CHAPTER 5

RESULTS AND ANALYSIS

The research estimates equation (4.10) in the preceding chapter as a panel data. The cross-section variable is defined as a system of code consists of trade-sector specific identity and trade-partner specific identity. Having 8 trade sectors and 5 main trading partners, the cross section variable, namely coding, has 40 individuals. On the other hand, time-series variable is defined as year. This variable has 20 individuals allowing for annual observation of the cross-section data from the year 1987 to 2006.

The chapter will be divided into two subchapters. The first subchapter provides elaboration of the results of different methods of estimations. These results will form an inductive elaboration to the results under the best estimation. The thresholds used in determining which estimation performs the best results are:

a) The method should be able to produce the most credible result under the assumptions specified.

b) The method should be able to produce a significant model.

c) The method should be able to produce the most numbers of significant parameters.

The second subchapter provides analysis of the result obtained from the chosen best method based on the thresholds above. The analysis elaborated in this subchapter will perform as the foundation of inferring process in order to draw conclusions and caveats in the next chapter.

5.1. Results

5.1.1. Pooled-Least Square

Estimation using the pooled-least square method produces the following results:

Table 5.1. Results of Pooled-Least Square

Number of obs.	800
F(11,788)	98.63
Prob > F	0.0000
R-squared	0.5793
Adj. R-squared	0.5734

Lntrade	**Coef.**	**Std. Err.**	**P > [t]**
Lngdppc	1.035235	0.0952873	0.0000
Lnpop	0.172135	0.0726814	0.018
Lndist	-0.660192	0.1405964	0.0000
u31	0.2171952	0.0861142	0.012
u32	-1.508523	0.0861142	0.0000
u33	0.3514693	0.0861142	0.0000
u34	0.4760764	0.0861142	0.0000
u35	-0.827109	0.0861142	0.0000
u36	0.4279386	0.0861142	0.0000
u37	0.7056182	0.0861142	0.0000
u38	0.8790189	0.0861142	0.0000
Cons	5.285036	1.822082	0.004

As we can see from the result above, the model is significant at 95% level of confidence. Meanwhile, it has a pretty good model specification that the R-squared exceeds the amount of 50%. Moreover, all independent variables are significant at 95% level of confidence.

However, the data has problems which cause it to violate basic assumption of OLS estimators. The Breusch-Pagan test of heteroscedasticity shows that the data rejects the null hypothesis that it has constant variance in its disturbances (homoscedasticity).

Table 5.2. Results for Breusch-Pagan Test of Heteroscedasticity

chi2 (1)	332.91
Prob > chi2	0.0000

Moreover, the VIF also states a result of 1.85. To confirm this VIF, a matrix correlation of independent variables is built. The matrix shows a suspicion of multicollinearity between two independent variables. Both of them are *lnpop* and *lndist*. These two variables have collinearity that exceeds 0.8, specifically 0.8671. However, this raw evidence of collinearity may be explained by the nature of the data especially that is obtained for the distance variable, namely *lndist*. For the whole sample that consists of 800 observations, there are only 5 different values of *lndist*, each representing the log-natural of the distance between Indonesia and a trading partner. This micronumerosity problem may be the source of this multicollinearity problem.

The Wooldridge test for autocorrelation is then performed in order to test the data under the null hypothesis of no first-order autocorrelation. The result shows that the data has autocorrelation problem which goes hand-in-hand with the following Wooldridge test.

Table 5.3. Result for Wooldridge Test of Autocorrelation

F(1,44)	13.019
Prob > F	0.0009

Taking into account the violation of assumptions elaborated above, an estimation which commands the program to compute robust variance estimators produces a result which has major similarities with the result shown above. The biggest difference is accordingly the standard errors of each parameter[17].

5.1.2. Fixed-Effects Model

[17] Result is provided in the Appendix.

Regressing the panel data under the pooled-least square model does not allow the model to take advantage of recognizing time-variant differentials among the cross-section variable. Therefore, the following estimation is performed under the fixed-effect model[18].

