EXCHANGE RATE EFFECT ON INDONESIAN EXPORT: THE COMPARISONS OF TWO CRISES EPISODES
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Abstract: Rupiah depreciation helped Indonesian export increase (1998/1999). The study used Engle Granger cointegration to assess the impact of depreciation to export (Asian crisis and the current global crisis). It found positive and significant long run relationship between nominal exchange rate and export. It showed the Rupiah depreciation helped export. Export elasticity to exchange rate tends to be higher in before global crisis period compared to after global crisis period. It related with the decreasing of US production index. The commodity price and trade partner income increased in portion and the speed of adjustment of Indonesian export is diminishing.

Keywords: exchange rate, export, crisis, cointegration, error correction model

JEL Classification: F14,F31, F41

1. Introduction

The 2007 global crisis has created the issue of currency war. Current account imbalances in several countries (especially advanced countries) following China export surges have also created this issue. The currency war hypothesis assumes that each country try to undervalue its currency to gain [2]competitiveness. Several advanced countries has undergone the quantitative easing policy as a method to recover from crisis as well as to gain export competitiveness via weak exchange rate.

Currency depreciation and/or devaluation are assumed to support export growth, ceteris paribus. The study by Hausmann, Prichet, and Rodrick (2004, pp. 2-4) found that real exchange rate depreciation is an important part of economic growth acceleration. Economic growth accelerations tend to be correlated with increases in investment and trade and with real exchange rate depreciations. Bernard and Jensen (2004) focused on links between exchange rate depreciation and export booms in Turkey and the United States (US). On the other hand, although several researchs have found that currency depreciation is a critical element to expand exports, it might not be a sufficient factor in determining export growth, while devaluations are not enough in increasing export earnings (Johnson, 1980). Indonesia is one of the emerging countries which has significantly affected by the global crisis was experiencing several turbulences on its macroeconomy variable.

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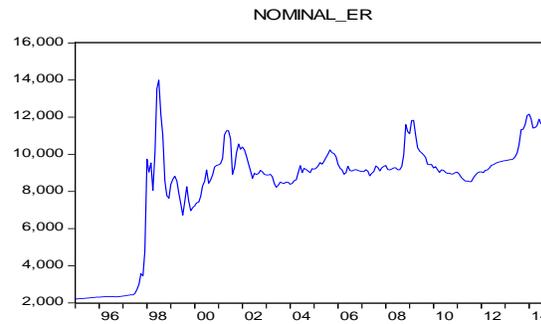
Figure 1: Nominal Exchange Rate in Indonesia (Rupiah/USD). Monthly, 1995-2014

Source: Pacific Exchange Rate Database.

Figure 1 shows the volatility of nominal exchange rate in Indonesia. The first sharp Rupiah depreciation happened in 1997-1998, period of Asian financial crisis, when the rupiah jumped from Rp. 2,500 to Rp. 9,000 and furthering up to Rp.14,000 Rupiah per USD. The second sharp depreciation happened in 2014, with the increase of exchange rate from Rp. 9,000 to Rp.13,000 per USD. Like other currencies of emerging market economies, the Rupiah has depreciated significantly against the USD, since mid-2013. During the fourth quarter of 2014, the Rupiah dropped on average by 3.9 percent (qtq) to a level of Rp. 12,244 per USD. An increasingly solid US economy triggered USD appreciation against all global currencies.

Since July 2014-March 2015, the Rupiah has depreciated against the USD by 10.2 percent (World Bank, 2015). This must be seen in the perspective of an overall increase in the USD strength to global currencies, and not just against the Rupiah but most global currency, especially emerging market currencies. The dollar strength represented by broad USD index gained 17.2 percent over July 2014-February 2015, a historically very large increase. This is because of the rebound in relative economic growth in the US and monetary policy divergence between the US (where the US Federal Reserve is expected to begin raising rates later in 2015); Euro Area (where the ECB in January began a major "quantitative easing" program); and also the divergence with Japan. The Rupiah depreciation primarily stems from negative sentiment concerning the planned tapering off of monetary stimuli by the Federal Reserve as well as its impact on the current account deficit in Indonesia (World Bank, 2015).
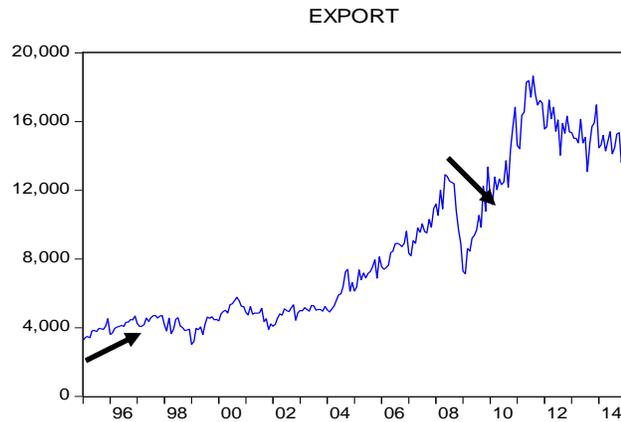
EXPORT

