Real Exchange Rate, Trade Balance and Deindustrialization in Indonesia

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June 2016

University of Indonesia

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Abstract

This study raises the current issues in Indonesia that links the instability of exchange rates and deindustrialization phenomenon. This association has not been studied directly in previous researches. Using 2SLS method, the study finds that these problems are interrelated and cannot be separated from each other. Deindustrialization problems in Indonesia, which are explained by the decline in manufacturing exports, decline in manufacturing labor productivity, trade balance deficit and investment displacement from the tradable sector (manufacturing), directly and indirectly affect exchange rate. The implication of this study is that government should pay attention to Indonesian manufacturing sector in solving exchange rate problem.

Key words: deindustrialization, exchange rate, manufacturing, 2SLS, trade balance.

1. Introduction

Recently, Rupiah's[1] movement is very unstable and tends to depreciate overtime. Such depreciation and instability are undesirable for Indonesia's economy since it is often associated with the 1997/1998 Asian financial crisis that severely hit the economy. Moreover, the depreciation does not provide benefit for the country's exports.

Exchange rate depreciation that is not accompanied by increase in exports may actually explain the poor performance of Indonesia's economy. Indonesia suffers from some structural economic problems currently. In the current account balance, Indonesia experiences current account deficit since the fourth quarter of 2011. The major problem here is the deficit in primary income account and trade balance. The deficit in primary income in 2014 reached USD27 million, which is higher than the deficit in current account itself, amounting to USD26 million. Deficit in primary income is mostly (around 64 percent) attributable to investments, be it direct, portfolio or other investments (Bank of Indonesia, 2014).

Indonesia's trade balance tends to deficit as well starting from 2012 caused, among others, by the declining Indonesia's export performance. All this time, Indonesia relies on commodities export so that Indonesia's export performance is very dependent on boom and bust cycle of global oil and commodity prices. Issues revolving around exchange rate, current account and trade balance deficit discussed above essentially cannot be separated from the performance of Indonesia's manufacturing industries. These industries have major role in Indonesia's exports besides the primary com-

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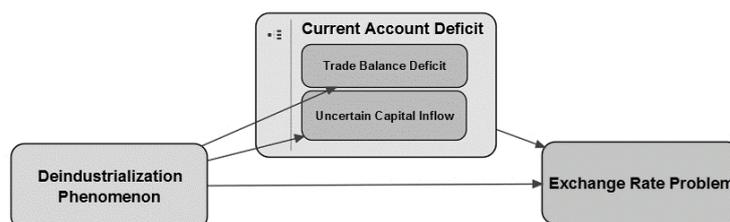[1]Rupiah is Indonesian exchange rate, symbolized by IDR

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Figure 1: Conceptual Framework between Exchange Rate, Deindustrialization, and Current Account Deficit

modities. However, today Indonesia tends to suffer deindustrialization that affects the performance of manufacturing output's exports.

Deindustrialization is widely known as a phenomenon when the manufacturing[2] output contribution to the total output of an economy decreases overtime. It reduces manufacturing output production (Pieper, 1998), reduces the manufacturing export (Singh, 1982), reduces the manufacturing employment (Rowthorn & Ramaswamy (1999); Pieper (1998)), leads to uncertain capital movement (Krugman, 1988), reduces labor productivity in manufacturing (Pieper, 1998), leads to poor trade balance, GDP and standard of living (Kitson & Michie, 1997).

Indonesia suffers some of deindustrialization signs above. First, the declining manufacturing output and export. Since 2001, Indonesia's manufacturing output relative to GDP and the manufacturing export proportion to the total export tend to decrease overtime. Further, Indonesia also endures uncertain capital movement. Krugman (1988) classifies this as deindustrialization variable because the resources movement out from the tradable sectors causes the economic turmoil in its capital inflow, which also affects the exchange rate. Indonesia's portfolio investment, which contributes about 36 percent to total investment in

2014 (Bank Indonesia, 2015), has a very large movement. This movement is not a trivial issue since it is one of the causes of a wide deficit in the current account.

This study sees that exchange rate, economic structural problem and deindustrialization in Indonesia have interdependent relationship as shown in in Figure 1. Based on this chart, this study attempts to prove whether deindustrialization affect exchange rate directly and indirectly through two major Indonesia's economic structural problems, trade balance deficit and uncertain capital movement.

The main objective of this study is connecting deindustrialization phenomenon and exchange rate problem in Indonesia. In this study, deindustrialization phenomenon in Indonesia is explained by the deficit in trade balance, decline in manufacturing labor productivity growth, uncertain capital movement and decline in manufacturing export relative to total export. The relationship is shown in Figure 2 below.