Table 5.4. Result for Fixed-Effects Model

R2 within	0.3526
R2 between	0.0142
R2 overall	0.0274
F(10,750)	35.79
Prob > F	0.0000

lntrade	**Coef.**	**Robust Std. Err.**	**P > [t]**
lngdppc	0.8724071	0.1647717	0.0000
lnpop	0.4749139	0.3423591	0.166
lndist	(dropped)		
u31	0.1900149	0.0355343	0.0000
u32	0.0795335	0.0851364	0.351
u33	0.054681	0.0416191	0.189
u34	0.1371107	0.049215	0.005
u35	0.1312771	0.0461391	0.005
u36	0.1062662	0.026553	0.0000
u37	0.1248746	0.0321285	0.0000
u38	0.0805738	0.0455271	0.077
cons	-8.66675	10.15594	0.394

[18] All results shown up from this part until the end of this chapter is under already estimated to be maximumly robust. However, results which are made not under the robust command are shown in Appendix.

The result above has a smaller R-square compare to that of the pooled-least square model. Here, it is approximately 35%. Nevertheless, the F-test still suggests the significance of the whole parameters simultaneously as a model.

However, the variable of distance, *lndist*, is dropped in this estimation. There are also four parameters that do not meet the condition of null-hypothesis rejection of parameter significance test at 95% level of confidence. These parameters are those of the following variables: *lnpop*, *u32*, *u33*, *u38*, and *constanta*.

5.1.3. Random-Effects Model

In order to find the best estimation, the research also regress the model under the random-effect model. The result is shown below.

Table 5.5. Result for Random-Effects Model

R2 within	0.3503
R2 between	0.1146
R2 overall	0.1318
Wald chi2(12)	16220.23
Prob > chi2	0.0000

lntrade	**Coef.**	**Robust Std. Err.**	**P > [z]**
lngdppc	0.9491302	0.1140475	0.0000
lnpop	0.2921572	0.2187764	0.182
lndist	-0.857081	0.4566235	0.061
u31	0.1956271	0.0339642	0.0000
u32	0.0223759	0.0911481	0.806
u33	0.0707706	0.0426699	0.097

u34	0.1548393	0.0558476	0.006
u35	0.0985891	0.0428304	0.021
u36	0.1233227	0.0272264	0.0000
u37	0.1519989	0.0320191	0.0000
u38	0.1161583	0.0480647	0.016
cons	3.854049	4.060406	0.343

The R-square estimated under the above random-effect model is relatively indifferent to that of the fixed-effect model. Here, the R-square is also around 35%. This random-effects model is also able to satisfy the model significance as it is shown by its Wald test.

Unlike the fixed-effect model, this random-effect model does not drop the distance variable which is *lndist*. However, this variable along with five other variables are not significant at 95% level of confidence. These five other variables are *lnpop, lndist, u32, u33* and *constanta*. Though, *lndist* and *u33* is significant at 90% level of confidence.

5.1.4. Hausman Test

Hausman test is performed in the objection to determine which model is better, the fixed-effect model or the random effect model. The hausman test between the fixed-effect and random effect's result is as follows.

Table 5.6. Result for Hausman Test

chi2 (10)	16.86
Prob > chi2	0.0776

The result says that the null hypothesis stating that there is no systematic different between fixed-effect model and random-effect model is accepted at 95%

level of confidence. Therefore, in accordance with the Hausman test, fixed-effect model can better explain the model compared to random-effect model.

The shortcoming of accepting fixed-effect model in this case is that it drops a variable which acts as one of the building block of the gravity model, namely *lndist*. Realizing such cost, the research chooses to appoint random-effect model as a better model compared to fixed-effect model.

5.1.5. Feasible Generalized-Least Square (FGLS) Model

Founding heteroscedasticity problem in the data, the research tries to solve the problem by estimating the model under the generalized-least square (GLS) model. The following result is the estimation of the model under GLS.

Table 5.7. Result for FGLS Model

Wald chi2 (11)	1101.47
Prob > chi2	0.0000

lntrade	**Coef.**	**Std. Err.**	**P > [z]**
lngdppc	1.035235	0.09457	0.000
Lnpop	0.172135	0.0721343	0.017
Lndist	-0.660192	0.1395379	0.000
u31	0.2171952	0.0854659	0.011
u32	-1.508523	0.0854659	0.000
u33	0.3514693	0.0854659	0.000
u34	0.4760764	0.0854659	0.000
u35	-0.827109	0.0854659	0.000
u36	0.4279386	0.0854659	0.000
u37	0.7056182	0.0854659	0.000
u38	0.8790189	0.0854659	0.000
Cons	5.285036	1.808365	0.003

The above result of GLS model shows a significant estimation of model. This is proved by the Wald test showing the rejection of null hypothesis of

similarity of parameters simultaneously to zero at 95% level of confidence. Moreover, the result shows that all independent variables are able to satisfy parameter significance test at 95% level of confidence.

