THE IMPACT OF FREE TRADE AGREEMENT ON TRADE FLOW OF GOODS IN VIETNAM[1]

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ABSTRACT

This study analyzes the effect of free trade agreement (FTA) on merchandise export of Vietnam by applying gravity model. The model is evaluated on a sample of 185 countries in the period 1990-2012 using country level data for total export value of goods. In order to deal with multilateral resistance terms in the model, the study employs the fixed-effect model to control for unobservable factors. Due to zero-export value in data set, the export-plus-one model, the multiplicative form of gravity model and adjusted sample selection model (SSM) are used to solve the zero-value in export between Vietnam and trading partners. Previous research argues for the lack of exclusion restriction in using SSM proposed by Heckman (1979), the paper proves that sample selection approach is more efficient than the other two models. The results from the study find out that Vietnam have positive relationship with the trade outflow. This finding is supported by the previous papers testing the impact of AFTA on the trade flow.

Key words: Free Trade Agreement, gravity model, total bilateral trade, export

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1 Introduction

According to World Trade Organization, Vietnam is now official member of eight free trade agreements which are signed and into force; and, Vietnam is also launching negotiation with a number of countries and economic groups to establish other free trade agreements such as TPP, ASEAN-EU FTA. On the one hand, free trade is espoused in improving the trade and welfare of signing countries. This belief is developed from the absolute advantage by Adam Smith, comparative advantage by David Ricardo, Heckscher-Ohlin model by Eli Heckscher and Bertil Ohlin to Paul Krugman with economies of scale and product differentiation. On the other hand, Michaely (1996) not only accepted the gain from free trade but he also pointed out the loss if countries build trading blocs. The "trade diversion" is the terminology for diverting trade from countries to countries. Therefore, question should be asked is how trade flow of Vietnam is affected by her free trade agreements.

Empirically, there are a vast number of papers investigating the relationship between free trade agreement and bilateral trade. Hur, Alba &Park (2009) conducted a research to evaluate the Hub-and-Spoke problem in free trade agreements by using panel data analysis of 96 countries from 1960 to 2000; and concluded that in spite of the existing of overlapping free trade agreement, export also increased. Other relevant paper by Baier & Berstrand (2009), that gives comprehensive contribution to the empirical model to investigate the effect of free trade agreement on international trade flow, also found the similar positive linkage. However, Aitken (1972) did an empirical research on trade creating and trade diverting after the establishment of EEC and EFTA. He found that EEC increased trading value of member countries significantly by trade creating and trade diverting, whereas the effect of EFTA is not considerably because of trade diverting. Besides, Jugurnath et al (2007) carried out a research on many free trade agreements. The authors asserted that ASEAN FTA, CER increased its members' trade significantly, while MERCOSUR, NFTA and APEC created the trade diversion. Relating to Vietnam context, papers

analyze the linkage between free trade agreement and trade flow in Vietnam is limited. For instance, Thai (2006) used gravity model to calculate the trade between Vietnam and twenty-three European countries. The paper found the determinants in trading such as economic characteristics, exchange rate volatility and the demand of destination. However, free trade agreement is not mentioned in the paper because Vietnam and those countries have not signed FTA yet. Other paper investigates the impact of ASEAN Free Trade Agreement (AFTA) on Vietnam's economy is by Fukase & Martin (2001). The authors concluded that impact of AFTA is not significant. Agricultural sector gets benefit from that free trade because of exporting opportunity to ASEAN market, while some other industries is hurt and need to be protected due to ASEAN competitors. Therefore, this study will analyze the role of free trade agreement on trade flow of goods in Vietnam by applying gravity model for panel of 184 countries over the period 1990-2012. The study is carried out by using Fixed Effect model proposed by Baier & Bergstrand (2007), Sample Selection model (SSM) by Helpman et al (2008), and Poisson Pseudo Maximum Likelihood model by Tenreyro & Silva (2008).

2 Free trade agreement

After establishing trading bloc, member countries can shift import from higher-taxed suppliers to lower-no taxed suppliers; and, domestic goods are substituted by foreign low-cost goods. Johnson (1974) stated these above movements will balance the increasing-welfare. Lipsey (1957) and Bhagwati (1971) defined the trade diversion as the change in the locus of production from initial lower supplier to higher member suppliers. Trade creation is defined as the increase in trade between member countries. Johnson (1974) argued that trade diversion can give a transfer from locus of production which negatively impact on welfare, and create a substitution effect which positively impact on welfare. Furthermore, Michaely (1976) asserted that trade liberalization impacts on the trade pattern of signing countries in three ways. First effect is the increase in new trade flow between bloc's members. Secondly, reducing trade barrier can

divert the import from non-member suppliers to member suppliers. Finally, the change in term of trade is an attributable to a rise in demand of substitute commodity.

