

A Gravity Model for Trade Creation and Diversion of the ASEAN-China Free Trade Agreement

ABSTRACT

The Gravity Model for trade is applied to examine trade creation and diversion effects after the ASEAN-China Free Trade Agreement (ACFTA) come into effect. The model is tested on cross-sectional data from 2010 for 19 countries by using the ordinary least square (OLS). The important determinants of trade are GDP, population and distance of exporters and importers. Results indicate that there are pure trade creations in exports as well as imports. This means that trade has expanded not only intra-bloc but also extra-bloc. By entering the ACFTA after 2010, the welfare of member and non-member counties are improved.

1. Background

Nowadays, countries are more closely linked together through international trade. Several countries enter to the economic integrations since the early 1990s. As of 31 July 2013, 575 notifications of regional trade agreements (RTAs) (counting goods, services and accessions separately) had been received by the WTO; while 379 of them were in force. This is the era when trade liberalization become prominent. For this reason, it is useful to learn what these RTAs will affect the world economy.

The big players in world market now turns to Asia especially China. China went through many process of economic reform in the late 1970s. Its economy is considered as one of the fastest growing economies in the world; besides its export also grow rapidly over the time. During the time, China played more attention and was very active in RTAs. In 2001 China decided to join the WTO and 8 years later it becomes number one exporter until today.

On another side, the Southeast Asian counties also seeks for economic integration within the region since 1970s. The Bangkok declaration was signed by Thailand, Malaysia, Singapore, Indonesia, and Philippines in order to establish the geo-political and economic called "Association of Southeast Asian Nations (ASEAN)". Since then, membership has expanded to include Brunei, Myanmar, Cambodia, Laos, and Vietnam, thus make up to 10 members. ASEAN aims to promote economic growth, social progress and cultural development among its members as well as protection of peace and stability to overcome the different between counties. The ASEAN economic community (AEC) will be enforced in 2015 including the free movement of capital, labor and goods. ASEAN alone is the 8th largest economy in the world.¹

¹ Ma. Lourdes N. Tiquia (17 June 2013). "Asean integration, ready or not!". The Manila Times.

China and ASEAN take more interest in one another as the trade between them increased substantially since mid-1990s. In 2001, they signed up the initial framework agreement with the intent on establishing a free trade area as well as economic cooperation between both parties called “ASEAN–China Free Trade Area (ACFTA)” that will come into effect on 1 January 2010. ACFTA includes the agreement in trade on goods, the agreement on trade in services, the agreement on investment and the agreement on dispute settlement mechanism. This FTA is considered as the largest free trade area in terms of population and the 3rd largest in terms of nominal GDP.²

The detail on the ACFTA of the agreement on trade of non-sensitive products are summary in the table below. For sensitive and highly sensitive products (depending on each country), there is still tariff imposed. However, the rate should not exceed 5% after 2018 for sensitive goods and not exceed 50% after 2015 for highly sensitive goods.

Table 1: ACFTA of the agreement on trade of non-sensitive products

Date of Tariff-cut	Date of Zero-tariff	Non-sensitive Product
1 January 2004	1 January 2006 for ASEAN-6 ³	• Early Harvest Program (EHP) covering HS code 01-08: agricultural goods, livestock, meat, fish and aquatic animals, dairy products, products from other animals, fruit and vegetables, etc. • Coal products: coke and semi-coke
	1 January 2010 for CLMV ⁴	
1 July 2005	1 January 2010 for ASEAN-6	• The rest of products under normal list
	1 January 2015 for CLMV	

Source: The Department of Trade Negotiations, Ministry of Commerce.