5.1.6. Treated FGLS Model

In order to fully solve the hereteroscedasticity and serial-correlation problem, this research also regress the model under FGLS with some special treatments. In this case, the model uses heteroscedastic error structure with no cross-sectional correlation. This treatment is specified to overcome the heteroscedasticity in the data. Moreover, the model also uses first-order autoregressive autocorrelation within panel in order to overcome the serial-correlation problem. The following result is the model estimation under these special treatments.

Table 5.8. Result for Treated FGLS Model

Wald chi2 (11)	504.55
Prob > chi2	0.0000

lntrade	**Coef.**	**Std. Err.**	**P > [z]**
lngdppc	0.966549	0.0735273	0.000
Lnpop	0.292827	0.0549066	0.000
Lndist	-0.811328	0.1125304	0.000
u31	0.1266452	0.0244063	0.000
u32	-0.350336	0.1002684	0.000
u33	0.1785326	0.0375418	0.001
u34	0.3750605	0.0811399	0.000
u35	-0.259657	0.0587757	0.000
u36	0.1665465	0.0263207	0.000
u37	0.2754399	0.0394555	0.000
u38	0.3562577	0.0551794	0.000
Cons	3.518053	1.290078	0.006

This treated GLS model shows significance of the estimation in explaining the model. This is proved by the rejection of null hypothesis of the Wald test. Moreover, this treated GLS model succeeds in obtaining an estimation having all significant parameters at 95% level of confidence.

Concerning the thresholds of choosing the best model as elaborated in the beginning of the chapter, we may conclude that the last model which is the treated GLS is the best model for estimating the data used in this research. Hence, the following analysis uses this treated GLS in explaining the behavior between the independent variables, namely trade, and the dependent variables, namely GDP per capita, population, distance and exchange rate uncertainty.

5.1.7. Results for Exchange Rate Uncertainty with k=5 and k=10

The same data set of gravity model is used with different measurement of exchange rate uncertainty. Apparently, the same problems prevail for both data set, in which there are heteroscedasticity and autocorrelation. These data-sets are regressed under the same panel-data regression models and show similar result with the default data set as shown above. The variable of GDP per capita and population are positive and significant whereas the variable of distance is negative and significant. Moreover, the regressions of these data-sets also show that the trade sector code 2 and 5 are significantly and negatively affected by exchange rate uncertainty, while the other 6 trade sectors are significantly and positively affected by exchange rate uncertainty.

5.1.8. Results for Exchange Rate Uncertainty in Log-Natural Form

The variable of exchange rate uncertainty is integrated into the model in log-natural form in order to obtain the elasticity of each trade sector's volume of trade to the level of exchange rate uncertainty. The data show that there is also heteroscedasticity and autocorrelation. The research also performs various panel

data regression methods in this data and obtains the best result with treated FGLS as well. The summary of the results is available in the next subchapter.

5.2. Analysis

5.2.1. Trade and GDP per Capita

The result assures that the product of GDP per capita between Indonesia and its trading partner has positive relation with trade. The result also suggests that the elasticity of this income factor to trade is biggest among all independent variables concerned in this research. At 95% level of confidence, an increase of one percentage point of product of GDP per capita increases trade by 0.97 percentage point of trade.

This evidence goes hand-in-hand with what the theory suggests that income has an increasing function with trade. Higher level of income indicates stronger purchasing power. It means that economic growth stimulates more trade.

5.2.2. Trade and Population

The result shows that product of population between Indonesia and its trading partner has positive relation with trade. It suggests that the elasticity of population to trade is significant at 95% level of confidence and therefore says that an increase of one percentage point of product of population raises trade by 0.29 percentage point.

Bigger population indicates bigger demand as well as bigger supply. In the perspective of trade, bigger population means more level of demand of goods. It is

common that each country cannot produce all its needs domestically. Therefore, it is natural that a country having bigger population would demand more goods from international market through imports. Besides, a country with bigger population indicates more capability in producing goods and thus bigger ability to supply goods to international markets through exports.