Chaney (2008) stated that the change in trade flow due to trade barrier shock can be explained through two mechanisms. The first mechanism is the intensive margin which is the increase in exporting volume of incumbent firms. The second one is the extensive margin which is the change in the number of exporter in different sectors. In general, trade barrier reduction such as free trade agreement between two countries leads to the change in the number of good each firm exports, and new exporters can enter the market. Crozet and Koenig (2010) confirmed the theory in heterogeneous firms established in Chaney (2008). The paper disintegrated effect of trade cost on trade flow in to intensive margin and extensive margin as follow:

$$\varepsilon_{\tau_j}^{M} = \varepsilon_{\tau_j}^{EXT} + \varepsilon_{\tau_j}^{INT} \qquad (2.1)$$

Where $\varepsilon_{\tau_j}^{M}$ is the total trade cost elasticity of trading value

$\varepsilon_{\tau_j}^{EXT}$ is the trade cost elasticity of external margins

$\varepsilon_{\tau_j}^{INT}$ is the trade cost elasticity of internal margins

Crozet and Koenig (2010) concluded that the change in trade flow due to fluctuation in trade cost varied across the industries. In details, the reducing in trade barrier impacts on trade level greater in homogenous industries than more heterogeneous industries. Extensive margin effect can dominate the intensive margin effect in industry with high differentiated product. Moreover, Helpman, Melitz, and Rubinstein (2007) stated that the profitability of firm export is higher if the importing countries' demand is higher, and lower trade costs. On the other hand, firm will not export if the profit of firm is negative. That can explain the zero value in export between two countries. He showed the primary bias in estimating impact of trade barrier on trade flow is attributed to ignoring

extensive margin effect. The reducing in trade friction may not only lead to the expansion of trade between existent country pairs, but also to create new trading partners.

3 Gravity model for free trade agreement

Aitken (1973) is the first author which applied the theory of gravity model in order to estimate the effect of European Economic Community (EEC) and European Free Trade Association (EFTA) on the import and export of member countries. In his model, he proposed a number of indicators for conceptions in the theoretical model. The dependent variable was export value. The independent variables were Free trade agreement, Income of exporting countries, Income of Importing countries, Distance between trading partners. Those indicators have been used by latter researches on observing the impact of FTA on trade flow of countries.

Trade flow

In empirical papers, there are three indicators for trade flow between countries. Firstly, McCallum (1995) used the shipment value from one country to other country as the representative for trade flow. In his paper, he analyzed the impact of trade border effect in the trade between The United States of America (USA) and Canada. The idea of research is that within-provincial trade of Canada is greater than the trade with USA's states. By applying the gravity model as follow:

$$x_{ij} = a + by_i + cy_j + ddist_{ij} + eDUMMY_{ij} + u_{ij} \quad (2.2)$$

Where x_{ij} is the total export from region i to region j

Anderson and Wincoop (2003) examined the results obtaining from McCallum (1995). The authors argued that the result is overestimated because it omitted trade resistance variables which are called multilateral resistance terms

(MRTs). Anderson and Wincoop (2003) proposed a new estimated model as follow:

$$x_{ij} = \frac{y_i y_j}{y^w}\left(\frac{t_{ij}}{\prod_i P_j}\right)^{1-\sigma} \qquad (2.3)$$

The model also used the export from countries i to j as the dependent variable for trade flow. The differences with McCallum (1995) are the variables$\prod_i$, and P_j, the multilateral resistance terms. The meaning of MRTs is that it indicated the average price of export country to the rest of the world's price. The definitions of MRTs are as follow:

$$\prod_i = \left(\sum_j \left(\frac{t_{ij}}{P_j}\right)^{1-\sigma} \theta_j\right)^{1/1-\sigma} \qquad (2.4)$$

$$P_j = \left(\sum_i \left(\frac{t_{ij}}{\prod_i}\right)^{1-\sigma} \theta_i\right)^{1/1-\sigma} \qquad (2.5)$$

Baier and Bergstrand (2007) did a research to estimate the impact of FTA on trade flow. The paper used data of 96 countries around the world from 1960 to 2000. In his estimation model, the trade flow between i and j is the export value from i to j divided by the GDP deflator to obtain real trade flow. Hur, Alba, and Park (2010) applied the gravity model proposed by Baier and Bergstrand (2007) to find out the hub-spoke effect of FTA using data on 96 countries around the world throughout 40 years from 1960. In the model, dependent variable is real exporting value, the nominal exporting value divided by GDP deflator. However, Yang and Martinez-Zarzoso (2013) estimated whether ASEAN-China Free Trade agreement is trade creation or trade diversion. In the paper, current export level in US dollar represent for trade flow concept in international trade.

On the other hand, Jugurnath, Stewart, and Brook (2007) did not exploit the export value as an indicator for trade flow. Instead of that, current import value is use as a dependent variable in the model. The reason is that country

often strictly reports its import value for the tax purpose, so the import value is more correct than export value.

Free Trade Agreement

The primary effect of FTA on trade flow is through the elimination of trade tariffs, so many research papers has analyzed trade cost as a tool for evaluation the impact of FTA. Anderson and Wincoop (2003) use the following measurement:

$$t_{ij} = b_{ij} d_{ij}^{p} \qquad (2.6)$$

b_{ij} indicates the border effect in his analysis. The variable will take the value of 1 if two regions is in same country, otherwise, it is equal to one add trading tax. Baier and Bergstrand (2007) estimated the impact of FTA on trade flow of countries by using variable FTA as a dummy variable. The variable FTA took value of 1 of exporter and importer are in the same free trade area, unless FTA was equal to 0. The paper use panel data and fixed effect estimation to find the FTA's coefficient, and the result showed that there is positive relationship between FTA and trade flow. Basing on Baier and Bergstrand (2007), Jugurnath, Stewart, and Brooks (2007) also used FTA as dummy variable in their paper. However, the paper not only estimated the impact of FTA on trade flow, but also intent to find the trade diversion and trade creation effect of FTA. Therefore, they set up more dummies variable to separate the diversion and creation effect in trade. The model is as follow:

$$\log IMPORT_{ij} = aX + \sum_{k=1} \alpha RTA_{ik} RTA_{kj} + \sum_{k=1} \alpha RTA_{ki} + \sum_{k=1} \alpha RTA_{kj} \qquad (2.7)$$