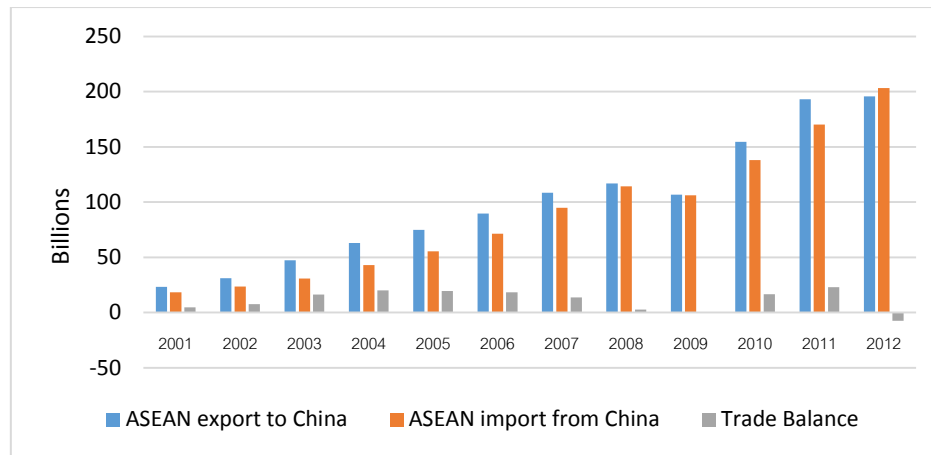
Currently, ASEAN became the 3rd largest trading partner of China after USA and EU28. On the other side, for ASEAN, China is the 1st largest trading partner. The upward moving of ASEAN to be 3rd largest China’s trading partner in 2012 from the 5th in 2004 closely correlates with the phased of tariff reduction of ACFTA.

Figure 1: Bilateral trade between ASEAN and China

² Walker, Andrew (1 January 2010). "China and Asean free trade deal begins". BBC News.

³ ASEAN-6 consists of Thailand, Malaysia, Singapore, Indonesia, Philippines and Brunei.

⁴ CLMV consists of Cambodia, Laos, Myanmar and Vietnam.



The formation of free trade agreement is always accompanied by the trade creation which every countries prefer and the trade diversion which is not prefer. These terms was first used by Viner (1950). He was one of the first who argue that under certain condition FTA generated losses rather than gains.⁵ The purpose of this paper is to investigate whether ACFTA really bring about the trade creation and if there is any trade diversion emerge from it, what can be done to improve the situation. Furthermore, the degree of factors that affect the trade flow in ACFTA are also examine.

Because there are so much more research paper based on GTAP model already, this report will focus mainly on Gravity Model with 3 dummy variables as a tool to confirm the result with the general equilibrium model in other literatures. Moreover, the chosen year i.e. 2010 (when ACFTA came in to full effect) is more updated than the paper works before.

The remainder of paper is consisted 4 parts and structured as follows: Literature reviews on other researchers' work related to ACFTA as well as Gravity Model, Methodology that are employed to evaluate the trade creation and diversion emerging from ACFTA, Empirical results from the Gravity Model of trade, Conclusion and Policy recommendations.

2. Literature Review

Because of an increasing in the importance of ASEAN as a trade partner of China, more people pay more attention at ACFTA and its effect on the regional economy. Some may argue that it is a threat since they would intensify the competition among members due to similar production and demand structure; while some still see the opportunity in it because the reduction in tariffs and non-tariff barriers would allow more access to members' domestic markets, subsequently trade activities would be promoted.

⁵ Trade creation occurs when the trade barriers are lifted because of free trade agreement as a result trade activities increases between the member countries. It leads to more efficient allocation of resources hence the welfare increase since importers shift from the original intra-bloc producers whose costs of production are higher to another intra-bloc producers whose costs of production are lower. Conversely, trade diversion is welfare-reducing that occurs when imports from more efficient non-member countries are replaced by less efficient member countries because intra-bloc countries are granted privilege by free trade agreement.

Nonetheless, the result of literature related to the impacts of ACFTA are somewhat mixed. The literatures that related to ACFTA is examine first, then follow by the literatures related to methodology.

2.1 Literature related to ACFTA

Literatures on this topic can be divided into 2 groups according to the analysis method: the general equilibrium analysis and the partial equilibrium analysis.

1. The general equilibrium analysis

The general equilibrium analysis is founded on the concept that any changes in a one sector of the economy will have wide impact on other sectors as well. We can say that it is analysis on the economy as a whole. Most of the models are considered as Computational General Equilibrium Model (CGE). Furthermore, these model can examine both in single-country and multi-region. Global Trade Analysis Project (GTAP) i.e. Global Model is also based on multi-region CGE.