5.2.3. Trade and Distance

The result shows that distance has negative relationship with trade. The estimation suggests that an increase of one percentage point of distance discourages trade by 0.811 percentage point. This estimation is significant at 95% level of confidence.

This negative relationship affirms the theory suggesting that distance is coherent with transport cost. The further the geographical location between two trading partners means that the more expensive the transport cost is.

5.2.4. Trade and Exchange Rate Uncertainty

The research confirms the postulates proposed by Maskus and the findings by Cho et al. that different trade sectors have different sensitivity with exchange rate uncertainty. Uniquely, the research also discovers that exchange rate uncertainty imposes different impacts, negative impact or positive impact, on different trade sectors. The following table summarizes the varying impacts of exchange rate uncertainty to different trade sectors estimated in this study.

Table 5.9. Results of Exchange Rate Uncertainty's Impacts on Various Trade Sector

Impacts of Exchange Rate Uncertainty on Trade Sectors	
Negative Impacts	**Positive Impacts**
Beverages & Tobacco (c=2)	Food & Live Animals (c=1)

Animal & Vegetable Oil (c=5)	Crude Matter, Inedible (c=3)
	Mineral Fuel (c=4)
	Chemical Products (c=6)
	Manufactured Goods (c=7)
	Machinery and Transportation Equip. (c=8)

As we can see from the table above, exchange rate uncertainty imposes negative impacts to two out of eight trade sectors. It means that an increases of exchange rate uncertainty discourages trade of these sectors, which are Beverages and Tobacco (c=2, SITC 1-) and Animal and Vegetable Oil (c=5, SITC 4-). Simultaneously, exchange rate uncertainty imposes positive impacts on other trade sectors. Trade of these six trade sectors is encouraged by the increase of exchange rate uncertainty. These sectors are Food and Live Animals (c=1, SITC 0-), Inedible Crude Matter (c=3, SITC 2-), Mineral Fuel (c=4, SITC 3-), Chemical Products (c=6, SITC 5-), Manufactured Goods (c=7, SITC 6-) and Machinery and Transportation Equipment (c=8, SITC 7-).

Different trade sectors have varying sensitivity toward exchange rate uncertainty as well. The table below summarizes the rank of this sensitivity owned by different trade sectors.

Table 5.10. Rank of Trade Sectors based on the Coefficients of Exchange Rate Uncertainty

Negative Impacts				
Rank	**Code**	**SITC**	**Trade Sector**	**Coefficient**
1	2	1-	Beverages & Tobacco	-0.350336
2	5	4-	Animal & Vegetable Oil	-0.2596572
Positive Impacts				
Rank	**Code**	**SITC**	**Trade Sector**	**Coefficient**
1	4	3-	Mineral Fuel	0.3750605
2	8	7-	Machinery and Transportation Equipment	0.3562577
3	7	6-	Manufactured Goods	0.2754399
4	3	2-	Crude Matter, Inedible	0.1785326
5	6	5-	Chemical Products	0.1665465
6	1	0-	Food & Live Animals	0.1266452

However, the results of the regression of exchange rate uncertainty in log-natural form tell more information about the behavior of each trade sector toward exchange rate uncertainty. The summary of the results is presented below.

Table 5.11 Elasticity of Each Trade Sector's Volume of Trade to Exchange Rate Uncertainty

Trade Sector	Elasticity to Exchange Rate Uncertainty		
	U3	U5	U10
Food and Live Animals	0.4036***	0.4512***	0.3183***
Beverages and Tobacco	-0.34085	-0.4372*	-1.0587***
Crude Materials, Inedible	0.45021***	0.48395***	0.48522***
Mineral Fuels, Lubricants etc.	0.7457***	0.84049***	1.0084***
Animal and Vegetable Oils & Fats	-0.3299**	-0.38007***	-0.79802***
Chemical Products	0.37636***	0.43696***	0.41426***
Manufactured Goods	0.57141***	0.63983***	0.75816***
Machinery and Transport Equipment	0.58438***	0.70254***	0.79654***

Notes:

*** significant in 99% level of confidence

** significant in 95% level of confidence

* significant 90% level of confidence

5.2.4.1. Trade of Food and Live Animals

As elaborated in chapter III, trade of food and live animals (code=1, SITC 0-) is highly dominated by exports. The movement of the value of trade is also relatively smooth. This sector accounts for around 5% to 7% of total trade throughout the time observed. It means that these commodities seem to have inelastic demands of exports and imports. This characteristic goes hand in hand with the feature of these commodities as necessities products or primary-needs products.