There are three variables of deindustrialization directly affecting exchange rate designed in this study, they are deficit in trade balance, decline in manufacturing labor productivity growth, and uncertain capital movement. Decline in manufacturing export directly affects exchange rate through trade balance deficit. Exchange rate used in this study is Real Effective Exchange Rate (REER) since it explains the competitiveness of a country's trade against its trading partner.

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[2]Referring to World Bank, manufacturing output is defined as commodities classified in Standard International Trade Classification (SITC) revision 3 sections 5 until 8 except 68 division.
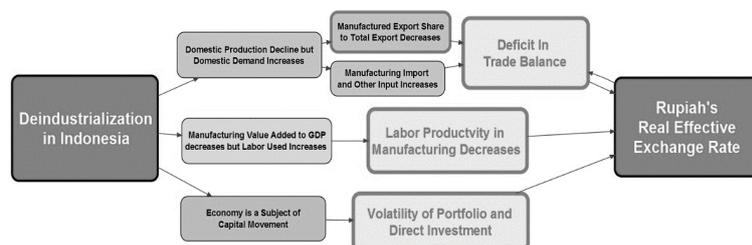
Figure 2: Transmission mechanism

Therefore, two main questions raised in this study are: (1) how deindustrialization phenomenon in Indonesia, explained by deficit in trade balance, manufacturing labor productivity growth and uncertain capital movement, affects REER and (2) how performance of manufacturing export affects trade balance that indirectly influence REER.

This study is a slight improvement from previous studies. To the author's knowledge, there are no previous research connecting deindustrialization phenomenon and exchange rate directly. Previous researches about exchange rate are more often associated with monetary variables, while deindustrialization researches are usually associated with economic growth.

2. Literature Review

Exchange rate instability is very undesirable for every country in the world since it reduces growth for countries with low level of development (Aghion, et al, 2006), reduces private investment (Aizenman and Marion, 1993) and has a serious impact on the trade flows (Huchet-Bourdon and Korinek, 2011). Therefore, in assessing this problem in Indonesia, this study takes deindustrialization problem as a variable affecting it.

Deindustrialization is defined as slowdown of manufacturing output growth, caused by the loss of industrial dynamism due to shifts of production and employment from tradable sectors (industry and agriculture) to the non-tradable sectors (financial and communication)

(Krugman, 1988). In fact, there is no specific theory about deindustrialization included in a broader context of economic development (Pieper, 1998). However, deindustrialization is often associated with negative phenomenon that is detrimental for the long-term economic sustainability.

In theory, productivity can assess exchange rate based on Ballasa-Samuelson Effect that argued about the positive relationship between the increased level of productivity and appreciation of real exchange rate in a country. Capital flow or investment in a country has been frequently used in assessing exchange rate, for instance, conducted by Nouira, Plane, Sekkat (2011). Manufacturing export and trade balance assess exchange rate through Balance of Payment approach which is often simplified with trade balance approach (Mussa, 1984). If the trade balances (export minus import) are in deficit, then the currency tends to depreciate relative to another currencies, vice versa (Krugman et.al., (2008); Salvatore (2012)).

Even though there are no previous researches connecting deindustrialization and exchange rate empirically in author's knowledge, Krugman (1988) has already explained this correlation in his paper "Deindustrialization, Reindustrialization and The Real Exchange Rate." He tried to make a connection between deindustrialization (which means the resources moved out from tradable to non-tradable sector) and exchange rate and argued that it was costly to move resources between tradable sector (manufacturing and agriculture) and non-

tradable sector (services). He also argued that an economy was a subject of capital flow that unpredicted which could not limit the responsiveness of resources reallocation to real exchange rate movements. One of his models in the paper is as follows.

$$e = \alpha - \beta \left(R_T + B \right) \qquad (1)$$

e defines exchange rate which is actually price of traded goods relative to non-traded goods. α and β are coefficients in this equation. Exchange rate affected by allocated resources in tradable sectors is signified with R_T and deficit in trade is indicated with B.