Figure 2: Indonesian Export (in Million USD)

Source: CEIC Database

Figure 2 shows the Indonesian export trend. In the first period of sharp depreciation, Indonesian export has increasing trend even with moderate growth but in the second period, Indonesian export has decreasing sharp trend.

Athukorala (2006) has made surveys about trends and patterns of Indonesian export performance, focusing on comparative experience in major commodity categories and changing revealed comparative advantage. He examined the implications of China's emergence as a major competitor in world trade and explores the factors contributing to the post-crisis export slowdown. His research showed that Indonesia's poor export performance in the post-crisis era is largely supply driven. They strengthened the case for reversal of recent backsliding in macroeconomic policy reform and for speedy implementation of the unfinished reform agenda. Prudent macroeconomic management according to his study, is not sufficient to achieve rapid and sustained export growth in an era of rapid economic globalization. We can see the pie diagram for Indonesian export structure below.
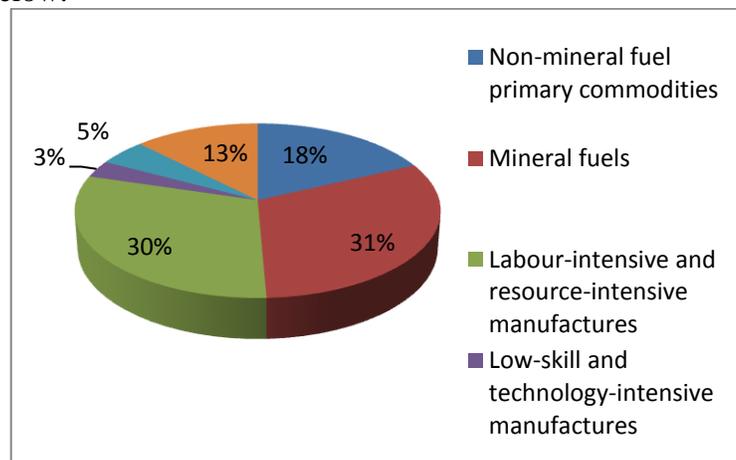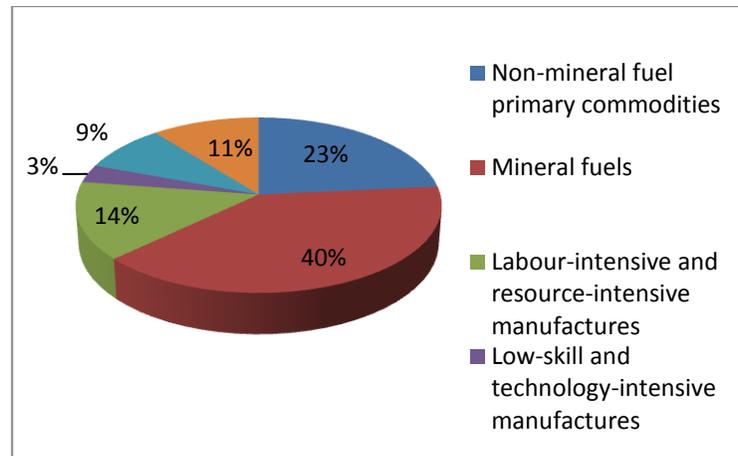
Figure 3: Indonesian Export Structure, 1995-1998