In the model, i is the importing country, j is exporter, and k indicates the Regional Trade Agreement (RTA) k. Unlike in Baier and Bergstrand (2007), there are separate RTAs for two countries to analyze the trade creation and trade diversion of RTAs. The paper concluded that regional trade agreement of ASEAN, CER are trade creation while APEC, MERCOSUR, and NAFTA have a tendency to increase trade within regional member or may be trade diversion. Furthermore,

Yang and Martinez-Zarzoro (2013) estimated the relationship between ASEAN-China (ACFTA) on trade flow of member countries. The model of paper set up three types of FTA dummy variables. The first FTA variable is equal one if both export and import countries are in same FTA. The second dummy FTA is equal 1 if exporter is in the ACFTA, and importer is not in ACFTA. The final dummy FTA is equal 1 if only importer is in ACFTA. FTA dummy variable is applied to measure free trade agreement effect in Hur, Alba, and Park (2010). Objectives of the paper are to answer two questions. The first question is the effect of FTA on trade by using dummy variable FTA as in Baier and Bergstrand (2007). The second question is the hub and spoke nature of FTA.

In conclusion, indicator for Free Trade Agreement is the dummy variable taking value of 1 if two countries is in same FTA, otherwise, FTA equal to 0. The coefficient of FTA variable is expected to be positive

Income of exporting and importing countries

Aitken (1973) took the nominal GDP of exporting and importing countries as measurement of income concept in international trade. This indicator for income has been accepted by other empirical papers. Anderson and Wincoop (2003) selected the gross domestic production as a proxy for income of trading countries. The nominal gross domestic production was also used in paper of Jugurnath, Stewart, and Brooks (2007). However, Baier and Bergstrand (2007) divided nominal GDP by the GDP deflator in order to obtain real GDP. There was no clear argument between choosing nominal GDP or real GDP as an indicator for income. In all mentioned papers, both income of exporting country and importing countries have been found to impact positively on the trade flow.

Distance

The development of information technology and transportation infrastructure has leaded to a decrease in transport cost between countries, yet the question arose is whether the distance effects on export of goods is important or not. Disdier and Head (2008) analyzed the distance effect on trading between

two countries. The paper collected 1467 coefficients of distance on trade flow from the estimation of 103 papers, and then found out that the change in the value of distance elasticity of trade flow. The authors stated that the mean effect of distance is approximate 0.9 meaning that 10 percent increase in the distance of two countries; the trade value will decrease 9 percent.

Carrère and Schiff (2005) conducted a paper to answer for puzzle in distance of trade. In the paper, the authors decomposed the components of transport cost into non-distance trade cost whose costs do not related to distance of goods export, and distance cost. By analyzing the transport cost of data from 150 countries between 1962 and 2000, Carrere and Schiff (2005) stated that the decision on how much to trade to foreign countries locating at varied distance depends on the combination of non-distance cost and distance cost. Although the paper did not solve which costs can be dominance factors, the measurement showed that the distance's role in trade is rose throughout the period.)

Relating to measure distance variable in empirical study, Baier and Bergstrand (2007) measured the distance variable by the distance between economic center of countries, while Yang and Martinez-Zarzoso (2014) estimate the distance variable by calculating the great circle distance from capital of exporting countries to capital of importing countries. In both papers, the expected impact of distance on trade flow is negative.

Exchange rate

The role of exchange rate in international trade is an ongoing argument within empirical studies. Rose and Wincoop (2001) looked into the effect of currency union on European countries on the trade flow. The paper used Economic and Monetary Union (EMU) as an indicator for no exchange rate volatility in international trade. In the paper, if the EMU impacts positively on the trade flow of member countries, the exchange rate volatility has negative relationship on export and import value. By using data on trade of 200 countries from 1970 to 1995, the paper applied gravity model adding EMU dummies

variable for estimation. The result indicated that the trade between EMU countries is higher than those without in EMU. Rose and Wincoop (2001) posed the importance of currency barrier in trade flow. McKenzie (2002) conducted a paper reviewing previous researches on the risk of exchange rate's effect to trade. The papers also found out the conclusion supporting Rose and Wincoop (2001); the result is that exchange rate volatility impact negatively on international trade, yet the degree of impact varying among the paper. Recently, Al-Rashidi and Lahiri (2013) used heterogeneous firm-selection model to estimate that relationship, and the result pointed out that exchange rate volatility coefficient in model is statistically significant.

4 Methodology

The study will apply the gravity model considered the powerful one in analyzing trade policies in order to estimate the coefficients between trade flow and FTA (Anderson & vanWincoop, 2003; Baier & Bergstrand, 2007; Silva & Tenreyro, 2006; Baier & Bergstrand, 2009; Zarzoso, 2013; Head & Mayer. 2013). The functional form is as follow:

$$\log(X_{jt}) = \beta_0 + \beta_1 \log(GDP_{jt}) + \beta_2 \log(DIST_j) + \beta_3 FTA_{jt} + \beta_4 \log(REER_{jt}) + \beta_5 ERV_{jt} + \beta_6 REV_{vt} + u_{vjt}$$

Where LnXjt is natural logarithm of trade flow between Vietnam and country j in year t; Log (GDPjt) is natural logarithm of product of Vietnam and partner GDP share to world GDP in year t; Log (DISTj) is the natural logarithm of distance between Vietnam and country j; FTAjt is the dummy variable take value of 1 if Vietnam and country j is in the same FTA in year t; REERjt is the real effective exchange rate in year t of Vietnam and country j; ERVvt, ERVjt is the real effective exchange rate volatility of Vietnam and country j in year t, respectively.