3. Material and Methods

This study uses econometric approach in connecting deindustrialization variables and REER. The models used are combination from researches by Krugman (1988), Zelekha Bar-Efrat (2011), Nouira et.al. (2011), Suhendra (2003), and Bernheim (1988). REER is specified as follows:

$$\begin{aligned} REER = {} & \alpha_0 + \alpha_1 \ tradebal + \alpha_2 \ REER_{t-1} \\ & + \alpha_3 \ riskating + \alpha_4 \ inv \\ & + \alpha_5 \ lprodvity + \alpha_6 \ openness \\ & + \alpha_7 \ govtexpend + u \end{aligned} \qquad (2)$$

In equation (2) above, there are three deindustrialization variables directly affecting REER: trade balance (*tradebal*), investment (*inv*) and manufacturing labor productivity growth (*lprodvity*). Suppose trade balance is not an exogenous explanatory variable, but it is still influenced by other variables. These variables are uncorrelated with **u** (error term) but have not been included in the structural equation. These variables are manufactured export (*manfexp*), trade barrier (*tradebarrier*), domestic consumption (*consump*), Net Foreign Asset

(*NFA*) and world oil price (*oilprice*) as follows.

$$\begin{aligned} Tradebal = {} & b_0 + b_1 \ manfexp + b_2 \ tradebarrier \\ & + b_3 \ consump + b_4 \ NFA \\ & + b_5 \ oilprice + v_1 \end{aligned} \qquad (3)$$

Since there are two regression equations defined, this study applies 2SLS regression to perform the analysis. 2SLS method can be used in two ways, for recursive and non-recursive model. Recursive equations can be done by common Ordinary Least Square (OLS) (Gujarati Porter, 2009) even though it can be done by 2SLS as well. Yet, for the non-recursive equations, OLS cannot be applied due to the inconsistencies and simultaneous bias of the result. Therefore, 2SLS method that will be used in this study depends on the result of Granger causality test that can see whether there is reversible relationship between equations.

Data used in this study are quarterly time series data from 2000:Q1 until 2014:Q2 (58 observations). The data collected from various sources such as Indonesian Statistic (BPS), Bank Indonesia (BI), Bank for International Settlement (BIS), and CEIC. In assessing exchange rate using the equation above, this study takes the following steps: (1) Testing variables stationarity, (2) De-trending the non-stationary data, (3) Checking optimal lag between REER and trade balance, (4) Testing Granger Causality between REER and trade balance, (5) Performing 2SLS regression, (6) Testing the Specification tests: Hausman's endogeneity test. (7) Conclusions.

One major difference in this study is that it treats carefully the non-stationary data. Time series data always possess secular trend in the data. This trending data, which make data unstable overtime, cause the stationary condition difficult to achieve. Therefore, the trending terms of variables must be omitted. The advantage in using de-trended data instead of first-differenced data is the process does not eliminate the original data pattern.

The previous research by Zelekha Bar-Efrat

Table 1: Stationarity Tests of the Data

Variables	Augmented Dickey Fuller Test		Phillips-Perron Test		Variables Used (All Variables in Percentage)
	Original Variable	Omit the Trend Linear	Original Variable	Omit the Linear Trend	
manfexp	-2.234	-2.792**	-2.272	-2.819**	Omit Trend
reer	-1.977	-2.361	-1.931	-2.512	Omit Trend
tradebal	-1.899	-2.78**	-1.772	-2.679**	Omit Trend
riskrating	-0.991	-2.031	-1.04	-2.334	Omit Trend
lprodvity	-5.009*		-5.302*		Original Variable
nfa	0.086	-12.709*	-0.231	-9.045*	Omit Trend
inv	-3.824*		-3.606*		Original Variable
govtexpend	-8.238*		-8.249*		Original Variable
oilprice	-1.188	-3.419*	-1.168	-3.478*	Omit Trend
openness	-1.239	-2.368	-1.286	-2.607**	Omit Trend
consump	-3.404*		-3.234*		Original Variable

(2011), which became one of the benchmark of this study, uses time series data and 2SLS method as well. However, although they found that their original variables have unit root problems, they did not take further consideration of this problem. They used the original variables in the regression process. Having slightly improved from that, this study tries to stationary the variables in order to avoid the spurious regression problem using de-trend method.

This paper utilizes method of omitting trend by Hoover (2012). In his book, he explains some different approaches to detrend the data especially by moving average method and regression method. This paper employs the regression method to omit the trend as follows.

$$\text{Detrended Data} = \left(\left(\frac{\text{Original Data}}{\text{Linear Trend}} \right) \text{-1} \right) \text{x100} \quad (4)$$

4. Results

Regression analysis using time series data must use stationary data to avoid the spurious regression. Checking the stationary of data, this study applies two approaches: Augmented

Dickey-Fuller unit root test and Phillips-Perron T-test. The test results are shown above.

From Table 1, we can see that many variables are not stationary in the original level. Only *lprodvity*, *inv*, *govtexpend* and *consump* that are already stationary in the original variable level. These variables are used in the regression without any further treatments. This study uses omitting trend method in order to make the data become stationary.