Source: www.unctadstat.unctad.org

Figure 4: Indonesian Export Structure 2008-2014

Source : www.unctadstat.unctad.org

Figure 3 shows that primary commodity goods in Indonesian export, namely mineral fuels and non-mineral fuel primary commodities, have accounted for 49% from Indonesian total exports, while manufacture has 51% portion of total exports. Indonesia as developing countries, in the initial stage of development its manufacture portion is dominantly taken by labor intensive and resource intensive manufactures, accounted for 30% in the period of Asian crisis (1995-1998). Figure 4 provides that primary commodities increasingly dominant in Indonesian export in the period of global crisis (2008-2014). Primary commodities portion increased to 63%, parallel with the decrease in manufacture that only accounted for 37%. The data showed that Indonesia has been experiencing deindustrialization period. Krugman (1988) defined deindustrialization is a phenomenon when the industrial output growth contribution to total output of an economy decreases overtime. In other words, there is a shifting from tradable sectors to non-tradable sectors. Moreover, both figure shows decreasing share of manufacture product in Indonesian export, similar to the result of Athukorala (2006). Indonesian dependency on primary commodity export has posed Indonesia to several problems, including the change in the impact of exchange rate to export.

2. Literature Review

A theoretical foundation for relationship between export and exchange rate is highlighted in Blanchard (2003) and Dornbusch, Fischer, and Startz (2004). Export is a function of foreign income and real exchange rate. Foreign income affects foreign demand for our exports. A real depreciation affects an export

increase. The real exchange rate is the ratio of foreign prices to domestic prices, measured in the same currency. The indicator measures a country's competitiveness in international trade.

The Marshall-Lerner condition states that devaluation will improve the trade balance if the devaluing foreign demand elasticity for nation exports plus nation's demand for imports elasticity exceed one (Kandil and Mirzaie, 2003). Liu et al. (2013) found a negative and significant relationship between currency appreciation and total export, 1 % currency appreciation decreases total export of China by 1.89%. They used monthly data to capture more variation in key variables and used the method of difference in difference. They found the exchange rate elasticity of export and elasticity of export has the value -0.454. Doing robustness test by using instrumental variable, they found elasticity to be 1.89 as in their major result. This corrected elasticity is in line with the theoretical prediction that exchange rate elasticity of exports is greater than one. The relatively similar relationship also found in the study of Thorbecke and Ayutsuki (2012).

Thorbecke and Ayutsuki (2012) found that Germany devaluation after 2000, contributed to a surge in export to Europe. They used Dynamic Ordinary Least Square (OLS) Model. Germany's nominal exchange rate has remained weaker because it is linked to weaker Eurozone economics. Beside nominal exchange rate depreciation, they are experiencing real exchange rate depreciation. They found export elasticity to the unit labor cost deflated exchange rate equals 0.6.
In the Euro area, a long term price elasticity for intra-euro Area export is doubled compared to extra euro Areas (Bayoumi et. al. 2011). The exchange rate elasticity is much higher for Germany's exports to Eurozone countries than its exports for non-Eurozone countries. Exports elasticity for consumption goods range from 1.3 to 1.5 for export to Eurozone countries. For outside Eurozone the elasticity is lower about 0.75. For elasticity for capital good is lower than consumption good. For Eurozone equal 0.64 and for non- Eurozone equal 0.2.
Chowdury (1993) examined the impact of exchange rate volatility on the trade flows of the G7 countries (Canada, France, Germany, Italy, Japan, US, and UK) using Vector Error Correction Model (VECM). His research indicated that exchange rate volatility has a significant negative impact on the volume of exports in each of G7 countries. Because market participants are risk averse, exchange rate uncertainty causes them to reduce the activities. It causes the prices to change and shifting in demand and supply to minimize the exposure to the effects of exchange rate volatility. On the other hand, Sercu and Vanhulle (1992) have shown that trade benefits from exchange rate or risk. According to their studies, trade can be considered as an option held by firms. As a consequence, the value of trade can rise with volatility.
Rodrik (2008) clarify the linkage between real exchange rate and rate of economic growth. He found that undervaluation of currency stimulates economic growth, especially for developing countries. The finding is robust using different measure of real exchange rate as well as different methods of estimation

techniques. Rodrik discussed anomaly for Mexico case, where correlation between undervaluation and growth is negative. He explained that this anomaly is caused by the history of capital flows. Periods of capital inflows in Mexico are associated with booms in consumption which drives economic growth and at the same time appreciates the currency. Rodrik regressed undervaluation measurement with real GDP growth. He used panel regression for 188 countries in five years period.

Johnson (1987) examines the theoretical basis for implementing currency depreciation. He indicates that while currency depreciation is an often critical element in efforts to expand exports, it is not sufficient factor in determining success. Devaluations are not enough in increasing export earnings. It must be part of a broader policy package.

