, Ghodsi, and Halicioglu (2017) used export-import ratio (balance of trade) as the dependent variable, while independent variables used by Arize, Malindretos, and Igwe (2017) and Bahmani-Oskooee and Aftab (2018) were adopted.

Bahmani-Oskooee, Bose, and Zhang (2017) examined the relationship between the real exchange rate and the balance of trade of China with 21 partner countries using the non-linear ARDL model. They used export-import ratio (balance of trade) as the dependent variable and the real exchange rate of China against each of the partner country, China's economic activity, and partner countries' economic activity as the independent variables. They found evidences of short-term asymmetric effects of exchange

rates in the cases of 18 partners (short-term adjustment asymmetry in cases of 11 partners and short-term cumulative asymmetry in cases of 7 partners), and significant long-term asymmetric effects in cases of five partners. In addition, there are several other studies that used export-import ratio (balance of trade) as the dependent variable; they are Bahmani-Oskooee and Faridatavina (2015), Bahmani-Oskooee and Faridatavina (2016), Firdaus et al. (2018), and Yiheyis and Musila (2018).

METHODOLOGY

Data

This study uses macroeconomic data that are relevant to the research objectives; they are monthly time series data from 2011 to 2019. The year of 2011 was chosen as the start of the research period due to limited data on China's Industrial Production Index, which is only available from 2011.

Variables

This study uses independent and dependent variables, in which the former is a variable that is influenced or explained by the independent variable, and the latter is a variable that explains or affects the dependent variable. The following are the variables used in this study.

Table 1. Variable, Symbol, Position, and Treatment during Estimation

No	Variable	Symbol	Position	Treatment during Estimation
1	Indonesia-China Balance of Trade	TB	Dependent Variable	Natural Logarithm
2	Indonesia-China Real Exchange Rate	REX_CNY	Independent Variable	Natural Logarithm
3	Indonesia's Industrial Production Index	IP_IND	Control Variable	Natural Logarithm
4	China's Industrial Production Index	IP_CH	Control Variable	Natural Logarithm
5	Indonesia-Japan Real Exchange Rate	REX_JPY	Control Variable	Natural Logarithm
6	Indonesia-Singapore Real Exchange Rate	REX_SGD	Control Variable	Natural Logarithm
7	Indonesia-USA Real Exchange Rate	REX_USD	Control Variable	Natural Logarithm
8	Indonesia-South Korea Real Exchange Rate	REX_KRW	Control Variable	Natural Logarithm
9	Indonesia-Malaysia Real Exchange Rate	REX_MYR	Control Variable	Natural Logarithm

Source: Author, 2020

Analytical Method and Model

In analyzing the effect of the exchange rate on Indonesia-China balance of trade, quantitative method with regression approach was used. Regarding the time-series data, the author used Auto-Regressive Distributed Lag (ARDL) and Non-Linear Auto-Regressive Distributed Lag (NARDL) developed by Pesaran and Shin (1999) ; Pesaran, Shin, and Smith (2001); Shin et.al (2013). This research consists of formation of basic model and dynamic model specifications, stationarity test, optimum lag determination, ARDL and NARDL estimation, Wald test, model feasibility test, model stability test, classical assumption test, and hypothesis testing. The followings are the models of this study.

Linear ARDL Model:

$$\Delta LnTB_t = a + \sum_{k=1}^{n1} b_k \Delta LnTB_{t-k} + \sum_{k=0}^{n2} c_k \Delta LnIP\_REX\_CNY_{t-k} + \sum_{k=0}^{n3} d_k \Delta LnIP\_IND_{t-k}$$

$$+ \sum_{k=0}^{n4} e_k \Delta LnIP\_CH_{t-k} + \sum_{k=0}^{n5} f_k \Delta LnREX\_JPY_{t-k} + \sum_{k=0}^{n6} g_k \Delta LnREX\_SGD_{t-k} + \sum_{k=0}^{n7} h_k \Delta LnREX\_USD_{t-k}$$