After omitting the linear trend from the variables, almost all variables become stationary. However, there are some variables that are still unable to reach the stationarity level although the linear trend had already omitted. These variables are REER and risk rating variables. In the next stage, these variables are still used considering the following reasons: (1) to maintain the consistency in treating the data, (2) these variables become "more stationary" after the trend-omitting process even though they are still not stationary. On the other hand, it is better than the original variables in the level of stationarity.

The next step is to check the optimal lag and choose type of 2SLS method for this study. Granger-causality test is used to check

Table 2: Granger-Causality Result

Relationship	P-value
Trade Balance → REER	0.024
REER → Trade Balance	0.505

Source: Author's calculation

whether there is a reversible relationship between REER and trade balance and ensure the type of 2SLS method that should be used. The relationship is shown in Table 2.

Table 2 shows that trade balance significantly granger-cause the REER but not vice versa. This relationship is proved in the first lag, which is the optimal lag for data under study. In conclusion, there is no reversible relationship between REER and trade balance in Indonesia for the data under study. Hence, 2SLS regression with recursive method will be used instead of the non-recursive method.

The regression results with 2SLS recursive method are shown in table below.

In the regression results above, most variables are significant in five percent significance level. Variable *lprodvity* is significant in 10 percent significance level, while govtexpend is not significant. The r-squared is 0.7401, which is good for model specification's goodness of fit.

5. Discussion

Based on Table 3, the regression results confirming that deindustrialization phenomenon affects REER. First, deindustrialization is represented by trade balance variable (*tradebal*) as what Kitson & Michie (1997) argue. Trade balance positively significant affects REER. This means that an increase in trade balance (or in other words, trade surplus) will increase (appreciate) the exchange rate, *vice versa*. Consequently, if Indonesia's trade balance tends to deficit day by day, the REER will also be influenced to be depreciated and unstable. This instability comes from the weakening of Indonesia's export, the turmoil of world's market, and

so on, which will be explained later.

The second variable that represents deindustrialization phenomenon is investment (*inv*). The volatility of investment affected by deindustrialization phenomenon is already explained by Krugman (1988). Investment that is positively significant to the REER means that increase in investment inflow will appreciate the exchange rate, *vice versa*. Deindustrialization that makes the capital out from the tradable sectors will directly affect the exchange rate to depreciate.

Third variable is manufacturing labor productivity growth (lprodvity). Deindustrialization makes the manufacturing labor productivity growth tends to decrease over time. This productivity will affect exchange rate directly as what Balassa-Samuelson theory argues. This theory is proven in this study where labor productivity positively significant[3], affects the exchange rate. It means that an increase in labor productivity growth will appreciate the exchange rate since it will increase goods production that is available for export and domestic consumption. The fact that Indonesia is facing deindustrialization right now influences the labor productivity growth to decrease, especially in manufacturing sector that also impacts the exchange rate to be depreciated relative to other currencies.

These three variables of deindustrialization, which directly and significantly affect exchange rate, are sufficient to explain that deindustrialization phenomenon is behind the problem of Indonesia's exchange rate depreciation and instability right now. This fact might provide

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[3]It is significant in 10 percent significance level

Table 3: Main Regression Result

Dependent Variable: REER	
Explanatory Variables	**2SLS**
$reer_{t-1}$	0.444***
	(3.12)
$tradebal$	0.028**
	(2.39)
inv	3.105**
	(3.02)
$riskrating$	-0.394**
	(-2.70)
$lprodvity$	0.631*
	(1.98)
$govtexpend$	-0.371
	(-1.13)
$openness$	-0.123**
	(-2.62)
Observations	56[4]
R-squared	0.7401

Source: Author's calculation

new perspective for the government to pay attention to the industrial sector in solving the exchange rate problem.

Moreover, the problem of Indonesia's exchange rate is not only influenced by deindustrialization problem, but also many other factors. This study also includes the country risk rating (riskrating), government expenditure (govtexpend) and degree of openness (openness) as other independent variables impact exchange rate. From the result, it can be inferred that risk rating negatively significant affects exchange rate. It means that the increase in risk rating (or increase in country's risk) affect exchange rate to depreciate. Increase in country's risk makes foreign investors collectively draw their investment and it will increase the capital outflow from the country. Other independent variables are government

expenditure and degree of openness. The government expenditure does not statistically significant affect exchange rate, while openness negatively significant affect the exchange rate.