- Chirathivat (2002) projected trade and economic effects of ACFTA on sectoral products based on the CGE model used by Tongzon (2001). The outcome demonstrated the increase in GDP of ASEAN as well as China. ACFTA would enhance China's imports of rice, sugar and vegetable oil and will increase China's export of fruits.
- The faculty of economic of Chulalongkorn University (2005) studied the effects of ACFTA on Thailand by employing GTAP model. This project was proposed to Thailand's Department of Trade Negotiations in order to analyse change in quantity of trade after FTA as well as to evaluate the result for further improvement in national strategies. Despite the result shows that ACFTA did not have much influence on macro-economic variables, the Thai GDP increased along with growth in exports to china. Nevertheless, Thailand also imported more from China.
- Yang and Chen (2006) studied the impacts of ACFTA on exports and imports of its members and non-members. The result from GTAP showed that there was trade creation among the members of ACFTA so a welfare of all member countries increased (especially during transition period of 2004-2006 GDP have been stimulated by this FTA). However, there was the trade diversion as well because the member counties traded less with non-members counties thus the welfare declined.
- Qiu, Yang, Huang and Chen (2007) emphasis on the change in trade pattern and product development of agricultural commodities after ACFTA by using GTAP model. The outcome stated that ACFTA supported agricultural trades between ASEAN and China along with the more effectiveness in allocating resources, as a result their economy expanded.
- Park et al. (2008) applied CGE model to quantify the welfare change as well as output change of ACFTA. The result point out positive effects including trade creation, higher output as well as better welfare for the region. In addition, the relatively less developing counties i.e. Cambodia, Laos, Myanmar and Vietnam

(CLMV) would benefit more from ACFTA than more advanced countries such as Singapore and Malaysia.

II. Partial Equilibrium

The partial equilibrium analysis is based on the assumption that any changes in the specific sectors in the economy will have an effect on that specific sector only. The method of analysis are mostly done by econometric models such as Market Share model, Price-discrimination model, Balassa Ex-ante & Ex-post and Import demand function and Gravity Model. Here are some examples of the academic papers.

- Zhang and Hock (1996) studied on the interdependent of international trade and foreign direct investment (FDI) between ASEAN and China. They found that China depended on trade with ASEAN more than ASEAN depended on trade with China. They also examined on the flow of FDI from ASEAN to China. In short run, there might be some negative spillover in caused by rapid expansion of China's economy. However, in the end, they concluded that ASEAN and China would get a benefit in long term by entering economic integration.
- Ahearne et la. (2004) investigated the trade flows of new industrial economies in Asia and China by using both aggregate and in aggregate data. It appeared that in aggregate level the complementary exporting linkage between ASEAN and China. Moreover, by reducing tariffs as a consequence of ACFTA would enhance trading competitiveness among them.
- By testing the disaggregate data to search for the distinct conditions that have impacts on ACFTA export competition, Roland-Holst and Weiss (2004) shown that ASEAN significant loss market share in USA and Japan due to an increase in the competition with China. Nevertheless, they found that there are substantial degree of complementary trade potential between them in the long term. Moreover, the future growth of China could increase the regional demand in East Asia As a result, ASEAN might be able to hold their market shares mainly in higher value-added products.
- Roberts (2004) used Gravity Model to test the existence of Linder Hypothesis⁶ among ACFTA member counties in bilateral fashion. He used cross-sectional data from 1996 to 2000, then estimated them by OLS. By testing Linder effect, the absolute different in GDP per capita between ASEAN and China are tested. It should have negatively relationship with trade because the larger the different in GDP per capita implies the greater different in preferences. If Linder effect existed, it indicates the trade enchantment in ACFTA. However, the statistical coefficient of related variable is insignificant. The other determinate of trades in his model are GDP and GDP per capita which are positively related with trade since high income

⁶ Linder Hypothesis indicates that the more similar of demand structures or income per capita among countries, the more intensity they will trade with one another. Even if 2 countries having identical preferences and factor endowments, the international trade will still occur since specialization on differentiated goods can create a comparative advantage between the 2 countries.

countries trends to trade more while distance is negatively correlated with trade because longer the distance, the higher the costs.

2.2 Literature related to the methodology

The Gravity Model in the literature can be separated into 2 methods. First method is based on Ballassa concept that income elasticity of import demand will change after enter FTA. If there is trade creation, the elasticity would be positive, otherwise it would indicate trade diversion. The dependent variable is import, while independent variables are GDP, GDP per capital, exchange rate, common language, contiguity, etc. Example work is Zidi and Dhifallah (2013). Another approach is the general Gravity Model which use entirely in this paper. The dependent variable can be bilateral trade or export; while independent can be GDP, population, distance, exchange rate, regional dummy, for instance. In earlier work, only 1 dummy variables are presented in the model so it can only capture either trade creation or diversion but not both such as Atiken (1973) and Bayomi (1997). Later on, searchers utilized 2 dummy variables - one use to find the trade creation within the group if its regression coefficient is positive and another one use to capture trade between the group and outside group if its regression coefficient is negative; for example, Hinbun (2006) and E.M. Ekanayake et al. (2010). The following works have 3 dummy variables which use to examine trade creation, export diversion and import diversion; for instance, Yang and Martines-Zarzoso (2013).