$$+ \sum_{k=0}^{n8} i_k \Delta LnREX\_KRW_{t-k} + \sum_{k=0}^{n9} j_k \Delta LnREX\_MYR_{t-k} + \lambda_0 LnTB_{t-1} + \lambda_1 LnREX\_CNY_{t-1}$$

$$+ \lambda_2 LnIP\_IND_{t-1} + \lambda_3 LnIP\_CH_{t-1} + \lambda_4 LnREX\_JPY_{t-1} + \lambda_5 LnREX\_SGD_{t-1} + \lambda_6 LnREX\_USD_{t-1}$$

$$+ \lambda_7 LnREX\_KRW_{t-1} + \lambda_8 LnREX\_MYR_{t-1} + \mu_t$$

Non-Linear ARDL Model:

$$\Delta LnTB_t = a' + \sum_{k=1}^{n1} b'_k \Delta LnTB_{t-k} + \sum_{k=0}^{n2} c'_k \Delta LnIP\_IND_{t-k}$$

$$+ \sum_{k=0}^{n3} d'_k \Delta LnIP\_CH_{t-k}$$

$$+ \sum_{k=0}^{n4} e'_k \Delta LnREX\_JPY_{t-k}$$

$$+ \sum_{k=0}^{n5} f'_k \Delta LnREX\_SGD_{t-k}$$

$$+ \sum_{k=0}^{n6} g'_k \Delta LnREX\_USD_{t-k} + \sum_{k=0}^{n7} h'_k \Delta LnREX\_KRW_{t-k} + \sum_{k=0}^{n8} i'_k \Delta LnREX\_MYR_{t-k} + \sum_{k=0}^{n9} j'_k \Delta POS_{t-k}$$

$$+ \sum_{k=0}^{n10} k'_k \Delta NEG_{t-k} + \theta_0 LnTB_{t-1} + \theta_1 LnIP\_IND_{t-1} + \theta_2 LnIP\_CH_{t-1} + \theta_3 LnREX\_JPY_{t-1}$$

$$+ \theta_4 LnREX\_SGD_{t-1} + \theta_5 LnREX\_USD_{t-1} + \theta_6 LnREX\_KRW_{t-1} + \theta_7 LnREX\_MYR_{t-1} + \theta_8 POS_{t-1}$$

$$+ \theta_9 NEG_{t-1} + \xi_t$$

Following Bahmani-Oskooee and Fariditavana (2015), the movement of LnREX_CNY can be decomposed into positive (depreciation) and negative (appreciation) as a partial addition of: $LnREX\_CNY = LnREX\_CNY_0 + LnREX\_CNY_t^+ + LnREX\_CNY_t^-$, where $LnREX\_CNY_t^+$ and $LnREX\_CNY_t^-$ are the partial addition of positive and negative changes in $LnREX\_CNY$. The exact term is as follows.

$$POS = LnREX\_CNY_t^+ = \sum_{j=1}^{t} \Delta LnREX\_CNY_j^+ = \sum_{j=1}^{t} \max\,(\Delta LnREX\_CNY_j, 0),$$

$$NEG = LnREX\_CNY_t^- = \sum_{j=1}^{t} \Delta LnREX\_CNY_j^- = \sum_{j=1}^{t} \min\,(\Delta LnREX\_CNY_j, 0)$$

In ARDL framework, Shin et al. (2013) proposed the replacement of $LnREX\_CNY$ in the Linear ARDL Model by two new variables, namely POS and NEG, so Non-Linear ARDL model was obtained.

RESULTS AND DISCUSSION

Stationarity

The results of the stationarity test show that Indonesia-China balance of trade and China's Industrial Production Index are the only variables stationary, with consecutive significance levels of 10% and 1%. However, in the first difference, all variables are stationary with the significance level of 1%, so conditions for Auto-Regressive Distributed Lag (ARDL) were met.