Krugman (1988) found a connection between deindustrialization and exchange rate. Deindustrialization is defined as the movement of resources moved out from tradable sector to non-tradable sector. Krugman modeled a condition in which a country faces uncertain capital flows in which costly resource allocation has a simultaneous relationship with exchange rate. His model could explain the case of US in 1980s, which capital inflow in US leads to decline in real exchange rate, but the declining exchange rate did not reduce the trade deficit rapidly. The real exchange rate affected by allocated resources in tradable sectors and deficit trade.

Freud and Pierola (2008) examined 92 episodes of export surges. The result of their study showed that export surges in developing countries tend to be preceded by a large real depreciation and a reduction in exchange rate volatility. They found that in contrast the role of exchange rate in developed countries is less than developing countries. They explained that depreciation leads to a significant reallocation of resources in the export sector. They found that depreciation of exchange rate attracts more entries into new export product markets and new markets. They concluded that a competitive currency leads firms to expand the product and market space for exports, inducing a large reorientation of the tradable sector.

3. Empirical Specification and Hypothesis
Blanchard (2003) formulated export in the demand side as follow:
$$X = f (E, P^*/P, Y^*) \qquad (1)$$
X is an export of goods and services, E is nominal exchange rate, P is domestic price, P^* is world price and Y^* is world income. P/P^* is called relative price and the combination between nominal exchange rate and relative price is called real exchange rate. Real exchange rate is usually symbolize as q, where $q = E P^*/P$.
If we take the logarithmic form of equation (1), we get the following equation:
$$Log (X) = \beta_0 + \beta_1 Log (E) + \beta_2 Log (Y^*) + \beta_3 Log (P/P^*) + \varepsilon \qquad (2)$$
Abeysinghe and Choy (2005) presented log linier export demand and supply equation. This study is focusing on demand side. They included price of exports,

price of competing goods in importing countries, and aggregate real income of the importing countries. Senhadji and Montenegro (1998) included two variables in their export demand model, namely real exchange rate and the activity variable computed as the weighted average of trade patterns Gross Domestic Product (GDP) minus exports.

Considering the fact that Indonesia is a price taker, the price of domestic goods that we export is assumed that significantly influenced by commodity price. So, the final model we used in this study is including nominal exchange rate, trade partners economic activity, and commodity price as a proxy for Indonesian export price. We use commodity price as the substitute of relative price to avoid the potential of multicollinearity problem if we use price of domestic and foreign goods at one equation. So, the empirical estimation model is as follows:

$$\text{Log(EXPORT)} = \beta_0 + \beta_1 \text{ Log (NOMINAL\_ER)} + \beta_2 \text{ Log (MPI)} + \beta_3 \text{ Log (COMPRICE)} + \varepsilon \qquad (3)$$

Where EXPORT is the value of export of goods and services in nominal term; NOMINAL_ER = Indonesian Rupiah exchange rate to USD in nominal term; MPI = manufacture production index as a proxy of trade partner economic activity; and COMPRICE = commodity price index as a proxy for relative price. For MPI we use two proxies, MPI_US and MPI_China, with the consideration that China and the US is the major trading partners for Indonesian export. The double log model used is in the aim for getting the elasticity number. Export elasticity is critical parameters in the assessment of exchange rate fluctuation on the export.

The hypothesis are: (1) nominal exchange rate has positive and significant impact to export; (2) manufacture production index has positive and significant impact to export; and (3) commodity price index has positive and significant impact to export because export here are in nominal terms, not in the real terms.

4. Data and Methodology
We use Indonesia monthly data from January 1995 to December 2014. We employed the data sources from International Financial Statistics, CEIC database, World Bank (WB) database, and Pacific Exchange Rate database. We defined two period of sample in running regression: (1) first period is from 1995M1 to 2006M12 and it is a period of before global economic crisis; and (2) second period is from 2007M1 to 2014M12 and it is after global crisis period.
Equation (3) is cointegrating equation assuming stationarity in residual estimates following Engel Granger co-integration. After co-integration proved, we can run error correction model in order to get short-term behavior of relationship between export and the regress well as error correction term coefficient reflecting size of adjustment to long-term trend.

Granger representation theorem states that if two variables Y and X are co-integrated, then the relationship between the two can be articulated as Error Correction Model. Negative error correction model is shown the process to restore the equilibrium. Error correction model representation for equation (4) is represented in following equation:

$$\Delta(Log(EXPORT))=\beta_0+\beta_1\Delta(Log \quad (NOMINAL\_ER))+\beta_2\Delta(Log (MPI))+\beta_3\Delta(Log (COMPRICE))+\beta_4 ECT_{-1}+v \quad (4)$$

Where ECT is error correction term. We can use this error term to the short run behavior of export to its long run value.

