The Asean Free Trade Agreement and Vietnam's Trade Efficiency

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Abstract. This study employs a stochastic gravity model to estimate efficiency performance of Vietnam's trade with its main trading partners from 1995–2015. Trade efficiency is measured as the ratio of actual trade volume to the maximum likelihood. Moreover, it analyzes the effects of both natural and man-made trade barriers on trade efficiency. The empirical results suggest that the actual trade of Vietnam appears to be much smaller than a possible efficiency level and that there is large space for further progress. Export efficiency outweighs that of import. Vietnam's AFTA membership has in general improved the trade efficiency, whereas tariffs and domestic devaluation downgrade it. Our findings lead to the recommendation that Vietnam should join more Free Trade Agreements (FATs) and eradicate the man-made barriers.

Keywords: FTA; trade efficiency; trade barriers.

Соглашение о свободной торговле АСЕАН и эффективность внешнеэкономической деятельности Вьетнама

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Аннотация. В данном исследовании проводится оценка эффективности внешней торговли Вьетнама с основными торговыми партнерами за период 1995–2015 гг. с использованием стохастической гравитационной модели. Эффективность торговли определяется как отношение фактического объема торговли и максимально вероятного объема. Кроме того, анализируются последствия влияния как природных, так и искусственных торговых барьеров на эффективность торговли. Эмпирические результаты свидетельствуют о том, что фактическая торговля Вьетнама оказывается значительно меньше, чем возможный уровень эффективности торговли и что существуют большие

возможности для дальнейшего прогресса. Эффективность экспорта превышает эффективность импорта. Членство Вьетнама в АФТА повысило в целом эффективность торговли, тогда как тарифы и внутренняя девальвация способствовали ее снижению. Авторы статьи считают, что необходимо провести ликвидацию «рукотворных» барьеров в свободной торговле, тем самым повысив эффективность и количество заключаемых соглашений о торговле во Вьетнаме.

Ключевые слова: ЗСТ; эффективность внешней торговли; торговые барьеры.

1. INTRODUCTION

Free Trade Agreements (FTAs) have become increasingly prevalent since the early 1990s as an effective instrument to foster trade. In the year 2016 the cumulative number of physical FTAs in force was 267. International trade plays an important role in stimulating the Vietnam's economic development. In order to promoting international trade, the responsible Vietnamese authorities have dynamically expanded the number of FTAs with its trading partners. As of the beginning of year 2017, Vietnam has signed eleven FTAs. Six out of eleven FTAs were countersigned as a member of ASEAN Free Trade Area (AFTA). The trade volume with these countries (China, Korea, Japan, Australia and New Zealand, India, and Chile) has been witnessed a substantial rise.

FTA brings both, pros and cons. In terms of pros, *trade creation's* effect arises from the abolishment of trade barriers such as tariffs on domestic goods and those of other members; for cons, *trade diversion's* effect exists due to the birth of some kinds of non-tariff accompanying with FTA that induce production and administrative cost. A large number of seminar works have questioned which effects is dominant. A positive and significant impact on trade flows among members in the European Community was shown by several economists (Aitken, 1973; Abrams, 1980; Brada & Mendez, 1983). Bergstrand (1985) pointed out insignificant effects, whereas Frankel et al. (1996) found mixed results. Close to our study of AFTA's effects on Vietnam trade is Le, et al. (1996), Nguyen (2009) and Narayan and Nguyen (2016). However, they all used the conventional gravity model in trade analysis proposed by Tinbergen (1962) and found a positive impact of AFTA on Vietnam's bilateral trade.

In this study, we aim to investigate how AFTA and trade barriers affect Vietnam's trade efficiency. Trade efficiency is defined as the ratio of Vietnam's actual trade to its potential trade, that is estimated with a stochastic frontier gravity model. We simultaneously analyze export and import flow. Our numerical results imply that Vietnam's exports and imports with a lot of its trading partners are far from its efficient level with the former exceeding the latter. Joining AFTA improve the Vietnam's trade efficiency. Man-made trade barriers have been introduced for some goods reasons, but they only benefit some limited sectors. For instance, infant industries in both developed and developing countries have been protected by those barriers under a high level of global competition. In general, it is essential to eradicate man-made trade resistance so as to narrow the gap between actual trade and trade frontiers.