However, there are nearly 50 percent values of total trade in data equal to zero, so they will be ignored from the model. The omitted variable will create sample selection bias, thus the study applies PPML model, SSM and Fixed- Effect model with adding one in trade value as following table

Table 1
Estimation models

Model	Model Specification	Estimation Method
Log linear Functional form		
4.1	$\log(X^{*}_{jt}+t)=\beta_0+\beta_1\log(GDP_{jt})+\beta_2\log(DIST_j)+\beta_3 FTA_{jt}+\beta_4\log(REER_{jt})+\beta_5 ERV_{jt}+\beta_6 REV_{vt}+u_{vjt}$	Fixed Effect Model;
4.2	$\log(X_{jt})=\beta_0+\beta_1\log(GDP_{jt})+\beta_2\log(DIST_j)+\beta_3 FTA_{jt}+\beta_4\log(REER_{jt})+\beta_5 ERV_{jt}+\beta_6 REV_{vt}+u_{vjt}$	SSM.
Multiplicative Functional Form		
4.3	$X_{jt}=e^{(\beta_0+\beta_1\log(GDP_{jt})+\beta_2\log(DIST_j)+\beta_3 FTA_{jt}+\beta_4\log(REER_{jt})+\beta_5 ERVVN_{vt}+\beta_6}$	Poisson Pseudo Maximum Likelihood

Source: Constructed by Author

5 Data

The study uses panel data set of 185 countries from 1990 to 2012 at the country level. The export value is collected from database of International Direction of Trade Statistics. GDP data is in real values, based year in 2005, and provided by World Bank Indicator. The data on distance come from CEPII database. Real effective exchange rate is compiled from Bruegel database. The volatility of real effective exchange rate is calculated by the author. (See Appendix 1, 2 for details)

6 Empirical results and Discussion

6.1 Fixed Effect Model

Table 2 shows the results of log-form gravity model using fixed effect in panel data. All models in the table use time fixed effect and country-paired fixed effect, so log of distance is omitted from model due to time-invariant value. It is expected that the fixed-effect techniques will control the time-invariant unobserved factors, country-pair unobserved factors; yet, the time-varying unobserved factors cannot be controlled completely from the model.

Column (1A) is the estimation results from model (4.1) whose explanatory variables do not include Vietnam REER and Partner REER. As can be seen from

the result, three independent variables' coefficients are statistical significance at 1% (Dummy variable for Asian Crisis, and Global Crisis) and FTA's coefficient is statistically significant at 10%; log of world share GDP's coefficient does not have statistical meaning while log of distance is omitted in FEM due to time-invariant value. The variable of interest FTA's coefficient is 1.367 which is consistent with the expectation that FTA will increase the export between Vietnam and its trading members. In details, on average, if Vietnam and trading partner is in the FTA, the total export will be merely 3.9 times ($e^{1.367}$) higher than the trade value between Vietnam and non-FTA trading partner, other factors are the same.

Relating to column (2A), after adding exchange rate volatility variables, the results do not change in term of coefficient's sign; the differences are the variable Log of World Share GDP is statistically-significant negative at 10%. FTA's coefficient is statistical significance at 1% in this column, and value is 3.517 which is higher than the one in column (1A), *ceteris paribus*. This indicates that if two countries are in FTA, the export value is average 33.68 times higher export value between Vietnam and non-FTA countries, *ceteris paribus.* The results from FEM regressions with dependent variable are export plus one in Table 2 accepts the hypothesis that FTA will increase the trade flow between Vietnam and FTA-member trading countries. The coefficient in model (2A) is considerably higher than FTA's coefficient in model (1A); the results will be compared with estimation result of SSM and PPML model.

Table 2

Regression Result for Fixed-Effect Model with dependent variable: Log (X_{vjt}+1)

Explanatory Variable	**(1A)[a]**	**(2A)[b]**
	FEM[c]	FEM
FTA	**1.367***	**3.517****
	(1.96)	(3.79)
Log of Distance	-	-
	(.)	(.)
Log of World Share GDP	-1.345	-2.795*
	(-1.53)	(-1.91)
Asian Crisis Dummy 1997	5.305***	3.451***
	(6.78)	(2.92)
Global Crisis Dummy 2008	-1.040***	-1.096**
	(-2.93)	(-2.61)
Both Countries in WTO	0.954	-1.331
	(1.19)	(-1.23)
Only Vietnam in WTO	-0.929	-0.704
	(-1.25)	(-0.87)
Only Partner in WTO	0.349	-1.287
	(0.53)	(-1.37)
Vietnam REER	1.354	6.913*
	(0.69)	(1.93)
Partner REER	-0.162	0.690
	(-0.42)	(0.56)
Vietnam ERV		37.52
		(1.56)
Partner ERV		-7.777
		(-1.40)
Constant	30.51**	58.52**
	(2.00)	(2.28)
Adjusted R-squared	0.765	0.786
Observations	3456	2522