3. Methodology

In this paper, the Gravity Model of trade is employed to evaluate the impacts of ACFTA because of its comprehensible structure as well as its explanatory power. The cross-sectional data is used since the Gravity Model is more suitable with the cross-sectional data according to Hufbauer, Schott and Elliott (2007). Data sets demonstrate in real term to be correspond to United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP)'s recommendation. They covered 19 countries including 9 ACFTA members and 10 non-ACFTA members whose are the main trading partner of ASEAN and China as of 2010.

3.1 Specification of Gravity Model

The classical and new trade theory⁷ can successfully explained the reasons why counties trade with one another. Nonetheless, those theories cannot answer how large is the size of the trade flows should be. Fortunately, the gravity theory of trade can be applied to quantify the magnitude of trade empirically.

It has been used for more than 50 years mainly to predict determinants of trade and analyze the effects of preferential agreement on bilateral trade flows as well as the regional integration. The model is based on the Newton's universal law of gravitation in Physics

⁷ For example, absolute and comparative advantage, Hecksher-Ohlin model (focusing on the different in factor endowments between countries) and new trade theory (emphasising on the trade which based on economies of scale, imperfect competition and product differentiation).

which stated that the gravitational force between 2 objects is depend on the mass and distance between each object.

$$F = G \left(\frac{m_1 m_2}{r^2} \right)$$

where F is the force between the masses, m_1 and m_2 is the first and the second mass, r is the distance between the centers of the masses and G is the gravitational constant.

In social science especially international economics, similar concept also applied i.e. trade between countries i and j is proportional to the size of economics and inversely relates to the distance which is the proxy for transportation costs. The basic model of gravity for trade, firstly introduced by Tinbergen (1962), can be written as follow.

$$F_{ij} = G \left(\frac{M_i^{\beta_1} M_j^{\beta_2}}{D_{ij}^{\beta_3}} \right) \eta_{ij}$$

where F_{ij} represents volume of trade from country i to country j , M_i and M_j generally represent the GDPs for countries i and j , D_{ij} represents the distance between the two countries, and η_{ij} represents an error term with expectation equal to 1.

Later on, the model was developed by adding more concrete theoretical frameworks such as by Linnermann (1966), Bergstrand (1985), Helpman (1987) and Anderson and Wincoop (2003). The model is now extensive used to study the determinants of bilateral trade as well as capital flows. Furthermore, it can be used to assess the effectiveness of free trade agreements, the effects of market access and trade resistance. Most analytical work also included other factors besides distance and the size of economy or GDP such as exchange rate, population, income per capita, historical background (colonial ties), common language, geographic factor (landlocked, share same borders, remoteness) and economic policy (tariffs, exchange rate regime).

The econometric estimation of the Gravity Model can be done in 2 ways. The first way is used linear approximation by taking the natural log of both sides, leading to a log-log model of the form.

$$\ln(F_{ij}) = \beta_0 + \beta_1 \ln(M_i) + \beta_2 \ln(M_j) - \beta_3 \ln(D_{ij}) + \epsilon_{ij}$$

where constant G becomes part of β_0

Alternatively, the multiplicative form can be used, then estimate regression coefficients by Poisson pseudo-maximum likelihood (PPML) estimators which is more advanced technique.

$$F_{ij} = \exp[\beta_0 + \beta_1 \ln(M_i) + \beta_2 \ln(M_j) - \beta_3 \ln(D_{ij})] \eta_{ij}$$

Therefore, in this paper, only the log-log model are used for simplicity.

In order to access the trade creation and trade diversion of ACFTA, 3 dummy variables are introduced in the basic model of gravity for trade to capture the outcomes of trade creation, export diversion and import diversion which are extend from Vinerian (1950) specification of integration effects. Moreover, the population are additionally included in

the equation 2. The model of this paper are consistence with Endoh (1999), Soloaga and Winters (2001), Carrère (2006), Magee (2008) and Martínez-Zarzoso et al. (2009).