Cointegration

The Bound test on the Linear ARDL model produces an F-statistic value of 8.0941. The value is greater than the upper limit of I(1) at α=10%, α=5%, and α=1%, indicating cointegrations or long-term relationships between variables in the model. For the Non-Linear ARDL model, the F-statistic value is 3.5489, which is greater than the upper limit of I(1) at α=10%, α=5%, and α=1%. Thus, cointegrations or long-term relationships are also found in this model.

Results of Linear ARDL dan Non-Linear ARDL Estimation

Table 2. Linear ARDL Model Estimation Result

Panel A: Result of Short-Term Estimation

	Lag			
	0	1	2	3
ΔLnREX_CNY	1.3006 [0.3413]	4.6772*** [0.0002]		
ΔLnIP_IND	-1.3088*** [0.0020]	-0.8154* [0.0544]		
ΔLnIP_CH	0.0195 [0.9049]			
ΔLnREX_JPY	0.5637 [0.4340]	-1.0716 [0.1362]	1.5695** [0.0232]	
ΔLnREX_KRW	-0.3269 [0.7602]	0.2059 [0.8452]	-1.2103 [0.1687]	2.5457*** [0.0016]

Panel B: Result of Long-Term Estimation

LnREX_CNY	-3.1068** [0.0359]
LnIP_IND	1.7009** [0.0283]
LnIP_CH	-0.9197** [0.0238]
LnREX_JPY	0.0063 [0.9915]
LnREX_SGD	0.9320 [0.5883]
LnREX_USD	0.7728 [0.6627]
LnREX_KRW	0.1648 [0.8613]
LnREX_MYR	-0.2347 [0.8045]
Constant	4.9847 [0.6304]

*Note: ***significant at 1%; **significant at 5%; *significant at 10%*

Source: Author, 2020 (processed data)

Table 3. Non-Linear ARDL Model Estimation Result

Panel A: Result of Short-Term Estimation

	Lag			
	0	1	2	3
ΔLnTB		-0.1199 [0.2726]	-0.0958 [0.3459]	-0.2019** [0.0229]
ΔLnREX_CNY_POS	-1.7872 [0.3858]	3.9324** [0.0185]		
ΔLnREX_CNY_NEG	-6.3784** [0.0226]	9.5555*** [0.0001]	-5.6775** [0.0135]	
ΔLnIP_IND	-2.0460*** [0.0001]			

ΔLnIP_CH	0.1921 [0.2727]	-0.2003 [0.2367]		
ΔLnREX_JPY	0.0731 [0.9237]	-1.1495 [0.1394]	1.5980* [0.0601]	
ΔLnREX_SGD	-0.0113 [0.9964]	0.3700 [0.8765]	7.4358*** [0.0013]	
ΔLnREX_USD	1.9193 [0.3356]			
ΔLnREX_KRW	-0.5131 [0.6876]	0.9059 [0.4954]	-4.3486*** [0.0015]	2.0921** [0.0139]
ΔLnREX_MYR	1.0010 [0.4583]	-2.3648* [0.0687]		
Panel B: Result of Long-Term Estimation				
LnREX_CNY_POS	-1.8068 [0.3271]			
LnREX_CNY_NEG	-4.1411* [0.0622]			
LnIP_IND	-1.1170 [0.4383]			
LnIP_CH	-0.6379 [0.3177]			
LnREX_JPY	-0.7730 [0.3332]			
LnREX_SGD	3.8467 [0.1649]			
LnREX_USD	-3.8360 [0.1767]			
LnREX_KRW	0.6696 [0.5986]			
LnREX_MYR	-1.6174 [0.2381]			
Constant	23.6785 [0.3569]			

*Note: ***significant at 1%; **significant at 5%; *significant at 10%*

Source: Author, 2020 (processed data)

Asymmetry

Asymmetry between exchange rate and balance of trade can be seen through the Wald test on POS and NEG coefficients in Indonesia-China Real Exchange Rate (REX_CNY).