Moreover, according to the table below, the percentage of exports from total output of the sector's main products varies highly and seems to be relatively small in most of period observed below. Based on Maskus's argument, a trade sector having low level of openness tends to have negative behavior toward changes in exchange rate uncertainty.

Table 5.12 Percentage of Exports from Total Output for Main Agriculture Commodities

Commodity	1990	1995	2000	2005
Shrimps	n.a.	2.119354	1.43625	0.545761
Coffee	13.65707	0.51003	0	41.86802
Cacao	60.73813	69.75006	94.34322	75.148
Fish	8.687148	5.947586	10.47339	8.421066

Source: BPS Input-Output Table, calculated

This low level of openness to international trade can also be seen by the percentage of imported inputs to total value added. Table below shows that this sector needs a relatively very small imported input.

Table 5.13 Percentage of Imported Input from Total Value Added for Main Agriculture Commodities

Commodity	1990	1995	2000	2005
Shrimps	n.a.	0.032009	0	0
Coffee	0.330593	1.028889	0	0
Cacao	0.262647	0.397493	0	0

Fish	0.980788	0.410744	0	0

Source: BPS Input-Output Table, calculated

On the other hand, the average level of tariff for agriculture products is relatively high. WTO's tariff profile reports that in 2006 the simple average final bound tariff for agriculture sector in Indonesia is 47%, while non-agriculture products is 35,6%. Thus, it can also be argued that the sector has a relatively high level of protection. According to de Grauwe, protectionism can cause lower level of international trade.

According to data provided by Indonesian Investment Coordinating Board, this sector is not one of the biggest receivers of foreign investment. Meanwhile, it is also difficult to find data about the level of concentration that prevails in the sector.

Based on the reasons elaborated above, the research cannot find any specific reason that can explain why exchange rate uncertainty imposes positive effects to this trade sector. The research proposes to take this finding as an anomaly.

Moreover, the estimated elasticity shows that an increase of one percentage point of exchange rate uncertainty can increase this sector's volume of trade by around 0.4 percentage point.

5.2.4.2. Trade of Beverages and Tobacco

Indonesia's trade of beverages and tobacco (code=2, SITC 1-) is highly dominated by trade of tobacco products. Moreover, trade is mostly dominated by exports except in the period between 1994 and 1996. In general, as we can see in chapter III as well, the movement of the value of trade is relatively volatile throughout the period observed.

Moreover, this sector is an object of high tariffs and duties. In 2006, the average final bound duties for this sector reach a level of 85%[19]. De Grauwe elaborates that protectionist regulation as indirect effect of exchange rate uncertainty may dampen international trade. This argument may be suitable to explain the negative effect that exchange rate uncertainty imposes on the trade of this sector.

This protectionist legislation may prevail due to high percentage of employment from total value added. This condition is shown in the table below.

Table 5.14 Percentage of Employment from Total Value Added for Beverages and Tobacco Main Products

Commodity	**1990**	**1995**	**2000**	**2005**
Tobacco	47.39095	49.74417	51.12068	40.5869
Manufactured tobacco	28.86032	46.24326	54.22806	50.27106
Cigarettes	6.994852	8.527589	8.443572	10.83625

Source: BPS Input-Output Table, calculated

This sector's level of openness is also relatively small. First, this condition can be seen from the percentage of exports from total output as shown by the table below.

Table 5.15 Percentage of Exports from Total Output for Beverages and Tobacco Main Product

Commodity	**1990**	**1995**	**2000**	**2005**
Tobacco	9.051695	10.00809	0	0
Manufactured tobacco	0.029725	0.190431	28.00665	24.90243
Cigarettes	1.768968	1.672052	3.903484	2.422511

Source: BPS Input-Output Table, calculated

[19] WTO. Indonesia Tariff Profile 2006.

Second, low level of openness can also be seen by the percentage of imported inputs from total value added. The calculated values of this term for beverages and tobacco main product are relatively small. This condition can be seen from the table below.