*Note: *, **, *** denotes statistical significance at 10%, 5%, and 1% respectively. Numbers in brackets are robust standard error. [a] presents regression models without Real Effective Exchange Rate Volatility variables; [b] presents regression models with Real Effective Exchange Rate Volatility variables; [c] present Fixed-Effect Model*

6.2 Sample Selection Model

Table 3 presents the regression results of Heckman SSM for panel data (Semykina & Wooldridge, 2010); Wooldridge, 2010; Wooldridge, 1995). Column (1B) and (2B) are the models excluding the Real Effective Exchange Rate volatility (ERV), yet model in (2B) includes the interaction variables between inverse Mill ratio and time dummy variables. While column (3B) and (4B) are the

models including Real Effective Exchange Rate volatility (ERV), yet model in (4B) accounts for the interaction variables between Inverse Mill Ratio and time dummy variables. The Wald test after each regression rejects the hypothesis that estimated coefficients of Mill ratio and interaction variables equal to zero in four models. Therefore, sample selection bias is a problem in model, and SSM is required to be applied (see Appendix 4 for details)

In general, four regressions are consistent in term of the sign of independent variable's impact on total export, yet the SSMs with ERV provide higher-value results than those without ERV. As can be seen from the table, FTA impacts positively on the trade outflow of Vietnam. The level of improvement in trade between Vietnam and FTA members are about 3.55 times in column (1B), 3.84 times in column (2B), 6.16 times in column (3B), and 6.57 times in column (4B), *ceteris paribus*; all estimated coefficients are statistical significance at 1%. As a result, SSM does not reject the study' hypothesis. Distance appears to have negative relationship with total bilateral trade. This is reasonable because the distance implies the variable trade cost. GDP of two countries effects positively on the trade outflow of Vietnam. Furthermore, estimated coefficients of Asian financial crisis 1997-1998 are negative and statistically significant in all four models. For the Crisis 2008, the sign of estimated coefficient in four models are negative, although it is only statistically significant for (1B) and (2B). In general, the crisis provoked unexpected consequences on the export between Vietnam and trading partners, in average and other conditions unchanged.

Table 3

Regression Result for Sample Selection Model with Dependent Variable: log (Xvjt)

Explanatory Variable	**(1B)**	**(2B)**	**(3B)**	**(4B)**
	SSM_NERV_NIR	SSM_NERV_IR	SSM_ERV_NIR	SSM_ERV_IR
FTA	1.266**	1.348***	1.819***	1.883***
	(2.50)	(2.62)	(3.69)	(3.81)
Log of Distance	-1.139***	-1.171***	-0.891***	-0.904***
	(-4.36)	(-4.49)	(-3.65)	(-3.79)
Log of World Share GDP	1.075***	1.093***	1.052***	1.060***
	(8.26)	(8.62)	(4.87)	(4.90)

Crisis Dummy 1997	-0.762	-0.929*	-0.630	-0.811*
	(-1.57)	(-1.88)	(-1.37)	(-1.69)
Crisis Dummy 2008	-0.368***	-0.549***	-0.386***	-0.569***
	(-3.27)	(-3.74)	(-3.39)	(-3.82)
Both Countries in WTO	0.472	0.491	0.429	0.448
	(1.11)	(1.16)	(1.12)	(1.19)
Only Vietnam in WTO	0	0	0	0
	(.)	(.)	(.)	(.)
Only Partner in WTO	0.456*	0.483*	0.287	0.259
	(1.83)	(1.91)	(1.09)	(0.97)
Vietnam REER	0	0	0	0
	(.)	(.)	(.)	(.)
Partner REER	-0.254	-0.175	0.0271	0.0743
	(-1.44)	(-0.97)	(0.13)	(0.37)
Vietnam ERV			0	0
			(.)	(.)
Partner ERV			0.944	1.239
			(0.76)	(0.98)
Inverse Mill ratio	1.110***	0	1.340***	0
	(4.31)	(.)	(4.08)	(.)
Constant	8.033***	7.576***	4.495*	4.258*
	(3.01)	(2.81)	(1.81)	(1.73)
Observations	1698	1698	1383	1383
Wald test for				
H_0: p=0	Rejected	Rejected	Rejected	Rejected
H_0: p_s=0, with all s= 1,23	Rejected	Rejected	Rejected	Rejected

*Note: Number in bracket is robust standard error. *, **, and *** are statistical significance at 10%, 5%, and 1% respectively. SSM_NERV_NIR: Sample Selection Model without ERV and Interaction variables; SSM_NERV_IR: Sample Selection Model without ERV, yet including Interaction variables; SSM_ERV_NIR: Sample Selection Model with ERV and without Interaction variables; SSM_ERV_IR: Sample Selection Model with ERV and Interaction variables*