Table 4. Result of Wald Test

Coefficient	F-statistics	Prob
Short Term	1.1492	0.2874
Long Term	4.6205	0.0351**

*Note: ***significant at 1%; **significant at 5%; *significant at 10%*

Source: Author, 2020 (processed data)

The Wald test results in Table 4 show that the short-term coefficient probability is insignificant, indicating that the POS and NEG coefficients in Indonesia-China Real Exchange Rate are not asymmetrical. In other words, the pattern is symmetrical. However, the long-term coefficient probability is significant at α=5%, which means that the POS and NEG coefficients in Indonesia-China Real Exchange Rate are asymmetrical.

Model Feasibility and Stability

Table 5. Results of Diagnostic Statistics

F-statistics	Linear ARDL Model	Non-Linear ARDL Model
RESET	0.5076	0.4315
CUSUM	S	S
CUSUMQ	S	S
Adjusted R^2	0.6765 (67.65%)	0.7176 (71.76%)

*Note: ***significant at 1%; **significant at 5%; *significant at 10%; "S" indicates stable parameter; "TS" indicates unstable parameter*

Source: Author, 2020 (processed data)

Classical Assumption

Table 6. Results of Classical Assumption Test

Assumption	Linear ARDL Model		Non-Linear ARDL Model	
	Prob	VIF	Prob	VIF
Heteroskedasticity	0.4215	-	0.1410	-
Autocorrelation	0.6669	-	0.8340	-
Multicollinearity	-	*Mostly* > 10	-	*Mostly* > 10
Normalitas	0.1701	-	0.7120	-

*Note: ***significant at 1%; **significant at 5%; *significant at 10%*

Source: Author, 2020 (processed data)

Selection of Better Model (Linear or Non-Linear ARDL)

Based on the estimation results of Linear and Non-Linear ARDL models, the Adjusted R^2 of Non-Linear ARDL is greater than that of Linear ARDL. In model feasibility test, model stability test, and classical assumption test, the results of the two models are equal, so no model does better in the three criteria. Therefore, Non-Linear ARDL is a better model, and the interpretation and discussion in the next section will use and refer to the estimation results of this model. The estimation results of Linear ARDL will still be written in this research paper, not to be discussed and only used as a comparison.

Discussion

Indonesia-China real exchange rate in the short term does not create any asymmetric effect, but it appears in the long term. Shin et.al. (2013) in Bahmani-Oskoee and Baek (2016) suggested that, in Non-Linear ARDL model, the asymmetric effect appears when the exchange rate, which is then broken down into a depreciation (POS) and appreciation (NEG), has different magnitudes, directions (signs), and lags. However, the technique they presented was unable to determine whether the magnitudes of POS and NEG differed significantly. Thus, the author decided to conduct a Wald test on POS and NEG coefficients so that the presence or absence of the asymmetric effects can be statistically accounted for even though there are several previous studies using the techniques used by Shin et.al (2013), such as the research of Hanif (2019).