$$\ln X_{ij} = \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 \ln D_{ij} + \alpha_1 ACFTA_{ij} + \alpha_2 exACFTA_{ij} + \alpha_3 imACFTA_{ij} + \varepsilon_{ij} \quad (1)$$

$$\ln X_{ij} = \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 \ln D_{ij} + \beta_4 \ln N_i + \beta_5 \ln N_j + \alpha_1 ACFTA_{ij} + \alpha_2 exACFTA_{ij} + \alpha_3 imACFTA_{ij} + \varepsilon_{ij} \quad (2)$$

The dependent variable:

- $\ln X_{ij}$ denotes the value of bilateral exports from exporter country i to importer country j in current US\$

The independent variables:

1. Core Variables

- $\ln Y_i$ denotes the value of gross domestic product of exporter country i in current US\$ (imply the economic size of exporter country i).
- $\ln Y_j$ denotes the value of gross domestic product of importer country j in current US\$ (imply the economic size of importer country j).
- $\ln D_{ij}$ denotes the distance between capital cities of the exporter country i and importer country j in kilometers (imply the cost of transportation).

2. Additional Variables

- $\ln N_i$ denotes the population of exporter country i (imply factor endowment and market size of exporter country i).
- $\ln N_j$ denotes the population importer country j (imply factor endowment and market size of importer country j).

3. Regional integration effects

- $ACFTA_{ij}$ denotes the dummy variable to capture the effect of trade creation. It equals to 1 when both export country i and importer country j are members the ACFTA and takes value of 0 otherwise.
- $exACFTA_{ij}$ denotes the dummy variable to capture the effect of export diversion. It equals to 1 when only exporter country i is a member of ACFTA but exporter country j is not and takes value of 0 otherwise.
- $imACFTA_{ij}$ denotes the dummy variable to capture the effect of import diversion. It equals to 1 when only importer country j is a member of ACFTA but exporter country i is not and takes value of 0 otherwise.

4. Error term

- ε_{ij} denotes the natural log of normal-distributed error term.

3.2 Interpretation and Expected Results

$\ln Y$ or GDP represents the ability to purchase or demand level of a country. Large economies tends to spend more on import since their income are high. Besides, they also produce wide range of products which attract other countries to buy from them as well. Hence it should be positively related with trade flows.

$\ln D_{ij}$ or the distance between the capital cities i.e. the economic center is used as the proxy of the transportation and communication costs as well as the time required to deliver goods. The longer distance incurs more cost from transportation, communication failure and delivery time, as a result the expected sign should be negative.

For $\ln N$ or population, the expected sign tends to be negative however it also can be positive. According to Nguyen (2009), the negative relationship occurs because larger population mean high resource endowment, larger domestic market and more diversified outputs. Therefore, the large absorption effect causes less dependency on international specialization. On the other hand, in accordance with Brada and Méndez (1985), the positive relationship occurs because larger population means larger market so the imported goods can compete better with domestic goods. This compensates exporters for the cost to sale activities abroad. The economy of scale can be exploited and country can trade more with foreign countries in wide range of products.

$ACFTA_{ij}$ or trade creation is expected to be positive. The positive indicates that more trade are promoted inside the ACFTA and the level of trade are higher than hypothetical trade level.

$exACFTA_{ij}$ uses to capture export diversion. It was first introduced by Endoh (1999) can be either positive or negative. The positive sign means that ACFTA members switch exporting activities from its members to non-ACFTA members. Conversely, the negative sign means that there is exporting diversion in ACFTA; in other word, the ACFTA members export more within the bloc rather than outside the bloc.

$imACFTA_{ij}$ uses to capture import diversion which was first introduced by Balasa (1967) can also be either positive and negative. The positive sign means there is an increase in imports from extra-trade bloc counties; while negative sign means there is import diversion in ACFTA i.e. ACFTA members switch importing activities from non-ACFTA members to its members.

Table 3.1: The summary of the description of variables in the model and expected signs

Variable		Description	Associated statistical parameter	Expected sign
Core factors	$\ln Y_i$ Economic Size	Value of GDP of exporter country i in current US\$	β_1	+
	$\ln Y_j$ Economic Size	Value of GDP of importer country j in current US\$	β_2	+