2. METHODOLOGY: STOCHASTIC FRONTIER GRAVITY MODEL AND TRADE EFFICIENCY

This paper employs a modified version of gravity model that is one of the main paradigm of numerical analysis on international trade and FTAs' effects. Canonical gravity models estimate the mean effects of driving factors of trade. Actual trade amounts are beneath the highest possibility levels due to the existence of both natural and man-made barriers. As a consequence, the gap between actual and maximum trade always exists and it could be measured by using disturbances with non-zero and non-negative mean. Kalirajan and Findlay (2005) proposed a method to estimate trade potential with gravity model motivated by the seminar works of measuring production possibility frontiers. Trade potential is defined as the highest feasible trade that can be reached without man-made barriers.

As in Armstrong (2007), the form of stochastic frontier gravity equation is given as follows:

$$X_{it} = f(Y_{it};\beta)exp^{(v_{it}-u_{it})}. \qquad (1)$$

where X_{it} is the bilateral trade between Vietnam and country i, $f(Y_{it}, \beta)$ captures factors which

determine the potential trade (Y_{it}) without man-made resistances — and β represents a vector of unknown parameters which will be estimated. Both u_{it} and v_{it} are error terms. While the single-sided error term, u_{it} is technical inefficiency that captures the man-made resistances, v_{it} represents the impact on trade of the rest of variables. u_{it} lies between 0 and 1 and it is assumed to have a non-negative truncated normal distribution with a mean of μ at a σ_u^2. The double-sided error term v_{it}, that is assumed to be normally distributed with a mean of zero and σ_v^2, captures the measurement and specification error.

Specifically, we assign the model as follows:

$$LnEX_{it} = \beta_0 + \beta_1 LnGDP_{it} + \\ + \beta_2 LnGDPVN_t + \beta_3 LnD_i + \beta_4 LL_i + \\ + \beta_5 RA_i + \beta_6 P_{it} + \beta_7 PVN_t + \beta_8 T + v_{it} - u_{it} \quad (2)$$

$$LnIM_{it} = \beta_0 + \beta_1 LnGDP_{it} + \beta_2 LnGDPVN_t + \\ + \beta_3 LnD_i + \beta_4 P_{it} + \beta_5 PVN_t + \beta_5 LL_i + \\ + \beta_6 T + v_{it} - u_{it} \quad (3)$$

Where EX_{it} and IM_{it} are the actual export and import value of Vietnam with country i at year t respectively; GDP_{it} and $GDPVN_t$ are the gross domestic product of country I and Vietnam at year t; GDP is used as a proxy for economic size; D_i is the weighted distance between Vietnam and country i (Head & Mayer, 2002); LL_i is a dummy variable, taking value 1 if country I is landlocked, 0 otherwise; RA_i is defined as the relative land area between country i and Vietnam; P_{it} and PVN_t capture the population of country i and Vietnam respectively. T is a time trend variable used to reflect macro-dynamic distresses. Error term v_{it} is the measurement and specification error. Error term u_{it} represents negative effects on the trade volume because of man-made trade barriers and measure the size of inefficiency of Vietnam trade with country i.

Based on the model assignment, we can now define both the export and import efficiency with a specific trading partner i as follows:

$$TRE_{it} = \frac{exp[LnX_{it}]}{exp[Lnf(Y_{it};\beta)+v_{it}]} = \\ = \frac{f(Y_{it};\beta)exp(v_{it}-u_{it})}{f(Y_{it};\beta)exp(v_{it})} = exp(-u_{it}) \quad (4)$$

where $exp(LnX_{it})$ is actual exports or imports and $exp(Lnf(Y_{it};\beta)+\varepsilon_{it})$ proxies the highest feasible exports to or imports from country i respectively. The higher the TRE_{it} is, the more efficient the exports/imports are, or closer to the frontier of exports/imports. The stochastic frontier gravity models are estimated by employing STATA version 13. In detail, this study used the time decay inefficiency built-in option (Battese & Coelli, 1992) to estimate u_{it}:

$$u_{it} = \eta_{it}u_i = \left\{exp\left[-\eta(t-T_i)\right]\right\}u_i \quad (5)$$

η is a scalar parameter to be estimated and can be used to determine whether the efficiency increases, is constant or decreases. The last period (t=T) for trade between Vietnam and country i contains the benchmark level of efficiency. If η>0, the level of efficiency increases towards the benchmark level or the impact of country-specific man-made policy constraint to exports/imports increases over time; If η=0 or is insignificant, the level of efficiency remains constant or the impact of country-specific man-made policy constraint to exports/imports stays unchanged over time.