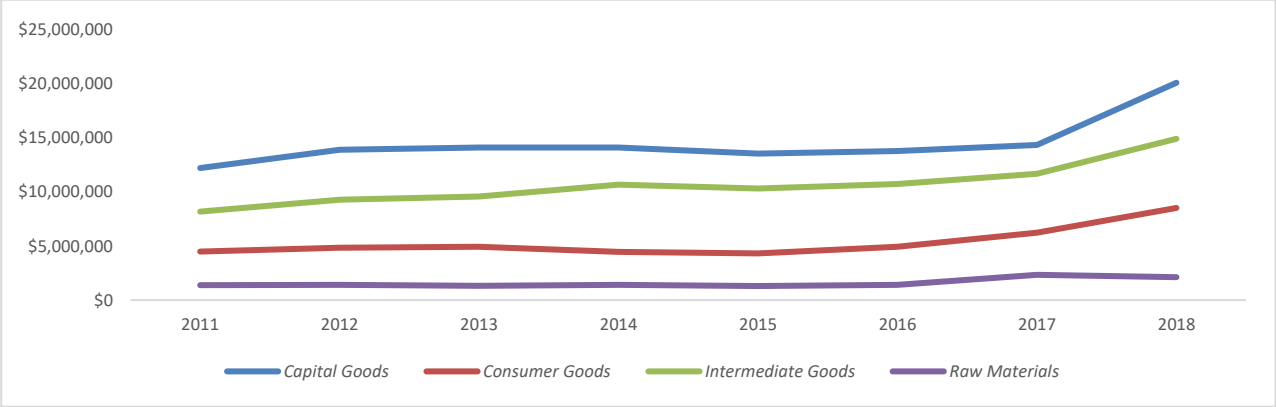
The coefficient of the depreciation of the real exchange rate between Indonesia and China in the short term (ΔPOS) is -1.7872 at lag 0, but it does not have any significant effect on the Indonesia-China balance of trade. At lag 1, the coefficient of depreciation of the real exchange rate between Indonesia and China is 3.9324, which has a significant effect on Indonesia-China balance of trade. It means that 1% depreciation of Indonesia-China real exchange rate increases Indonesia-China balance of trade by 3,9324% in the next 1 period (i.e. next month), ceteris paribus. The coefficients of the appreciation of the real exchange rate between Indonesia and China in the short term (ΔNEG) at lag 0, lag 1, and lag 2 are -6.3784; 9.5555; and -5.6775. All lags have a significant effect on Indonesia-China balance of trade. It means that 1% appreciation of the real exchange rate between Indonesia and China increases Indonesia-China balance of trade by 6.3784% in this period (this month), ceteris paribus; decreases the balance of trade between Indonesia and China by 9,5555% in the next 1 period (next month), ceteris paribus; and increases the balance of trade between Indonesia and China by 5.6775% in the next 2 periods (next month), ceteris paribus.

The estimation results are in accordance with the research of Bahmani-Oskoee and Fariditavana (2015); Nusair (2016); Bahmani-Oskoee and Aftab (2018); Bahmani-Oskooee and Aftab (2017); Bahmani-Oskooee and Gelan (2018); Bahmani-Oskooee, Bose, and Zhang (2017); Bahmani-Oskooee, Harvey, and Hegerty (2015) and with the theory stating that exchange rate depreciation can increase exports. When the exchange rate decreases, the price of domestic goods is relatively cheaper than the price of foreign goods, so export demand increases, and balance of trade also increases. Conversely, if the exchange rate appreciates, the price of domestic goods is relatively more expensive than the price of foreign goods, so export demand decreases, and balance of trade also decreases.The effect of real exchange rate between Indonesia and China on the balance of trade between the countries is not significantly different. Therefore, it can be said that the asymmetric effect does not appear. In other words, the effect of the

exchange rate on Indonesia-China balance of trade in the short term is symmetrical. This result is consistent with the research of Bahmani-Oskoee and Fariditavana (2015) that the effect of exchange rates on balance of trade is symmetrical in the short term.

However, in the long run, Indonesia-China real exchange rate is asymmetrical; there is a different effect between depreciation and appreciation. The depreciation coefficient of Indonesia-China real exchange rate in the long run (POS) is -1.8068, but it does not have any significant effect on the countries' balance of trade. The appreciation coefficient of Indonesia-China real exchange rate (NEG) in the long term is -4.1411, so 1% appreciation of Indonesia-China real exchange rate increases the countries' balance of trade by 4.1411%, ceteris paribus. POS and NEG coefficients in the long term have the same direction, in this case they are negative. The estimation results of the Non-Linear ARDL can be understood mathematically that, in the long and short term, when POS and NEG coefficients have the same direction (either positive or negative), the estimator has shown the right pattern. Conversely, if POS and NEG coefficients show different directions, then the estimator cannot show the right pattern, so the justification on economic theories is very difficult to do.