5. Empirical Results and Discussion
5.1 Statistics Pattern
The first and the third periods are including two episodes of crisis. The second period excluded the two episodes of crisis that represent no crisis period. The descriptive table, we can see on table1.

The mean of exchange rate in first period, is the lowest compared to the second and the third period. The reason in the first period, was including the period when Indonesia still in the managed floating periods. Since August 1997, Indonesia moved to free floating periods because of the economic crisis and the agreement with economic reformation by International Monetary Fund (IMF). The highest mean of exchange rate is in third period, where the global crisis happened. The global economic turbulence along with Indonesia's structural economic problem has made Rupiah exchange rate getting worse.

The highest coefficient variation is nominal exchange rate in the first period. The reason is, during the time of Asian economic crisis in 1997-1998, the exchange rate jumped following the regime shift from managed floating to free floating. In the second period, exchange rate coefficient variation is decreasing, but it increasing again in the third period, due to the indirect effect of the global crisis. The coefficient variation in the third period was increasing again because of the crisis but now indirect effect of global crisis. The higher the coefficient variation means, the higher the volatility. Export, commodity price, the US manufacturing index, and China manufacturing index are also having the highest variation coefficient in the first period. We can conclude that the volatility is higher for the period of Asian financial crisis.

5.2 Correlation Analysis
We did the correlation analysis before doing regression result. We did it for several period of analysis to see the dynamic correlation change from time to time. The highest correlation in the full sample is the correlation between COMPRICE and EXPORT, which is equal to 0.965. The correlation is found to be statistically significant. The correlation between COMPRICE and EXPORT is relatively similar to the period before global crisis happened or in the period when Asian Financial Crisis happened (1995M01-2006M14). It is equal to 0.940

and still statistically significant. In the period after global crisis (2007M1-20014M12), the correlation decreased to 0.860 but but still significant.

For NOMINAL_ER (NOMINAL EXCHANGE RATE), the correlation with EXPORT is equal to 0.413 in full sample. In the period of Asian financial crisis, the correlation slightly higher is equal to 0.429. Both are statistically significant. The pattern of correlation between NOMINAL_ER and EXPORT is change after global crisis (2007M01-2014M12), which is negative and not statistically significant, equal to -0.127. In after period of global crisis, several variables that initially have significant correlation with EXPORT but change is not significantly correlated with EXPORT. Those variables are NOMINAL_ER and MPI_US. If we linked this evidence to the introduction part about Indonesian export structure (Figure 3 and Figure 4), the increasingly dominant portion of primary commodities (and also deindustrialization experience) is the explanation for the change behavior in correlation. Global uncertainty and global turbulence have taken dominant to change EXPORT variables, left the COMPRICE and MPI_CHINA (as the only variable that has significant correlation with EXPORT) and also diminished the role of NOMINAL_ER in correlation with EXPORT.

Correlation is not reveal causation but at minimum in the first sight, we can analyze and have initial description about the relation between each variables used in the regression model.

5.3 Cointegration Equation Result
Unit Root Test using ADF test shows the variables are non-stationary in level (except for MPI_US and MPI_CHINA) and stationary in first difference for all variables. The Unit Root Test has the null hypothesis that the variable has unit root. All test equations were tested using the method of least square including intercept but no trend. The optimal lag in ADF equations are selected using Schwarz information criterion. The result of unit root is in Table 5.

Engel Granger co-integration test shows all estimated equation are supporting co-integration hypothesis (ADF test on residual estimates attached in annex). For the whole sample, we found positive and significant relationship between nominal exchange rate and export in Indonesia, with the elasticity 0.103. It means that percent Rupiah depreciation will increase export 0.103 percent. The estimation shows the Rupiah exchange rate depreciation could help to boost export and controlling for other factors. This evidence has consistent result with the research by of Liu, Lu, and Zhou et al. (2013) and also Thorbecke and Ayutsuki (2012). Both study found positive and significant relationship between currency depreciation or devaluation and total export.

All independent variables are significantly affected export, except for MPI_US. The possible explanation for this insignificancy is related with the use manufacture production index for monthly data as a proxy for the US aggregate

economic activity. The use of GDP in quarterly data possibly could correct this insignificancy. For testing the insignificancy, we also used MPI_China as substitute for MPI_US. Fundamentally, we tried to represent world economic activity that will influence Indonesia's demand for goods and services from the world.