Table 5.16 Percentage of Imported Inputs from Total Value Added for Beverages and Tobacco Main Products

Commodity	**1990**	**1995**	**2000**	**2005**
Tobacco	0.334254	0.801219	0	0
Manufactured tobacco	6.930026	14.63617	45.82682	0
Cigarettes	7.912016	8.768465	16.96226	0

Source: BPS Input-Output Table, calculated

This low level of openness can help explain the negative relationship between exchange rate uncertainty and the sector's volume of trade. The estimated elasticity shows that an increase of exchange rate uncertainty by one percentage point reduces the volume of trade by 0.4 percentage point for *k* equals to five years and 1.06 percentage point for *k* equals to ten years. Moreover, the elasticity of exchange rate uncertainty with *k* equals to three years is not significant and can be taken as zero.

5.2.4.3. Trade of Crude Matter

As we can see from chapter III, trade of crude matter (code=3, SITC 2-) is highly dominated by exports while its imports are relatively stagnant over the time observed. As we can see from the table below, this trade sector's main commodities such as rubber other than latex and various mining products such as copper and nickel are mostly exports-oriented products.

Table 5.17 Percentage of Exports from Total Output for Main Commodities of Crude Matter

Commodity	1990	1995	2000	2005
Rubber other than latex	70.62382	62.82433	71.78474	74.49945
Pulp	34.18077	50.76985	67.32493	75.41017
Paper and board	8.671816	21.68278	39.99402	54.21506
Products from paper and board	3.105095	13.64274	22.76005	59.94163

Source: BPS Input-Output Table, calculated

Moreover, especially for pulp and paper the importance of imported inputs is relatively high. This condition may also reflect the high openness of the sector.

Table 5.18 Percentage of Imported Inputs from Total Value Added for Crude Matter's Main Products

Commodity	1990	1995	2000	2005
Rubber other than latex	9.221692	3.032436	3.033316	0
Pulp	14.0952	19.98413	142.1489	0
Paper and board	55.43053	76.50033	138.8009	0
Products from paper and board	10.18012	4.267165	40.74036	0

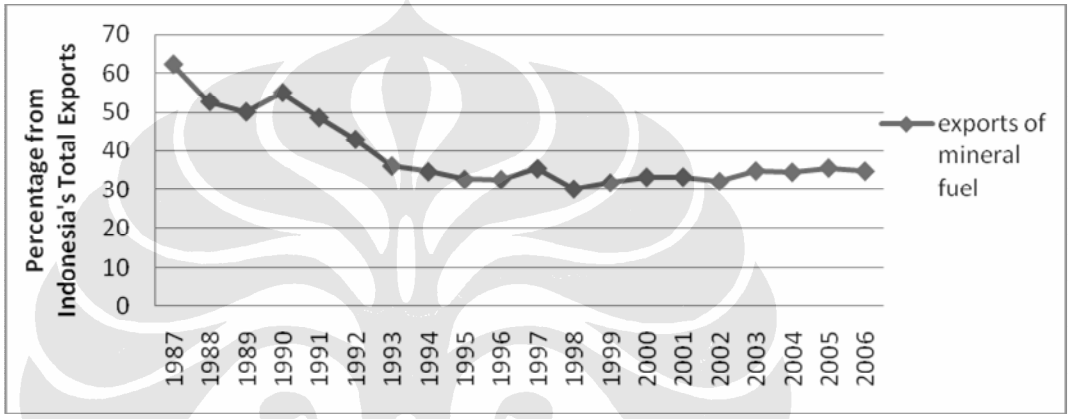
Source: BPS Input-Output Table, calculated

In accordance with Maskus's arguments, this sector openness may be the reason that exchange rate uncertainty imposes positive effects to this sector's international trade. The estimated elasticity shows that an increase of exchange rate uncertainty by one percentage point increases the sector's volume of trade by around 0.48 percentage point.

5.2.4.4. Trade of Mineral Fuel

Elaborations in chapter III show that trade of mineral fuel (code=4, SITC 3-) is highly dominated by its exports. Export of mineral fuel is widely known as Indonesia's main exports commodity such as liquefied natural gas (LNG) and crude petroleum oil. As we can see from the graph below, exports of mineral fuel always accounts for more than 30% of Indonesia's total exports.