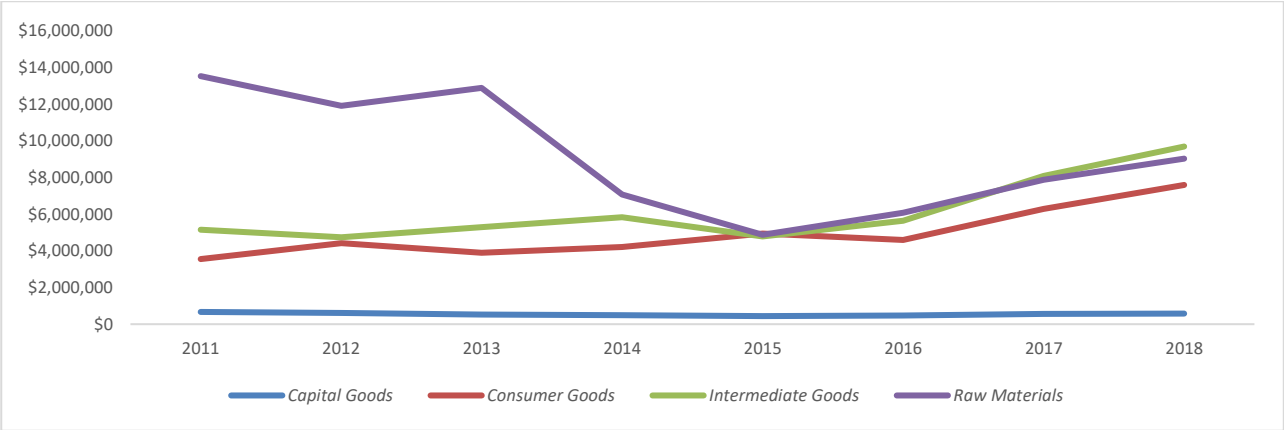
Figure 2. Indonesian Import from China Based on Types of Goods during 2011-2018



Source: World Bank, 2021 (processed)

In the long run, the real exchange rate between Indonesia and China has an asymmetric effect on the balance of trade with a negative direction. This means that the real exchange rate depreciation actually lowers the balance of trade (although in this study it is not statistically significant). This is also the case when the real exchange rate is appreciated; the balance of trade increases.The increase in balance of trade between Indonesia and China due to the strengthening of real exchange rate in the long term may occur due to the composition of goods being traded. Based on Figure 2, goods mostly imported from China are capital goods, followed by intermediate goods, consumer goods, and raw materials. They are productive goods that will be reprocessed, such as capital goods which are static resources for making other goods. Intermediate goods are also items that will be processed to make other goods.

Figure 3. Indonesian Export to China Based on Types of Goods during 2011-2018



Source: World Bank, 2021 (processed)

The long-term estimation shows that, when Indonesia-China real exchange rate increases, Indonesia will increase imports of productive goods. The goods will be processed into consumer goods or intermediate goods, which will be exported to China. The increase in exports increases the balance of trade. Figure 3 shows that, until 2018, Indonesia's exports to China were mostly intermediate goods, followed by raw materials, consumer goods, and capital goods. Consumer goods did not dominate Indonesia's exports, but intermediate goods did. However, they increased the exports value as they are always needed to make finished goods. If we look at the historical data, Indonesia-China balance of trade has created a surplus for almost 2 decades, from 1989 to 2007. This is an evidence that during that period Indonesia had been able to create a healthy trade relationship with China. Thus, it is possible to improve Indonesia-China balance of trade in the long run through the strengthening of real exchange rate, which is supported by technological changes (as proposed in Solow's theory of long-term growth) that can create more efficient production

techniques. In the end, Indonesian products will be competitive with Chinese products. Given that Indonesia's largest trading partner is China, the flow intensity of goods from and to China must be relatively higher than the flow with other countries. Thus, the intensity of goods imported from China, which are then processed and resold to China, is also relatively high.