	$\ln D_{ij}$ Proxy of cost of transportation	Distance between capital cities i.e. economic center of the exporter country i and importer country j in kilometers	β_3	-
Additional Factors	$\ln N_i$ Factor endowment and market size	Population of exporter country i	β_4	+ / -
	$\ln N_j$ Factor endowment and market size	Population importer country j.	β_5	+ / -
ACFTA integration effects	$ACFTA_{ij}$ Trade Creation	= 1 when both exporter country i and importer country j are members the ACFTA = 0 otherwise.	α_1	+
	$exACFTA_{ij}$ Export Diversion	= 1 when only exporter country i is a member of ACFTA but exporter country j is not = 0 otherwise.	α_2	+ / -
	$imACFTA_{ij}$ Import Diversion	= 1 when only importer country j is a member of ACFTA but exporter country i is not = 0 otherwise.	α_3	+ / -

Not only the sign of regression coefficients of $ACFTA_{ij}$, $exACFTA_{ij}$ and $imACFTA_{ij}$ are important, but the relative magnitude are also important. According to Martínez-Zarzoso et al. (2009), the sign of α_1 alone is not sufficient to determine whether there is a net trade creation in FTA; α_2 and α_3 must be considered as well. There are many ways to interpret the results of dummy's coefficients as listed below.

Table 3.2: The possible outcomes of effects of trade integration in FTA

	Export Effects		Import Effects	
	$\alpha_2 > 0$	$\alpha_2 < 0$	$\alpha_3 > 0$	$\alpha_3 < 0$
$\alpha_1 > 0$	Pure trade creation in term of export	- Trade creation and Export diversion $\alpha_1 > \alpha_2$ - Export diversion $\alpha_1 < \alpha_2$	Pure trade creation in term of import	- Trade Creation and Import diversion $\alpha_1 > \alpha_3$ - Import diversion $\alpha_1 < \alpha_3$
$\alpha_1 < 0$	Expansion of extra-bloc exports	Export diversion and Contraction of intra-bloc exports	Expansion of extra-bloc imports	Import diversion and Contraction of intra-bloc imports

Source: Yang and Martínez-Zarzoso (2013)

3.3 Data description and sources

The cross-section data of 2010 are employed because ACFTA came into effect on 1 January 2010 and the data of 2010 is very complete. Moreover, as already mentioned, the Gravity Model is more suitable with the cross-sectional data in accordance with Hufbauer, Schott and Elliott (2007). However, in other papers, panel data can also be used.

The model is tested on a sample of 19 countries. The 9 countries are from the members of ACFTA: Cambodia, China, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand and Vietnam except Brunei and Myanmar due to lack of data. The rest 10 countries are from non-ACFTA member which are major trading partners of ACFTA: Australia, France, Germany, Hong Kong, India, Japan, Russian, South Korea, United Kingdom and United States of America. In total, there are 343 observations.

According to UN ESCAP (2013), for cross-sectional data, whether the data are expressed in the nominal or real terms do not matter since they will give equivalent results regardless of any uniform scaling. However, for time series, trade flows should be in nominal rather than real terms because data are effectively deflated by the multilateral resistance terms which are special price indices. Deflating data using the CPI or the GDP deflator would not adequately capture the unobserved multilateral resistance terms hence could produce misleading results. Furthermore, in accordance with Linneman (1966), there will be small difference in the coefficients of determination if real GDP are used to replace nominal GDP. As a result, in this paper the nominal terms are employed only.

Table 3.3: Data sources

Data	Data Sources
Bilateral Export at current US\$ (2010)	Trade Map of International Trade Center (2013)
GDP at current US\$ (2010)	World Development Indicator of World Bank (2013)
Population (2010)	World Development Indicator of World Bank (2013)
Distance	Time and Date distance calculator

4. Empirical Results

Since the cross-sectional data are applied, it is more appropriate to use ordinary Least Squares method (OLS). The results of the 2 equation are in the table below.

Table 4.1: Empirical results of regression of equation 1 and 2.

Independent Variables	Equation 1	Equation 2
Constant	-24.7299*** (-11.3347)	-26.7347*** (-13.4529)
$\ln Y_i$ Economic Size	1.0951*** (20.3748)	1.4688*** (20.6653)
$\ln Y_j$ Economic Size	0.9602*** (17.8409)	1.2431*** (17.4754)

$\ln D_{ij}$ Proxy of cost of transportation	-1.1968*** (-10.2954)	-0.5053*** (-7.1681)
$\ln N_i$ Factor endowment and market size		-0.3806*** (-5.3990)
$\ln N_j$ Factor endowment and market size		-1.2461*** (-11.8326)
$ACFTA_{ij}$ Trade Creation	0.9555*** (3.0843)	2.0672*** (6.7041)
$exACFTA_{ij}$ Export Diversion	0.9241*** (3.6174)	1.5914*** (6.3942)
$imACFTA_{ij}$ Import Diversion	0.5155** (2.0174)	1.0216*** (4.1032)
P-value of F-test	0.0000	0.0000
Adjusted R ²	0.7030	0.7570
SEE	1.4663	1.3264