Chart 5.1 Percentage of Exports of Mineral Fuel from Indonesia's Total Exports



Source: BPS Statistik Perdagangan Luar Negeri Indonesia, calculated

Moreover, the sector can be argued to be export-oriented and therefore also has a relatively high degree of openness to international trade. This argument is based on the high percentage of exports from total output for products of this trade sector as shown in the table below.

Table 5.19 Percentage of Exports from Total Output for Commodities of Mineral Fuels

Commodity	**1990**	**1995**	**2000**	**2005**
LNG	94.57868	91.45213	89.95811	93.3645
Crude Petroleum Oil	60.80511	53.22665	53.64008	65.1719
Refinery Products	18.08619	16.12601	31.79882	13.63541

Source: BPS Input-Output Table, calculated

However, only refinery products have high importance of imported inputs compares to the sector's other main products. This condition can be seen on the table below.

Table 5.20 Percentage of Imported Inputs from Total Value Added for Mineral Fuels' Main Commodities

Commodity	**1990**	**1995**	**2000**	**2005**
LNG	0.377497	1.005712	0.20705	0
Crude Petroleum Oil	1.254466	1.478394	0	0
Refinery Products	61.69202	49.76748	60.32304	0

Source: BPS Input-Output Table, calculated

This high level of openness may induce exchange rate uncertainty to have positive impact on the trade of mineral fuel. This argument is also proposed by Maskus. Indeed, this sector has the biggest positive elasticity of trade to exchange rate uncertainty. One percentage point increase of exchange rate uncertainty raises the sector's volume of trade by 1.01 to 0.74 percentage point.

5.2.4.5. Trade of Animal and Vegetable Oil

As we can see in chapter III, the values of imports of animal and vegetable oil are extremely low compared to the values exports. This condition causes the trade of animal and vegetable oil (code=5, SITC 4-) to be dominantly represented by its exports. On the other hand, the exports of this trade sector is also highly reflected by its main product namely palm oil.

Palm oil is a very important commodity to Indonesia because it is part of the input of cooking oil, one of the commodities in Indonesian people's basic needs basket. As one of Indonesia's basic needs, the government keeps a close eye on the fulfillment of domestic palm oil needs. When exchange rate uncertainty increases, producers of palm oil simultaneously face a higher expected profit from participating in international market. In order to stabilize domestic price of cooking oil due to decline of domestic supply of palm oil, the government usually imposes exports tax. This export tax can discourage producers of palm oil in shifting their sales from domestic market to international market. In the period between 1984 and 2005, export tax ranges from 40% to 60%. In the period after 2005, export tax range from 0% to 10%[20].

In accordance with the de Grauwe's argument, protectionist regulation imposed on this trade sector induces exchange rate uncertainty to have negative impacts on the trade sector's international trade.

In accordance to the argument, the percentage of exports from total output for the sector's main products is small.

Table 5.21 Percentage of Exports from Total Output for Animal and Vegatable Oils's Main Commodities

Commodity	**1990**	**1995**	**2000**	**2005**
Palm Oil	29.52523	0.455402	0.19263	0.853607
Copra	n.a,	0.005786	18.7709	3.842451

Source: BPS Input-Output Table, calculated

It is estimated that an increase of exchange rate uncertainty by one percentage point discourages the sector's volume of trade by 0.7 percentage point to 0.3 percentage point.

[20] More on the analysis of palm oil's export tax, see: Dradjat, Bambang. *Stabilisasi Harga Minyak Goreng*.

5.2.4.6. Trade of Chemical Products

Trade of chemical products (code=6, SITC 5-) is highly dominated by imports of chemical products. In general, trade of this sector increases over the period observed.

According to Indonesian Investment Coordinating Board, the sector of chemical products is one of the biggest sectors which receive foreign direct investment in Indonesia[21]. This condition may be the reason of this research's finding that exchange rate uncertainty has positive impacts on trade of chemical products. This result goes hand in hand with the argument proposed by Maskus that exchange rate uncertainty can increase international trade if it induces a highly multinational industry to engage in greater international trade.

Moreover, it is estimated that an increase of exchange rate uncertainty by one percentage point raises the sector's volume of trade by around 0.4 percentage point.