This method also applies to the parameterization of Battese and Corra (1977), who replaced σ_u^2 and σ_v^2 with $\sigma^2=\sigma_u^2+\sigma_v^2$ and $\gamma=\sigma_u^2/(\sigma_u^2+\sigma_v^2)$. It can be said that γ must take the value between 0 and 1. We can test whether we should put the error term u in the form of stochastic frontier function, or not, by testing the significance of the γ parameter. If the null hypothesis, that γ equals zero, is rejected, this would mean that σ_u^2 is non-zero and therefore the u term should be added into the model, leading to a specification with parameters that should be consistently estimated using the stochastic frontier approach.

This study utilizes panel data consisting of 30 Vietnam's bilateral trading partners and period 1995–2015 that account for an average of 85% total international trade with the world. The list of countries included in this study is shown in Table 4, which was selected based on their relative importance to Vietnam exports in different regions including ASEAN, ASEAN+3, NAFTA, the European Union, and Others (Australia, New Zealand, India, and Russia). The main reason this study takes this period is that Vietnam joined ASEAN in 1995. We use a variety of data sources.
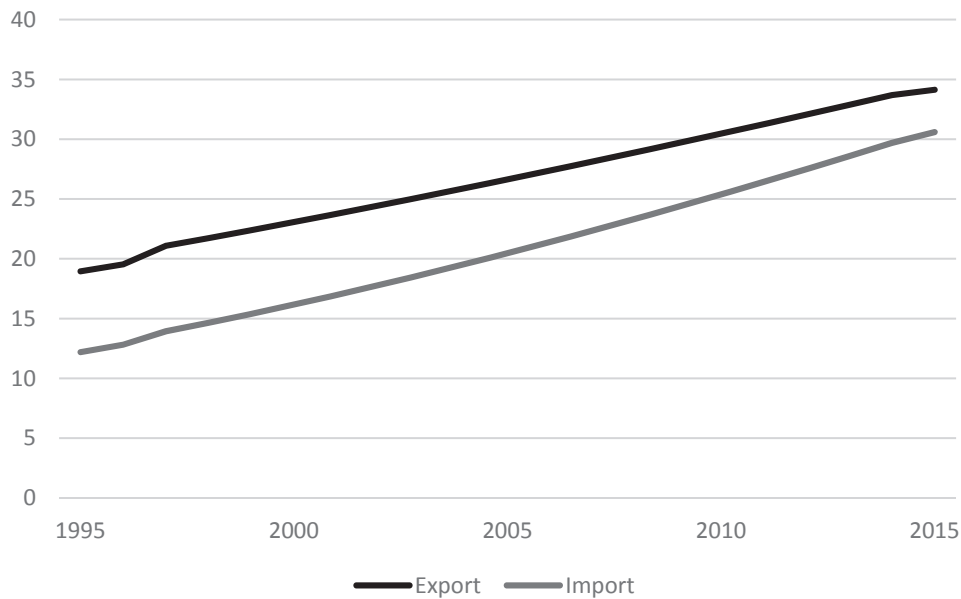
Trend of Vietnam's trade efficiencies, %

Exports/imports data have been taken from the International Monetary Fund (Direction of Trade Statistics-DOTS). Gross Domestic Products (GDP), Population (POP), Real Effective Exchange Rate, and all product tariff rates have been taken from the World Bank database. Data on the weighted distance measured in kilometers (D) and land area (Area) are taken from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). The economic freedom index (EF) is taken from the Heritage Foundation. The list of ASEAN member countries have been taken from official website asean.org. Export/import, gross domestic products, Real Effective Exchange Rate, and distance were transformed to logarithms. Table 6 in the appendix shows the estimation results of stochastic frontier gravity model. In general, the estimators are analogous to our expectation.