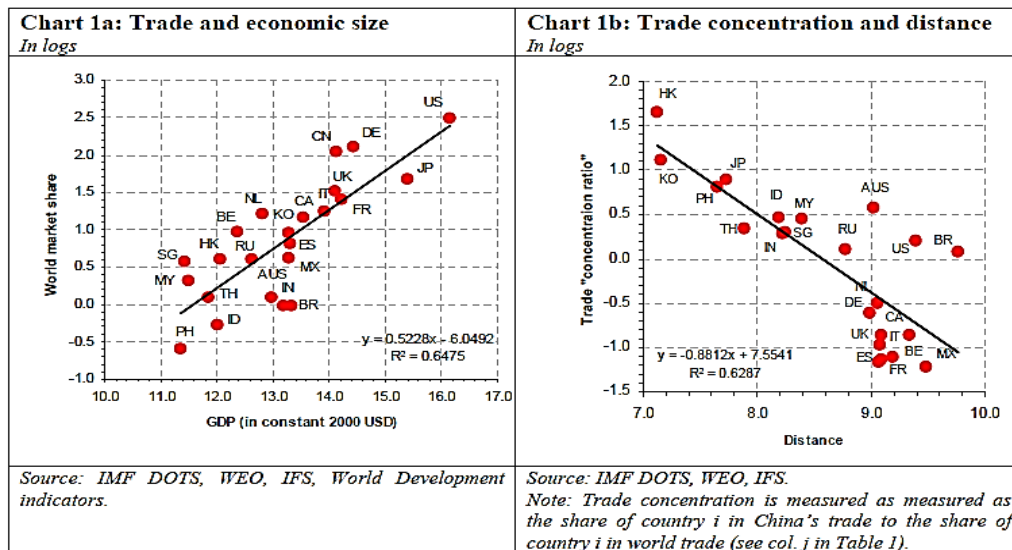
Note: 1. *** and ** denotes the coefficient is significant at 1% and 5% level respectively.
2. T-value is in parentheses

The F-test (the overall significance of a multiple regression equation) of both equation 1 and 2 is statically significant. This means that the entire set of independent variables in a multiple regression equation has a net effect on the dependent variable. All independent variables in both equations are also statistically significant at 1% level, except for import diversion of equation 1 which is significant at 5% level. Besides, the results of the coefficients in both equations are also consistence with the expectation. Hence, the Gravity Model plays a major role in explain pattern of trade flow empirically. Notwithstanding, the equation 2 should be more accurate since its adjusted R² is higher and standard error of the equation is lower. For the equation 2, approximately 76 percent of the variation in the response variable can be explained by the explanatory variables. Thus, the equation 2 is chosen as the main equation for this paper.

4.1 Gravity Model variables

The GDP has significantly positive effect on trade while distance has negative effect. This results are consistence with many researchers such as Robert (2004) and Bussière and Schnatz (2006). For the populations, they are negative and statistically significant which is accordant with Ho Sze Yin and Iris (2010). The larger population means the larger absorption effect which causes less dependency on international specialization, hence the international trade reduces. If the GDP of exporter i or GDP of importer j increases by 1 percent; the export would increase by 1.47 or 1.24 percent respectively. On the other side, distance between i and j, population of exporter i or population of importer j increases by 1 percent; the export would decrease by 0.51, 0.38 or 1.25 percent respectively.

Table 4.2: The stylized fact on relationship between bilateral trade with GDP and distance in case of China from the other author's work.



Source: European Central Bank (ECB) working paper series, Bussière and Schnatz (2006).

4.2 Trade integration and diversion variables

The coefficient of $ACFTA_{ij}$ is positive and statistically significant. This shows that there is intra-regional trade creation effect after ACFTA has fully in effect. Low tariff facilitates trade among the member counties. Hence, the welfare of member countries increase.

$exACFTA_{ij}$ shows significantly positive sign indicating export expansion. ACFTA members export to non-members more beyond the hypothetical trade level. Thus, the welfare also increases for the non-members countries.

$imACFTA_{ij}$ displays positive sign and statically significant which implies import expansion. Thus, ACFTA members import more form non-members beyond the hypothetical trade level.