5.2.4.7. Trade of Manufactured Goods

The values of exports of manufactured goods (code=7, SITC 6-) exceeds the values of its imports throughout the period observed. However, neither exports nor imports extremely dominate the values of trade of manufactured goods.

Moreover, exports of the sector's main product which is plywood share a relatively big portion in total exports of manufactured goods. Study by World Bank states that by the early 1990s Indonesia has become the world's top plywood exporters. On the other hand, study by World Bank also states that plywood industry is characterized by high level concentration. However, Bird (1999) elaborates that this level of concentration was higher in the period before mid 1980s. In that period, CR4[22] in plywood industry reached a level of 51.1 %. After mid 1980s, it stayed in the level around 33%. Moreover, export activities are

[21] Details on foreign direct investment in Indonesia, see Appendix.
[22] CR4 is four-firm concentration ratio.

highly monopolized in forms of export cartel. This condition lasts until mid 2000s.

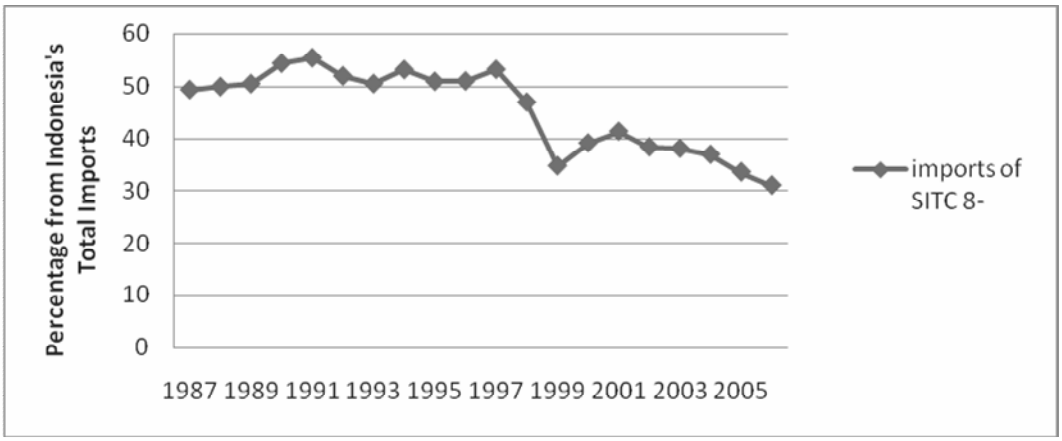
Maskus argues that a high level of industry concentration may cause an industry to have better capacity to cope with exchange rate uncertainty. This argument can be the reason that exchange rate uncertainty imposes positive impacts on trade of manufactured goods.

Moreover, it is estimated that an increase of exchange rate uncertainty by one percentage point encourages the sector's volume of trade by 0.75 to 0.57 percentage point.

5.2.4.8. Trade of Machinery and Transportation Equipment

Trade of machinery and transportation equipment (code=8, SITC 7-) was highly dominated by imports prior to the year 1999. After 1999, exports and imports shared relatively similar portion. However, import of machinery and transportation equipment Indonesia's main import commodity throughout the period observed. As we can see from the chart below, imports of machinery and transportation equipment take a portion of more than 30% of Indonesia's total imports.

Chart 5.2 Percentage of Imports of Machinery and Transportation Equipment from Indonesia's Total Imports



Source: BPS Statistik Perdagangan Luar Negeri Indonesia, calculated

According to Indonesian Investment Coordinating Board, this trade sector is one of the biggest receivers of foreign direct investment in Indonesia. Similar to the sector of chemical products, high level of foreign investment may be the reason that exchange rate uncertainty imposes positive effects on trade of machinery and transportation equipment.

On the other hand, the percentage of exports from total output especially for the commodities of manufacture of machinery kept increasing over time. This phenomenon can be seen in the table below.

Table 5.22 Percentage of Exports from Total Output for Commodities of Machinery and Transport Equipments

Commodity	**1990**	**1995**	**1998**	**2000**	**2003**
Manuf. of machine	4.69	24.67	97.83	67.83	59.83
Manuf. of transport equip.	3.56	5.58	83.16	7.24	6.65

Source: BPS Input-Output Table, calculated

This increasing trend of percentage of exports from total output may reflect the trend of the sector to be more export-oriented. This phenomenon can also reflect