3. ESTIMATED TRADE EFFICIENCY
Estimated trade efficiencies are shown in Table 1 and 2, whereas Figure 1 plots the trend. Table 1 describes the estimation with Asian pacific countries, consisting of eight ASEAN countries, China, Japan, Korea, and Russian plus India. According to the definition, the estimated trade efficiencies should lie between 0% and 100%, where 100% implies that trade takes place at the frontier, the maximum possibility. In general, the empirical results infer that both export and import efficiencies of Vietnam enhanced considerably in period surveyed 1995–2015. Exports

perform much more efficiently than imports do. The average export efficiency with ASEAN countries grew from 37.54% in the years between 1995 and 1999 to 48.73% in the period 2010–2015, while imports from ASEAN rose about one and a half times, from 19.94% to 33.41% in the same periods. In particular, the trade of Vietnam with Singapore outweighed 90%, very near to the highest potential. On the other side, the trade efficiencies with Thailand and Indonesia were still less than 30%, indicating that actual trade with these nations were far from the maximum likelihoods. The space for trade's growth are enormous. Due to the adverse effects of economic sanction imposed on Myanmar by the US, its trade efficiency with Vietnam was the least among ASEAN members, only below 5%.

Regarding Vietnam's trade with China, Japan, and Korea, while efficiency of exports to Japan is the highest, followed by Korea, 61.9% and 41.25% respectively, that of imports from Korea ranks first, then Japan with the levels being 83.83% and 36.91% respectively. It is worth mentioning that until 2015 the trade with China was still less than one fourth of the estimated maximum possibility. Although ASEAN-China FTA came into force since 2005, as a member of ASEAN, Vietnam's trade could take the advantages from this FTA. In terms of exports, due to the intensive competition of similar products made in China, Vietnamese goods with high labor intensity such as textiles cannot compete successfully and are unable to

Table 1. **Estimated Efficiencies of Vietnam's trade to Asia Pacific Countries + India, %**

	1995–99		2000–04		2005–09		2010–15	
	Export	Import	Export	Import	Export	Import	Export	Import
Singapore	86.95	85.44	88.57	87.74	89.99	89.70	91.36	91.51
Cambodia	86.86	3.92	88.48	6.77	89.92	10.65	91.30	16.08
Lao	31.66	30.91	36.82	37.68	41.99	44.43	47.55	51.57
Malaysia	30.62	12.62	35.77	17.88	40.94	23.90	46.54	31.10
Philippines	30.53	2.42	35.68	4.52	40.85	7.62	46.45	12.24
Thailand	17.66	10.91	22.17	15.85	27.03	21.62	32.61	28.65
Indonesia	15.20	12.95	19.46	18.28	24.13	24.34	29.60	31.57
Myanmar	0.82	0.37	1.53	1.05	2.65	2.26	4.47	4.55
ASEAN	37.54	19.94	41.06	23.72	44.69	28.07	48.73	33.41
Japan	47.60	17.09	52.48	23.02	57.12	29.49	61.90	36.91
Korea	25.40	73.14	30.41	77.11	35.56	80.57	41.25	83.83
China	9.48	5.31	12.92	8.71	16.90	13.13	21.82	19.08
Australia	51.69	21.07	56.37	27.40	60.78	34.08	65.28	41.54
Russia	8.79	15.04	12.10	20.69	15.97	26.99	20.78	34.34
New Zealand	3.31	21.22	5.18	27.56	7.64	34.25	11.05	41.71
India	0.51	0.97	1.02	2.11	1.85	4.04	3.29	7.29

Source: authors' calculation.

rise the export volume in order to reach the highest likelihood, which is principally defined by the economic size of trading partners. It is odds that efficiency of imports from China was a merely 19.08% while import volumes from China accounts for one third. The reason may come from the gravity model's properties that claim that the higher the similarity between two countries is, the more efficient the trade is. China is 50 times in GDP and 15 times in population bigger than Vietnam. This reason is also used to explain why the efficiency of Vietnam's trade with India is very low, only below 10%. Moreover, the free trade agreement between ASEAN and India only came into effect several years ago, (2010) and it then has had a large effect on trade flows between Vietnam and India. The Vietnam's export volume to India in 2010 and 2015 are twice and six times, respectively, higher than in 2009.

Table 2 shows estimated efficiencies of Vietnam's trade with EU and NAFTA members. The general picture is that the trade efficiencies with both EU and NAFTA did not exceed one half of maximum level. Among EU members, the trade efficiencies with Netherland, UK, Belgium and France are 47.57%, 33.59%, 44.08% and 27.65% respectively for exports and 28.99%, 17.65%, 32.72% and 35.55% for imports respectively. The remainders are below one fourth. By 2015, Vietnam's trade efficiency with EU are on average 21.21% and 19.78% for exports and import respectively. The efficiency with NAFTA's member countries is also moderate. In spite of the largest foreign market of Vietnam's goods (US21.8%; China 12.4%, Japan 8.3% in 2015), the export efficiency was only 41.32%. Trade efficiency with Canada and Mexico were less than 20% and 10% of the maximum respectively. The estimation expresses that, if man-made trade resistances could be abolished, Vietnam's trade with those countries surveyed could grow substantially.