In the full sample equation, commodity price index, namely COMPRICE, is also highly significant affecting Indonesia's export. The elasticity number for COMPRICE is 0.914. This significant relationship is supporting the importance of commodity product in Indonesian export.

In order to have the detail about the pattern before and after global crisis happened, we divided the sample (with simple rule) the data before 2007 are before global crisis period; and after January 2007 are global crisis period and after global crisis period. The first period from 1995-2006 is capturing the period of Asian 1997/1998 crisis period. The second period from 2007-2014 is capturing the period of global crisis. The difference of the two crises to the elasticity of export to its determinants, especially nominal exchange rate is a focus of this study.

Equation for full sample
Log(EXPORT)=2.894+0.103   Log   (NOMINAL_ER)+0.200   Log (MPI_US)+0.914 Log (COMPRICE)   (5)
R Square=0.979

Equation before global crisis:

Log(EXPORT)=2.558+0.035   Log   (NOMINAL_ER)+0.615   Log (MPI_US)+0.696 Log (COMPRICE)   (6)
R Squared=0.937

Equation after global crisis:

Log(EXPORT)=4.698-0.0153   Log   (NOMINAL_ER)+0.612   Log (MPI_US)+0.426 Log (COMPRICE)   (7)
R Squared =0.875

Equation 6 shows the result for pre-global crises period, while equation 7 shows the result for post-global crises period. For the two estimated equations, we found insignificant relationship between nominal exchange rate and export even with ten percent significance level. This insignificant relationship provided the change in behavior after the global crisis. Rupiah depreciation in this period did not help for increasing export. It could possibly related with the decreasing of MPI_US (US manufacture production index) at the global crisis period. Decreasing pattern of MPI_US could be seen at Figure 5 MPI_US has

marginally significant positive coefficient (at 10 percent significance level, with the probability value 14.4 percent in affecting Indonesia's export). With decreasing of MPI_US, Indonesian export could decrease, reducing the impact of Rupiah exchange rate depreciation to export.

Adjusted R square for all samples are 97.9 percent. On the other hand, before crisis R square is 93.7%. Adjusted R Square is decreasing for after crisis period into 87.5%. The decreasing of adjusted R square is reflecting the decrease of degree of model explanation, other factors were not included in the model is determining export behavior.
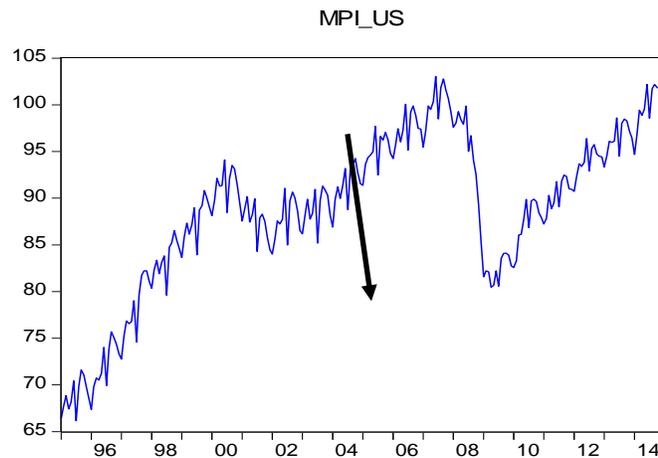

Figure 5: Manufacture Production Index United States

Source : CEIC Database

We do sensitivity analysis by replacing MPI_US with MPI_CHINA. Since 2001, China has become the major world demander for commodity product or raw material product to support its manufacture industry. Now, Indonesia's major trading partner is China. So, it is important to include MPI_CHINA as the proxy of world economic activity that influence Indonesia's export. For whole sample period, we found the coefficient of MPI China is negative and marginally significant at 10% (with 11.64 percent probability value). It is contrast with MPI_US that has positive coefficient, MPI_CHINA has negative coefficient. It showed that there was some degree of competition between Indonesia and China in the third market (the US and Europe).

In the full equation sample, replacing MPI_US with MPI_CHINA did not change the coefficient of nominal exchange rate. It is still positive and has significant relationship with export. The elasticity number is almost the same.
Equation for full sample

Log(EXPORT)=3.723+0.107 Log (NOMINAL_ER)-0.026 Log (MPI_CHINA)+ 0.9586 Log (COMPRICE)   (8)
R Squared=0.979

There is a change pattern from positive and significant impact of nominal exchange rate before global crisis period into insignificant impact of nominal exchange rate after period of global crisis. The result is supporting the hypothesis that after global crisis, Rupiah depreciation did not give much help in boosting Indonesia's export. The elasticity of export to exchange rate is changing from positive into negative (even not statistically significant).