This study did not find any J-Curve phenomenon, as the balance of trade will decrease after the depreciation of the real exchange rate and will improve afterwards (Krugman et.al., 2018). In the context of empirical testing using Non-Linear ARDL approach, J-Curve phenomenon will appear if the total POS coefficient is negative in the short run and the POS coefficient is positive in the long term (Rose and Yellen, 1989). If Linear ARDL approach is used, the J-Curve phenomenon will appear if the real exchange rate coefficient is negative at the lowest lag, followed by a positive coefficient at the highest lag (Bahmani-Oskoee, 1985). This result confirms the finding of Nusair (2016).The coefficient of Indonesia's Industrial Production Index in the short term is -2.0460, only at lag 0, and has a significant negative effect on Indonesia-China balance of trade. An increase in Indonesia's Industrial Production Index by 1% lowers the countries' balance of trade by 2.0460% in the current period (this month), ceteris paribus. Industrial Production Index is an indicator for production output, as it can be used to see economic activity and production capacity. In the short term, when Indonesia's Industrial Production Index increases, Indonesia-China balance of trade will decline. This is due to an increase in economic activity in the short term, which requires input for production activities. Therefore, Indonesia's import demand for productive goods increases, resulting in a decline in the balance of trade. In the long term, Indonesia's Industrial Production Index has no significant effect on Indonesia-China balance of trade, while China's Industrial Production Index, both in the short and long term, has no significant effect on the countries' balance of trade.

Indonesia's real exchange rate with several other trading partner countries (i.e. Japan, Singapore, the United States, South Korea, Malaysia) in this study has various effects. In the short term, only Indonesia-South Korea and Indonesia-Malaysia real exchange rates have a significant negative effect on Indonesia-China balance of trade. The coefficient of Indonesia-South Korea real exchange rate is -4.3486 at lag 2, while the coefficient of Indonesia-Malaysia real exchange rate is -2.3648 at lag 1. A one-percent depreciation of Indonesia-South Korea real exchange rate reduces Indonesia-China balance of trade by 4.3486%, ceteris paribus. While one-percent depreciation of Indonesia-Malaysia real exchange rate reduces Indonesia-China balance of trade by 2.3648%, ceteris paribus. The estimation results are in accordance with the law of one price, where identical goods must be sold in various countries at the same price if the price is stated in the same currency (Krugman et al., 2018). If the real exchange rate of Indonesia-South Korea or Indonesia-Malaysia depreciates, goods in South Korea or Malaysia will become more expensive. At ceteris paribus, the prices of goods in China are relatively cheaper than the prices of goods in South Korea or Malaysia. Thus, Indonesia will substitute Chinese goods, or, in other words, Indonesia's imports from China will increase, and Indonesia-China balance of trade will decrease.

If we compare the coefficients above, the effect of the depreciation of Indonesia-South Korea real exchange rate on Indonesia-China balance of trade is greater than that of the depreciation of Indonesia-Malaysia real exchange rate. In other words, goods from South Korea that could be replaced by goods from China are relatively higher in number than goods from Malaysia that could be replaced by goods from China.Indonesia-Japan and Indonesia-Singapore real exchange rate also have a negative effect on Indonesia-China balance of trade, namely at lag 1 with Japan and at lag 0 with Singapore. However, the effects are insignificant. The real exchange rate between Indonesia and the United States does not have any significant effect on Indonesia-China balance of trade. In the long term, Indonesia's real exchange rates with Japan, Singapore, the United States, South Korea and Malaysia have no significant effect on Indonesia-China balance of trade.

CONCLUSION AND IMPLICATION

As Indonesia-China real exchange rate in the short term has a significant positive effect on Indonesia-China balance of trade at lag one, the exchange rate has a significant negative effect on the balance in the long run. Asymmetry of the effect of Indonesia-China real exchange rate on Indonesia-China balance of trade in the long run was found. The influence is greater on NEG, which is during appreciation rather than during depreciation. In the short term, there is no asymmetry in the effect of Indonesia-China real exchange rate on the countries' balance of trade. The findings of this study imply that Bank Indonesia needs to maintain the stability of Rupiah on Yuan, considering that, as this study has found, appreciation of exchange rate in the long term can increase the balance of trade between Indonesia and China. Bank Indonesia is expected to maintain price stability for domestic goods so that they can compete with Chinese goods. The government is expected to be more progressive in implementing RnD so that innovation and technological improvements to create more efficient production techniques can be achieved.

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