Table 2. **Estimated Efficiencies of Vietnam's trade to EU and NAFTA members, %**

	1995–99		2000–04		2005–09		2010–15	
	Export	Import	Export	Import	Export	Import	Export	Import
Netherland	31.68	11.14	36.84	16.12	42.01	21.93	47.57	28.99
UK	18.49	4.62	23.08	7.76	27.98	11.93	33.59	17.65
Belgium	17.49	8.88	33.25	19.27	38.43	25.44	44.08	32.72
France	13.68	15.99	17.77	21.78	22.29	28.16	27.65	35.55
Italia	9.14	7.80	12.51	11.98	16.43	17.13	21.30	23.70
Spain	8.96	2.30	12.29	4.34	16.19	7.35	21.03	11.89
Poland	5.29	2.89	7.77	5.24	10.87	8.61	14.95	13.52
Sweden	5.06	8.04	7.49	12.29	10.52	17.50	14.54	24.12
Denmark	4.22	7.47	6.40	11.57	9.18	16.64	12.93	23.14
Finland	1.72	4.31	2.93	7.32	4.66	11.37	7.24	16.96
Germany	1.40	0.08	2.44	0.26	3.98	0.71	6.32	1.78
Greece	0.51	0.97	1.02	2.11	1.85	4.04	3.29	7.29
EU	9.80	6.21	13.65	10.00	17.03	14.23	21.21	19.78
USA	25.47	7.17	30.48	11.18	35.63	16.17	41.32	22.61
Canada	7.84	5.63	10.96	9.13	14.65	13.67	19.30	19.71
Mexico	2.62	0.50	4.23	1.22	6.40	2.56	7.65	3.96
NAFTA	11.98	4.43	15.22	7.18	18.89	10.80	22.76	15.43

Source: authors' calculation.

4. TRADE EFFICIENCIES AND FTA

Our estimation implies that, Vietnam's trade attained very high efficiency with a few countries such as Singapore, whereas performed at very low level with most of its trading partners, such as China, India, and Canada. In order to enhance the efficiency of Vietnam's trade, it is vital to recognize driving determinants diminishing efficiency level. In this part, we employ regression analysis to discover those determinants. We consider the following regression models:

$$TRE\_Export_{it} = \delta_0 + \delta_1 ASEAN_i + \\ + \delta_2 EF_{it} + \delta_3 TR_{it} + \delta_4 LnREERVN_{it} + \varepsilon_{1t} . \quad (6)$$

$$TRE\_Import_{it} = \delta_0 + \delta_1 ASEAN_i + \delta_2 EF_{it} + \\ + \delta_3 TR_{it} + \delta_4 LnREER_{it} + \\ + \delta_5 EFVN_t + \delta_6 TRVN_t + \varepsilon_{2t} \quad (7)$$

In equation (6) and (7), ASEAN is the dummy variable, taking value one for the member of ASEAN, zero otherwise. TR_{it} and $TRVN_t$ are the weighted tariff levied by country i and Vietnam to imports respectively. High tariffs reduce the Vietnam's trade efficiency. EF_{it} and $EFVN_t$ are the indexes of economic freedom of country i and Vietnam at year t, which is a composite measure by the Heritage Foundations of ten factors, separated into four categories, rule of law, limited government, regulatory efficiency, and open market. The indexes take value between 0 and 100 with higher indexes implying lower trade barriers. While the higher economic freedom in Vietnam results into an increase in Vietnam import flows, the greater economic freedom for trading partners induces a lift in their foreign trade flows. Thus, both economic freedom in Vietnam and its partners are predicted to increase Vietnam's trade efficiency. $REER_{it}$ and $REERVN_t$ are the real effective exchange rate of

Table 3. **Determinants of Trade Efficiency**

Variables	TRE's Export	TRE's Import
ASEAN	0.3218769*** (0.0199869)	0.1453607*** (0.0231692)
EF	0.0076596*** (0.0007578)	0.0060855*** (0.000994)
TR	-0.0034488*** (0.0012272)	-0.0018702* (0.0010874)
LnREERVN	-0.1156541** (0.0478629)	
LnREER		0.0429117* (0.0412438)
EFVN		0.0031847 (0.0033066)
TRVN		-0.00885** (0.0039383)
Constant	0.2572335 (0.2325056)	-0.4543695* (0.2707365)

Note: numbers in parentheses are standard errors.