Equation before global crisis:

Log(EXPORT)=4.244 + 0.113 Log (NOMINAL_ER)-0.017 Log (MPI_CHINA)+0.793 Log (COMPRICE)   (9)
R Squared=0.933

Equation after global crisis:

Log(EXPORT)=6.814 -0.065 Log (NOMINAL_ER)-0.065 Log (MPI_CHINA)+0.659 Log (COMPRICE)   (10)
R Squared = 0.878

Freund and Pierola (2008) examined 92 episodes of export surges and find that export surges in developing countries tend to be headed by a large real depreciation. They explained the depreciation leads to a significant reallocation of resources in the export sector or tradable sector. The reason is mantaining a competition currency leads firms to expand their product and market space for exports, inducing a large reorientation of the tradable sector. However, this study found this prediction did not happened after global crisis. Insignificancy of exchange rate to export could be explained by the research of Kandil and Mirzaie (2003) and Guitian (1976). They argued that the success of currency depreciation in promoting trade balance largely depend on switching demand in proper direction and amount. It is also depend on the capacity of home economy to meet the additional demand by supplying more goods. Meade (1951) also highlighted the important prerequisites for positive effect of exchange rate to trade balance is the requirement of Marshall Lerner Condition. If the Marshall Lerner condition is not satisfied, then the currency depreciation could produce contraction.

5.5 Error Correction Model Result
According to Engel and Granger (1987), after cointegration is proved, there is error correction the representation in which the short run dynamics of the variables in the system are influenced by the adjustment to deviation in order to achieved equilibrium.

In the short term, the change in exchange rate does not significantly influence the change in export. It is applied to all alternative models. Error correction terms in all alternative models are significant at 1% significance level and negative. The largest error correction coefficient is in the before crisis alternative 1 model, for 68.2% adjustment coefficient. In the short term, the commodity price is the only variable that has a significant impact to export. The only variable that has significant impact to export is only commodity price. Thus, the results shows This research found the superiority of commodity price impact as explanatory variable to Indonesian export, compared to exchange rate.

6. Conclusion and Future Research

In the case of after global crisis period (2007-2014), we did not find the evidence of exchange rate depreciation significant impact to Indonesian export. We found that the change in behavior after the global crisis period, whereas Rupiah did not increase export.

Export elasticity in its long run estimation tends to be higher in before global crisis period (1995-2006) compared to after global crisis period (2007-2014). This research also found the superiority of commodity price impact as explanatory variable to Indonesian export, compared to exchange rate.

Although the study already served its purposed, there are some limitations due to data availability than can be minimized in future research. This study used manufacture production index as a proxy for GDP trading partner may have several weaknesses in portraying the aggregate economic activity. The export data could also be decomposed into primary export and manufacture export to get more comprehensive view about the difference in responses of each type of export to exchange rate changes.

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Annex

Table 1: Descriptive Statistics

STATIS-TICS	EXPORT			NOMINAL_ER			COMPRICE			MPI_US			MPI_CHINA		
	Period 1	Period 2	Period 3	Period 1	Period 2	Period 3	Period 1	Period 2	Period 3	Period 1	Period 2	Period 3	Period 1	Period 2	Period 3
Mean	5,145.10	6,008.07	13,311.81	7,469.33	9,316.54	9,838.05	68.63	80.43	164.27	85.79	91.34	93.21	13.63	14.72	12.79
Maximum	9,610.30	9,610.30	18,647.83	13,995.90	11,274.10	12,432.80	130.92	130.92	219.74	100.06	100.06	103.04	23.20	23.20	19.40
Minimum	3,017.85	3,894.70	7,134.32	2,207.00	8,224.30	8,522.80	41.91	49.39	98.16	66.16	84.02	80.46	2.10	2.30	5.40
Std. Dev.	1,410.85	1,472.19	2,918.58	3,061.33	689.95	1,098.04	21.15	23.96	29.62	8.64	4.21	6.26	3.85	4.02	3.40
Variation coefficient	0.274	0.245	0.219	0.410	0.074	0.112	0.308	0.298	0.180	0.101	0.05	0.07	0.28	0.27	0.27

Note:
Period 1: 1995M1-2006M12 (Obs: 144)
Period 2: 2001M1-2006M12 (Obs: 72)
Period 3: 2007M1-2014M12 (Obs: 96)
Source: Researcher Calculation.