To determine the total outcome from regional integration, the table 3.2 is used. For export effect, since $\alpha_1 > 0$ and $\alpha_2 > 0$ there is pure trade creation on export. In addition, for import effect, $\alpha_1 > 0$ and $\alpha_3 > 0$ there is also pure trade creation on import. Therefore, the estimated results prove that by reducing and removing both tariff rates as well as non-tariff barriers in ACFTA enhance trade volume not only intra-bloc but extra-bloc also. The welfare for member and non-member raises as a result. These are consistent with Yang and Martines-Zarzoso (2013).

The underlying factors that cause the pure trade creation are as the following. First, trade are boosted because of the reduction of both tariff rates and non-tariff barriers in ACFTA. Second, the locations between each country are very near comparing to outside-bloc. According to location theory, the cost of transportation is lower when the counties is in the same neighboring region. Third, the integration between the counties that have different development stages would allow the members to specialize in different kind of products. This helps to foster trade creation while reducing trade diversion (Ponpiruth 2009). Forth, the economic integration with large economies such as China benefits the

member countries more than the integration with many small economies. Fifth, since ASEAN also sign many FTA with other partners beside China. According to Second-Best theory, the diversion in trade depends on the difference between trade barriers of intra-bloc and extra-bloc. Since there are no huge difference, the trade creation effect overcomes.

5. Conclusion and Policy Recommendations

China and ASEAN take more interest in one another as the trade between them increased substantially since mid-1990s. In 2001, they signed up the initial framework agreement with the intent on establishing a free trade called “ASEAN–China Free Trade Area (ACFTA). This paper aims to analyze the impact of ACFTA on trade diversion and creation by using the Gravity Model for trade. The data sets cover 19 countries including 9 ACFTA members (Cambodia, China, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand and Vietnam except Brunei and Myanmar due to lack of data) and 10 non-member countries which are major trading partners of ACFTA (Australia, France, Germany, Hong Kong, India, Japan, Russian, South Korea, United Kingdom and United States of America). The cross sectional data of 2010 are employed because the ACFTA came into effect at this year and full data is available in 2010. Moreover, according to Hufbauer, Schott and Elliott (2007), the Gravity Model is suitable for the cross-sectional data.

For the determinant of export, the estimated results show that GDP of importer and exporter is positively related with export activities; while population and distance of both countries is negatively related with trade. The regional dummies which use to capture trade creation, export diversion and import diversion are all positive and statistically significant. The meaning is that ACFTA enhance the trade volume among intra-bloc also extra-bloc as well. Since the coefficient of trade creation is higher than coefficient of export and import diversion, the net product is that there is pure trade creation of export and import. As a result, the welfares of intra-bloc and extra-bloc increase.

From the empirical finding, the actual trade policy of ASEAN and China should be remain because it improves the trade growth and development of members along with non-members. Even the ACFTA create a lot of opportunity to trade and has economic potential, it is still not fully integrated compare to other FTA that was done by developed nations. For example, tariffs still exist for sensitive good and the free movement in capital and labor, free trade in service and reduction in non-tariff barriers is still limit to some extent. Hence, not only tariff that should reduce but it should pay more attention product differentiated, structure of trade complementary, cooperation on vertical integration and efficient custom procedures.

When there will be another economic integration, the government should look at the determination of trade. A country should negotiate with countries of higher development to gain the trade creation because their incomes are high. The distance also

play great role in determining comparative advantage. A greater distance means a higher costs. A country should focus on improve logistic as well as focus more in expanding market in region, not just in large economies. For the population, the larger population means the need for international specialized decrease so trade between counties decreases as well. Hence, the given everything constant, a country should target more on country that has smaller absorption effect.

In this study, there are some limitations. First, the model was run on cross-sectional data so it can only capture the snapshot of event. Panel data should be used instead to see the change of variables over time. When the panel data is employed, the empirical result by the pooled OLS, fixed effect and random effect should be compare to determine the best one as the main model. Second, the method of Log-linearized equation by OLS can give biased result. It can be improve by including more relevant variables as well as counties as the rest of the world to increase a number of observations. Moreover, all econometric problems such as auto-correlation, heteroscedasticity and endognity should be solve to obtain more accurate results. If the result is still bias, alternative model i.e. Multiplicative form can be employed and estimate by Poisson pseudo-maximum likelihood (PPML). Lastly, aggregate data are used so it cannot analyze the effect of ACFTA on each export products. In order to do so, disaggregate data should be used instead.

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