*** significance at the 1% level; ** significance at the 5% level; * significance at the 10% level.

country i and Vietnam at year t. A devaluation of domestic currency is expected to boost exports and undermine imports.

Table 3 shows the regression results. The estimated coefficients of ASEAN are 0.3219 and 0.1453 for export and import respectively and all statistically significant at 1% level, suggesting that the ASEAN membership contributes positively to the Vietnam's trade efficiency. The estimated coefficients of tariff are negative and statistically significant, implying that tariffs levied by trading partners or by Vietnam plays as one of driving factors to undermine the trade efficiency between Vietnam and those countries. The trading partners' economic freedom significantly raised trade efficiency, diminishing the gap between the actual and potential trade. Vietnam's economic freedom coefficient is insignificant but positive, that partly reflected the achievements of Vietnam Economic Reform, the so-called "Doi Moi". The coefficient of LnREER is 0.0429 and significant at 10% level, whereas that of LnREERVN is −0.1157 and significant at 5%. It means that Vietnam cannot enjoy the benefits from domestic currency's devaluation as its trading partners do. The low competi-

tive ability of Vietnam's products is the main reason. Moreover, the loss of Vietnam dong value increases the price of imported inputs mainly used to produce exporting goods, that dampens the competitive ability of Vietnam's exports further.

It is worthy to explain the reason why export efficiency exceeds import's as we saw in Figure 1. The adverse effects of Vietnam's trade balance deficit in the long term lead to a gap between exports and imports barriers. Trade deficit comes from the prolonged severe imbalance in the structure of export's and import's goods. To reduce the trade deficit, Vietnam in the past two decades has adjusted the exchange rate policy, implemented the restructuring of import and export goods, improved the institutional environment, and provided policies that promote export industries. As a result, the export barriers are lower than those of import, reflecting the export-oriented industrialization of Vietnam. Vietnam's government has continued to implement policies restricting imports to protect domestic industries, the average tax rates of Vietnam are twice higher than its trading partners (11.4% versus 5.7%) (World Bank

tariff database). Moreover, regression results showed that the absolute value of estimated coefficients of TRVN is five times bigger than that of Tariff, lowering import efficiency much more than export's one.

5. CONCLUDING REMARKS

In this paper, we estimated the trade efficiency of Vietnam with its major trading partners. Our empirical results indicate that, Vietnam's trade are much below the highest potentials and exports contribute more to the overall efficiency than imports do. While joining AFTA and relaxing economic constraints help to rise Vietnam's trade efficiency, imposing tariffs and devaluating Vietnam dong undermines it. To improve the Vietnam's trade efficiency, it is vital that Vietnam should join more regional FTAs, improve economic freedom, cut tariffs and improve the competitive ability of its products to take the advantage of domestic currency devaluation.

REFERENCES

1. Abrams, R.K. (1980). International Trade Flows under Flexible Exchange Rates. Federal Reserve Bank of Kansas City *Economic Review* 65, No. 3: 3–10.

2. Aitken, Norman D. (1973). The Effect of EEC and EFTA on European Trade: A Temporal Cross-Section Analysis. *American Economic Review* 5: 881–892.

3. Armstrong, S. (2007). Measuring Trade and Trade Potential: A Survey. *Asia Pacific Economic Papers,* No. 368, 1–19.

4. Battese, G.E., & Coelli, T. (1992). Frontier Production Functions, Technical Efficiency and Panel Data: with Application to Paddy Farmers in India. *Journal of Productivity Analysis,* 3 (1/2), 153–169.

5. Battese, G., & Corra, G.S. (1977). Estimation of A Production Frontier Model: With Application to the Pastoral Zone of Eastern Australia. *Australian Journal of Agricultural Economics.* 21 (03).

6. Bergstrand, Jeffrey H. (1985). The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence. *Review of Economics and Statistics,* 67 (3), 474–81.

7. Brade, J.C., & Mendez, J.A. (1983). Regional Economic Integration and the Volume of Intra-regional Trade: A Comparison of Developed and Developing Country Experience. *Kyklos.* 36 (4): 589–603.