Table 2: Correlation for Full Sample (1995M01-2014M12)

Correlation Probability	COMPRICE	EXPORT	MPI_CHINA	MPI_US	NOMINAL_ER
COMPRICE	1.000000				
	(-----)				
EXPORT	0.965183	1.000000			
	(0.0000)	(-----)			
MPI_CHINA	0.019627	-0.079213	1.000000		
	(0.7672)	(0.2314)	(-----)		
MPI_US	0.543132	0.504328	0.027701	1.000000	
	(0.0000)	(0.0000)	(0.6760)	(-----)	
NOMINAL_ER	0.384774	0.413109	-0.253938	0.722573	1.000000
	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(-----)

Table 3: Correlation for Before Global Crisis Period (1995M01-2006M12)

Correlation Probability	COMPRICE	EXPORT	MPI_CHINA	MPI_US	NOMINAL_ER
COMPRICE	1.000000				
	(-----)				
EXPORT	0.939484	1.000000			
	(0.0000)	(-----)			
MPI_CHINA	0.478133	0.330194	1.000000		
	(0.0000)	(0.0001)	(-----)		
MPI_US	0.574627	0.737617	0.028519	1.000000	
	(0.0000)	(0.0000)	(0.7344)	(-----)	
NOMINAL_ER	0.238624	0.428913	-0.195326	0.802101	1.000000
	(0.0040)	(0.0000)	(0.0190)	(0.0000)	(-----)

Table 4: Correlation for After Global Crisis Period (2006M12-2014M12)

Correlation Probability	COMPRICE	EXPORT	MPI_CHINA	MPI_US	NOMINAL_ER
COMPRICE	1.000000				
	(-----)				
EXPORT	0.860081	1.000000			
	(0.0000)	(-----)			
MPI_CHINA	-0.214492	-0.374055	1.000000		
	(0.0339)	(0.0001)	(-----)		
MPI_US	0.210575	-0.030796	0.280608	1.000000	
	(0.0374)	(0.7634)	(0.0051)	(-----)	
NOMINAL_ER	-0.196173	-0.127104	-0.578759	-0.174458	1.000000
	(0.0529)	(0.2123)	(0.0000)	(0.0858)	(-----)

Table 5: Results of Unit Root Test

Variable	Augmented Dickey Fuller test	
	Level	First difference
EXPORT	-0.989	-21.450***
NOMINAL_ER	-2.427	-11.652***
COMPRICE	-1.209	-10.132***
MPI_US	-2.665**	-4.099***
MPI_CHINA	-3.375**	-14.640***

Notes: All variables are in natural logarithmic form.
  ***=significant at 1%
  **=significant at 5%
  *=significant at 10%

Table 6: Error Correction Model Results

Variable	Alternative 1 (MPI_US)			Alternative 2 (MPI_China)		
	All sample	Before crisis	After crisis	All sample	Before crisis	After crisis
Constant	0.003[0.777]	0.002[0.488]	0.004[0.524]	0.010[1.213]	0.003[0.575]	0.004[0.499]
d(LNOMINAL_ER)	0.028[0.439]	0.061[1.031]	-0.379[-1.11]	-0.371[-1.043]	0.046[0.729]	-0.447[-1.223]
d(LCOMPRICE)	0.404[4.109]***	0.491[3.479]***	0.259[1.649]*^{0}	0.356[2.077]**	0.537[3.622]***	0.355[2.016]**
d(LMPI_US)	0.216[1.196]	0.256[1.379]	0.580[1.507]	-	-	-
d(LMPI_CHINA)	-	-	-	-0.022[-0335]	-0.019[-1.494]	-0.054[-0.804]
ECT_{t-1}	-0.494[-8.304]***	-0.682[-8.196]***	-0.437[-4.904}***	-0.543[-5.573]***	-0.599[-7.256]***	-0.496[-5.050]***
R^2	0.282	0.365	0.275	0.338	0.310	0.299
Adjusted R^2	0.269	0.346	0.242	0.306	0.290	0.265
F statistics	22.923	19.821	8.515	10.359	15.533	8.551

  ***=significant at 1%
  **=significant at 5%
  *=significant at 10%
  *^{0}=marginally significant at 10%