This study takes further consideration of trade balance affecting exchange rate problem in Indonesia. Trade balance in Indonesia that tends to deficit these days is also impacted by the main deindustrialization phenomenon: declining manufactured export goods. The decreasing portion of manufacturing output to total output will also affect the manufacturing export to total export since manufacturing export is constrained by manufacturing output produced in a country (Ahmed & Chhibber, 1989). Assessing this problem, trade balance is also estimated by its own independent variables. Since this study uses recursive method of 2SLS, the equation can be estimated individually using OLS (Gujarati & Porter, 2009).

The regression results on trade balance are summarized above.

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[4]There are only 56 instead of 58 observations due to the lack of data available for the Net Foreign Asset (NFA) variables.

Table 4: Additional Regression Result

Dependent Variable: Trade Balance	
Explanatory Variables	**OLS**
manfexp	7.153***
	(3.58)
nfa	-0.917**
	(-2.75)
tradebarrier	0.278**
	(3.23)
oilprice	-0.496**
	(-0.81)
consump	22.620***
	(6.78)
Observations	56
R-squared	0.5093

Source: Author's calculation

The most concerned variable in this OLS regression is the manufacturing export (*manfexp*) and how it affects the trade balance. From the result, manufacturing export positively significant affects the trade balance. If the manufacturing export increases, the trade balance will increase (surplus) as well, vice versa. Along with this, deindustrialization phenomenon, which is currently happening in Indonesia, will influence the manufacturing export to decrease, the trade balance to deficit and the REER to depreciate indirectly.

Other variables that affect trade balance defined are net foreign asset (*nfa*), trade barrier (*tradebarrier*), world oil price (*oilprice*) and domestic consumption (*consump*). *nfa* negatively significant affects trade balance. An increase in NFA improves the ability to import the goods and makes the trade balance deficit. Trade barrier positively significant affects the trade balance. Increasing trade barrier to a country will decrease the imported goods flow and directly trigger the trade balance to surplus. World oil price, variable used by Krugman et al. (1987) to assess US trade balance, does not significantly affect the trade balance in Indonesia's case.

6. Conclusion

This study finds that deindustrialization phenomenon and exchange rate problems in Indonesia are related and cannot be separated each other. In solving the exchange rate problem in Indonesia, which is continuously depreciating and volatile, the manufacturing sector problem must be continuously considered carefully.

Deindustrialization experienced by Indonesia today impacts the exchange rate through three variables, they are: i) Indonesia's trade balance positively significant affects exchange rate. It means a good performance of trade balance will appreciate the exchange rate, vice versa. Deindustrialization leads to a decreasing trade balance's performance since it affects the manufacturing export performance. Poor performance of trade balance, which started to be deficit since 2012, would eventually affect exchange rate to depreciate and be unstable; ii) Manufacturing labor productivity growth is positive and significant to affect exchange rate. It means an increasing labor productivity growth will appreciate the exchange rate, vice versa. Deindustrialization leads to labor pro-

ductivity growth decrease which in turn will make the exchange rate depreciate as well. Although the labor productivity in Indonesia is not compared to other countries due to limitation of the data, this result is quite clear to prove that Ballasa-Samuelson theory applies in Indonesia; iii) Capital movement has a positive and significant effect to exchange rate. Deindustrialization, which makes resources reallocation out from the tradable sector to nontradable sector, leads to an uncertainty in capital movement to enter and exit easily from the economy. It is also experienced by Indonesia in which the exchange rate is volatile in the shortrun due to this capital movement.

More about trade balance, this study also specifically concerns about the relationship between manufacturing exports and the trade balance. Manufactured export positively significant affects the trade balance. If manufactured export increases, the trade balance will increase (surplus), *vice versa*. It also means that the trade balance deficit right now is also due to deindustrialization, which affects the manufacturing export and output in the economy.

Based on this result, the suggestions are as follows: (1) Minimizing the bad effect of deindustrialization suffered by Indonesia, the authority should improve the industrial regulations to rebuild the industry in Indonesia and implement it consistently. The regulations should encourage the industry especially for the export promotions that will increase manufacturing output production, reduce deficit in trade balance, and increase the productivity. (2) The authority should promote more stable direct investment directed to the tradable sectors, especially manufacturing sector.

There are some limitations in this study that can be improved in the next study, they are: (1) Deindustrialization explanatory variables used in this study are limited to variables that have direct relevance to the exchange rate. The consequence is deindustrialization variables used in this study might not fully explain the overall condition of deindustrialization, (2) There are some variables used in this study which have not yet reached the stationary level. However, the method of de-trending time series data is an appropriate method for this case since the variables are getting closer to the stationary level after being de-trended. (3) The model used in this study are still not able to enter such monetary variables that may affect the exchange rate as money supply, terms of trade, interest rate, and so on due to econometric reasons.

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