6.3 Multiplicative-Form Gravity Model

Table 4 provides the regression results for model with Possion Pseudo Maximum Likelihood estimation method. The dependent variable is export between Vietnam and trading partner (X_{jt}). The column (1C) and (2C) contain the explanatory variables without real effective exchange rate volatility (ERV), and with ERV, respectively. In column (1C), FTA is not statistical significance, yet its sign is positive which is consistent with the hypothesis. FTA's coefficient value in column (2C) is 0.660, yet it is not statistically significant. Therefore, the PPML model may not accept the hypothesis of the study that FTA impact positively on the export of Vietnam. Log of distance can be obtained from model (4.9) to interpret the effect of distance on trade flow. Its coefficient is negative and statistically significance at 1 percent in both regression (1C) and (2C). The results in model (1C) and (2C) are -0.77 and -0.69, respectively; the coefficients do not

vary greatly after adding the ERV into model (2C). For interpreting, if the distance between Vietnam and trading partner increase 1 percent, the total trade value may decrease around 0.77 percent in column (1C) and 0.69 percent in column (2C). The World share GDP of two countries provide consistent result with Anderson & van Wincoop (2003) and Baier & Bergstrand (2007); the GDP of two countries relative to the world is greater, the more total trade value of country pair. The model can prove the statistically significant effect of crisis on trade outflow of Vietnam. In details, the sign is negative for Asian Financial Crisis 1997 and Global Crisis 2008 in both column (1C) and (2C).

Table 4

Regression Results for PPML model with Dependent variable Xvjt

Explanatory Variable	**(1C)**	**(2C)**
	PPML	PPML
FTA	0.407	0.506
	(1.28)	(1.49)
Log of Distance	-0.770***	-0.692***
	(-5.17)	(-4.41)
Log of World Share GDP	0.875***	0.868***
	(10.89)	(10.26)
Crisis Dummy 1997	-0.413**	-0.498**
	(-2.01)	(-2.24)
Crisis Dummy 2008	-0.270***	-0.221***
	(-3.72)	(-2.91)
Both Countries in WTO	0.171	-0.120
	(0.65)	(-0.48)
Only Vietnam in WTO	-0.577	-0.792**
	(-1.59)	(-2.16)
Only Partner in WTO	0.165	0.227
	(0.59)	(0.89)
Vietnam REER	0.203	1.700**
	(0.62)	(2.39)
Partner REER	-0.0747	-0.0333
	(-0.26)	(-0.09)
Vietnam ERV		13.31**
		(2.57)
Partner ERV		0.173
		(0.03)
Constant	8.655***	7.929***
	(4.07)	(3.50)
Observations	3456	2522

Note: Number in bracket is robust standard error;

, **, and * are statistical significance at 10%, 5%, and 1% respectively.*

6.4 Discussion

In PPML estimators, the FTA has positive relationship with the export of Vietnam, and is consistent with those in FEM and SSM. However, the value of FTA's coefficient is lower than coefficients and statistically insignificant in other two methods. PPML can perform efficiently in the case of heteroscedasticity in data, yet it is claimed to be poorly estimating in the case of frequent zero-value in trade (Martin & Pham, 2008). This can be applied to the study' data where the zero values are account for nearly 50% in total observations. One indicator used to evaluate the bias in model is GDP's coefficient. Theoretically, the coefficient of GDP converge to unity (Anderson & van Wincoop, 2003); and Martin and Pham (2008) stated that if GDP's coefficient is lower greatly than one, model may be underestimated or downward biased. Looking at the coefficient of log World Share GDP in PPML model, it is significant lower than one, so it may indicate that FTA coefficient in model is downward bias. Applying to FEM models, the log World Share GDP's coefficient is considerably greater than one, so the FTA is upward biased. That may be one reason for the high value of FTA coefficients in FEM in compare to those in SSM and PPML model. Turning to the SSM, the value of log of World Share GDP's coefficient is nearly equal to one. This may subjectively assert that SSM is better than other model (Linder & Groots, 2006; Helpman, Melitz, and Rubinstein, 2007). Furthermore, the paper proves that sample selection is appropriate for context of Vietnam export. Testing results of collinearity of Inverse Mill Ratio show that SSM is not vulnerable. Later, the SSM judges zero-trade value as non-random value and come from the decision of other factor such exporter and importer while PPML and FEM do not judge zero-trade in such way.

7 Conclusion

Empirical results from three above estimation models prove the positive relationship between FTA and Vietnam's export consistently. After joining the FTA, the trade between Vietnam and its FTA-member partner increase from 3.5

times to 6.5 times according to SSM results. The reason for why FTA improves the trade flow between member countries can be attribute to the elimination in the tariffs and other trade-facilitate conditions. The tax reduction will help to reduce the trade cost substantially. The other condition is the integration in transit infrastructure and other custom obligation. One more reason for the positive impact on trade of FTA can be attributed to the "natural FTA" (Krugman, 1991). Natural FTA is terminology for the FTA between countries have advantage on geography (neighboring country, short distance), culture. The author stated that if natural FTA is established, it will impact positively on trade flow and welfare of members. Turning to Vietnam FTAs, most of them are with ASEAN countries, which can become the "natural FTA".

The government may consider the free trade agreement as a policy for trade openness and export development. The other implication come from the study results is the impact of the controlling variable. The distance variable indicates that Vietnam is less likely to trade with countries are in greater distance than the shorter ones. The trade will increase when the GDP of two countries are higher in relative to world GDP. The controlling variables help the government to decide in choosing trading partners.

8 Limitation and Further Research

Firstly, gravity model is "work horse" tool in estimating ex-post relationship between trade policy and trade flow, yet in order to estimate the ex-ante effect of FTA on trade flow of goods, the Computable General Equilibrium (CGE) is a recommended model (Hertel et al, 2007). CGE can help to anticipate the effect of FTA on Vietnam trade flow when the tax elimination fully in force in 2020-2027. Other limitation of gravity model is its functional form. The log- linear form and multiplicative form take account for non-negative observation. Thus, in the model, dependent variables are total bilateral trade, export value, or import value. Trade balance which is also important trade indicator cannot be included in the model due to its negative value. The time period in data does not capture

the full impact of FTA on trade flow because the available of data is constrained at the time this study is done.