8. Frankel, J., Stein, E., & Wei, S.J. (1996). Regional Trading Agreements: Natural or Supernatural? *American Economic Review* 86 (2): 52–56.

9. Head, K., & Mayer, T. (2002). Illusory Border Effects: Distance Mismeasurement Inflates Estimates of Home Bias in Trade. *CEPII Working Paper,* No. 2002–01.

10. Kalirajan, K. and Findlay, C., (2005). Estimating Potential Trade Using Gravity Models: A Suggested Methodology, Foundation for Advanced Studies on International Development, Tokyo.

11. Le, Q.P., Nguyen, D.T., & Bandara, J.S. (1996). Vietnam's foreign trade in the context of ASEAN and the Asia-Pacific region: a gravity approach. *ASEAN Economic Bulletin*, 185–199.

12. Narayan, S., & Nguyen, T.T. (2016). Does the trade gravity model depend on trading partners? Some evidence from Vietnam and her 54 trading partners. *International Review of Economics & Finance*, 41, 220–237.

13. Kien, N.T. (2009). Gravity model by panel data approach: an empirical application with implications for the ASEAN free trade area. *ASEAN Economic Bulletin*, 26 (3), 266–277.

14. Tinbergen, J., 1962. Shaping the World Economy: Suggestions for an International Economic Policy, The Twentieth Century Fund, New York.

APPENDIX

Table 4. **Vietnam's Trading Partners**

Region/Country		Region/Country	
ASEAN		EU	
Indonesia	IDN	Belgium	BEL
Cambodia	KHM	Germany	DEU
Lao PDR	LAO	Denmark	DNK
Myanmar	MMR	Spain	ESP
Malaysia	MYS	Finland	FIN
Philippines	PHL	France	FRA
Singapore	SGP	United Kingdom	GBR
Thailand	THA	Greece	GRC
ASEAN+3		Italy	ITA
China	CHN	Netherlands	NLD
Japan	JPN	Poland	POL
Korea, Rep.	KOR	Sweden	SWE
NAFTA		Others	
Canada	CAN	Australia	AUS
Mexico	MEX	New Zealand	NZL
United States	USA	Russia	RUS
		India	IND

Table 5. **Statistical Summary**

Variable	Mean	Std. Dev.	Min	Max	Expected signs
LnEX	19.72608	1.902665	11.31447	24.26536	
LnIM	19.45836	2.087243	9.21034	25.01385	
LnGDP	26.73658	1.828001	20.97026	30.51844	+
LnGDPVN	24.85482	0.7277004	23.75514	25.98906	+
LnD	8.434485	1.011696	5.861461	9.608898	-
POPVN	82.19356	5.844866	71.9955	91.7038	+
POP	136.7221	298.5413	3.524506	1371.22	+
EF	66.1	10.29905	33.5	89.4	+
EFVN	46.92556	4.246476	38.6	51.7	+
TR	5.763222	5.974561	0	56.4	-
TRVN	11.43429	3.487111	6.63	15.57	-
LnREER	4.60641	0.3002	2.49734	7.13669	+
LnREERVN	4.705	0.1493	4.4783	4.978414	+

Source: Author's calculation based on data collection.

Table 6. **Maximum Likelihood Estimates of the Stochastic Gravity**

Variable	LnEX	LnIM
LnGDP	0.5031678*** (0.1047388)	0.6721288*** (0.0727893)
LnGDPVN	1.35851*** (0.3555741)	0.8101256** (0.3302682)
LnD	−0.3642712** (0.1433375)	−1.185056*** (0.1098836)
PVN	1.12*** (0.1356952)	0.4719188*** (0.1326053)
P	0.0010149** (0.0004789)	0.0013233*** (0.0003016)
LL	−0.2226489 (0.3298014)	−0.711911** (0.3241075)
T	−1.13867*** (0.1628305)	−0.5049462*** (0.157479)
Constant	−102.6388*** (16.63973)	−39.92446** (16.06557)
Mu	1.098108** (0.4479883)	1.289445*** (0.3073283)
Eta	0.0281909*** (0.0041293)	0.037003*** (0.0031502)
Sigma^2	1.110187	0.9348502
Gamma	0.8339191***	0.820268***

Note: Values in parentheses () are standard errors.*** Significant at the 1 per cent level; ** Significant at 5 per cent level; * Significant at 10 per cent level.