The study analyzes the aggregate data on trade flow, yet the disaggregate data also need to be taken account for because the effect of FTA will be difference depend on sectors in the industries. Trade flow is one of the points of view in judging the foreign trade policy. Other aspects are the welfare change (McCaig, 2011), the investment (Lakatos & Walmsley, 2012; Anderson, 2010) the labor wage (Fukase, 2013). Those aspects are beyond the copes of this study, and they can be a topic for future evaluation.

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Appendix 1. List of countries

Afghanistan, Islamic Republic of	Bosnia and Herzegovina	China, P.R.: Mainland	Guatemala	Kuwait	Morocco	Russian Federation	Tajikistan
Albania	Botswana	Denmark	Guinea	Kyrgyz Republic	Mozambique	Rwanda	Tanzania
Algeria	Brazil	Dominica	Guinea-Bissau	Lao People's Democratic Republic	Myanmar	Samoa	Timor-Leste, Dem. Rep. of
American Samoa	Brunei Darussalam	Dominican Republic	Guyana	Latvia	Namibia	Saudi Arabia	Togo
Antigua and Barbuda	Bulgaria	Ecuador	Haiti	Lebanon	Nepal	Senegal	Tonga
Angola	Burkina Faso	Egypt	Honduras	Lesotho	Netherlands	Seychelles	Tunisia
Argentina	Burundi	El Salvador	Hungary	Liberia	New Zealand	Sierra Leone	Turkey
Armenia, Republic of	Cabo Verde	Equatorial Guinea	Iceland	Libya	Nicaragua	Singapore	Turkmenistan
Aruba	Cambodia	Eritrea	India	Lithuania	Niger	Slovak Republic	Tuvalu
Australia	Cameroon	Estonia	Indonesia	Luxembourg	Nigeria	Slovenia	Thailand
Austria	Canada	Ethiopia	Iran, Islamic Republic of	Macedonia, FYR	Norway	Solomon Islands	Trinidad and Tobago
Azerbaijan, Republic of	Colombia	European Union	Iraq	Madagascar	Oman	South Africa	Uganda
Bahamas, The	Comoros	Fiji	Ireland	Malawi	Pakistan	Spain	Ukraine
Bahrain, Kingdom of	Congo, Democratic Republic of	Finland	Israel	Malaysia	Palau	Sri Lanka	United Arab Emirates
Bangladesh	Congo, Republic of	France	Italy	Maldives	Panama	St. Kitts and Nevis	United Kingdom
Barbados	Costa Rica	Gabon	Jamaica	Mali	Papua New Guinea	St. Lucia	United States
Belarus	Cote d'Ivoire	Gambia, The	Japan	Malta	Paraguay	St. Vincent and the Grenadines	Uruguay
Belgium	Croatia	Georgia	Jordan	Mauritania	Peru	Sudan	Uzbekistan
Belize	Cuba	Germany	Jordan	Mauritius	Poland	Suriname	Vanuatu
Benin	Cyprus	Ghana	Kazakhstan	Mexico	Portugal	Swaziland	Venezuela, Republica Bolivariana de
Bermuda	Czech Republic	Greece	Kenya	Moldova	Philippines	Sweden	Yemen, Republic of
Bhutan	Chad	Greenland	Kiribati	Montenegro	Qatar	Switzerland	Zambia
Bolivia	Chile	Grenada	Korea, Republic of	Mongolia	Romania	Syrian Arab Republic	Zimbabwe

Appendix 2. Data collection summary

Number	Variable	Variable Definition	Expected sign	Unit	Source
Dependent Variable					
1 Total Export Value		Total export value at 2005 US$		US$	DOTS
Independent Variable					
2	FTA	Dummy variable, equal 1 if Vietnam and trading country is in FTA in year t	+	Binary number (0,1)	WTO database
3	GDP	Ratio of Product of RGDP of Vietnam and trading partner to world GDP in year t, based year 2005	+	US$	World Bank Indicator
5	DIST	Distance between two capital of Vietnam and trading partner	-	Km	CEPII
6	REER	Real Effective Exchange Rate of Vietnam, Trading Partner	-	Index, based year 2007	Bruegel
7	ERV	Real Effective Exchange Rate Volatility of Vietnam, Trading Partner	-	Percentage	Author's calculation
8	DUM97 DUM08	Dummy variables for Financial Crisis	-	Binary number (0,1)	Author's establishment
9	WTO2 WTOV WTOP	Dummy variables for WTO member ship	+/-	Binary number (0,1)	WTO

Note: + indicates the expected positive effect; - indicates the expected negative effect

Source: Constructed by the Author

Appendix 3. Endogenous testing for FTA

FTA is argued to suffer the problem of endogeneity in the gravity model, yet the study does not agree with that belief for the case of Vietnam. It is the reason that FTA is tested whether it is endogenous variable or not by using the command ivreg2 and ivendog in STATA 13.0. The result is as follow

Table 5
Testing results for Interaction Terms in Sample Selection Model

H_0: Restricted model nested in non-restricted model	**Model: 1B and 2B**	**Model: 3B and 4B**
Chi-square	2.16	1.22
P-value	0.021	0.24
Accepted or Not Accepted H_0	**Not Accepted**	**Accepted**

Source: Constructed by the Author

The test accepts the null Hypothesis that FTA is exogenous.

Appendix 4. Testings in Sample Selection Model

1. Testing Results for Collinearity Problem in sample selection model

The study applies the command collin in STATA 13.0 to detect multi-collinearity problem in data. The testing will report the VIF (Variance Inflation Factor) and Condition Number. After testing, the mean VIF is 1.86 which is lower 10 and the condition number 4.5918, so the multi-collinearity is not a problem in the study. Relating to the reliability of four models, all models in the table do not contain excluded restriction variable in selection equation, so the models are argued to be vulnerable if there are the collinearity between inverse Mill's ratio and other regressors. The collinearity is checked by calculating formula proposed by Madden (2008). The result is illustrated by following table.

Table 6
Testing Results for Collinearity Problem in SSM

Mean VIF	**Condition number**
2.03	4.80

Source: Constructed by the Author

The condition number is less than 20 which is the threshold for concerning collinearity problem in Sample selection (Leung &Yu, 2000), so the inverse Mill's ratio does not encounter the collinearity problem with other regressors.

2. Testing results for Interaction Terms in Sample Selection Model

Turning to test for choosing between model with interaction terms and without interaction terms, the study considers the model without interaction terms as restricted models, and model with interaction terms as non-restricted models. Thus, there are two pair of model for judgment (1B and 2B; 3B and 4B). The Wald-test will be applied for testing. The results are indicated in following table

Table 8
Testing results for Interaction Terms in SSM

H_0: Restricted model nested in non-restricted model	**Model: 1B and 2B**	**Model: 3B and 4B**
Chi-square	2.16	1.22
P-value	0.021	0.24
Accepted or Not Accepted H_0	**Not Accepted**	**Accepted**

Source: Constructed by the Author

Between model in 1B and 2B, Wald test rejected the Null Hypothesis, so adding interaction terms in model 2B is worthy, and more preferable than in restricted model 1B. Between model in 3B and 4B, Wald test accepted the Null Hypothesis, so it does not required to add interaction term in model 4B, or restricted model is still reliable.

Appendix 5: Exchange Rate Calculation

There are two type of exchange rate applied in the study for analyzing the relationship between exchange rate and trade: real effective exchange rate (REER) and exchange rate volatility (ERV)

Real Effective Exchange Rate index (REERvjt, REERjt)

The study will use real effective exchange rate index (REER) as a proxy for controlling the impact of exchange rate on trade flow between Vietnam and her partner. REER is obtained from Nominal Effective Exchange Rate (NEER) deflated by the relative price between calculating country and its trading partners. It is consider as the measurement of the change of domestic currency in response to bundle of trading partners.

Based on Darva (2012), REER calculated as following formula

$$REER_t^d = NEER_t^d \frac{CPI_t^d}{CPI_t^f} \qquad (3.9)$$

Where $REER_t^d$ is the real effective exchange rate of domestic country in year t

$NEER_t^d$ is the nominal real effective exchange rate of domestic country in year t, calculated as $NEER_t^d = \prod_{i=1}^{n} S(i)_t^{w(i)}$, $S(i)_t$ is the nominal bilateral exchange rate between domestic country and its trading partner i with the weighted w^i, n is the total trading partners.

CPI_t^d is the consumer price index of domestic country in year t

CPI_t^f is the consumer price index of trading partners weighted geometrically, calculated as $CPI_t^f = \prod_{i=1}^{n} CPI(i)_t^{w(i)}$, $CPI(i)_t$ is the consumer price index of partner i in year t

Exchange Rate Volatility

Besides of REER index, the exchange rate volatility (ERV) also impacts on the trade of country (Bahmani-Oskooee & Hegerty, 2009; McKenzie, 2002). The reason is that the uncertainty in exchange rate will distort the behavior of risk-aversion exporters. Exporters may not enter the market whose exchange rate is not stable because of the risk in future payments.

The study will use the ERV as a proxy for controlling the effect of currency-related risk on export and import value. From McKenzie (2002), and Tenreyro

(2007), the ERV will be calculated by the standard deviation of percentage change in monthly real effective exchange rate, formulated as

$$ERV_{it} = \sqrt{Var(\ln REER_{i,tm} - \ln REER_{i,t(m-1)})_{\{m=1\to 12\}}} \quad (4.9)$$

where ERV_{it} is the exchange rate volatility of country i in year t

$REER_{i,tm}$ is the real effective exchange rate of month m in year t of country i.

Relating to use nominal effective exchange rate or real effective exchange rate, McKenzie (2002) pointed out that there is no different in estimation results in applying REER or NEER. Therefore, the study can use the real effective exchange rate because there is available and consistent with the REER index variable used in study

There are arguments in the effect of ERV on trade flow. Bahmani-Oskooee & Hegerty (2009) find out the negative relationship between ERV and trade flow of Mexico and United States of America; Bahmani-Oskooee and Xu (2013) analyzed the short run and long run impact of ERV on trade between Hong Kong and United States of America, the results are negative. However, Tenreyro (2007) applied instrument variable in observation the ERV and trade flow changes from 1970 to 1997. The authors did not found significant result in the relationship. McKenzie (2002) mentioned that the relationship of ERV and international trade is in arguments, and may depend on specific data and measurement of ERV.