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The Trade Enhancing Effect of the Free Trade Agreement and Tariff Margin: Evidence from Thailand

*Pit Jongwattanakul**
School of Economics, Sukhothai Thammathirat Open University, Thailand

Abstract

This paper examines the trade enhancing effect from FTA, using Thailand as a case study. A gravity equation model, the popular trade model workhorse, is applied during the period between 1991 and 2010 with allowing export and import to perform differently to the preferential trade scheme. The novel feature of the paper is that actual tariff margin, the gap between MFN and preferential-FTA rates, is calculated to measure the effect from FTAs, instead of using zero-one dummy variable. In addition, the estimate of costs in complying rules of origin is included in the calculation. Also, Products are further disaggregated into manufacturing and machinery and transport equipment (SITC 7) to examine possible different impact of FTAs. Our key finding is how to measure FTA effect matters to the outcome. Zero-one dummy variable tends to overestimate trade enhancing effect. In addition, products under production network dominated by parts and components are less likely to utilize preferential trade scheme due to the already low tariff margin. Our result raises the policy awareness in maximizing a number of FTAs. Rather its trade enhancing effect depends on FTA partners and the nature of bilateral trade between them.

Keywords: Free Trade Agreement, Global Production Network, Gravity Equation, Thailand.
JEL Classifications: F14, F15, aO53, F63

* **Address:** 9/9 Moo 9, Tambon Bang Phut, Pakkret Nonthaburi 11120 Thailand.
E-mail: pit.jon@stou.ac.th

1. Introduction

The opening of international trade has become the norm in policy design worldwide in order to promote long-term economic growth (Palley, 2003, pp. 175-176). Until 2000 multilateral trade negotiation was governed by the General Agreement of Tariff and Trade (GATT) and its successor the World Trade Organization (WTO). These represented the core mechanisms in reducing cross-border trade barriers. As a result average world tariffs dropped significantly and a rapid expansion of world trade was evident in the 1980s and 1990s[1].

Since the start of the new millennium mechanisms opening up international trade have changed. The role of the WTO has been gradually diluted and replaced by a proliferation of preferential trade agreements, widely known as free trade agreement (FTA). Different from the WTO, FTAs are discriminatory and represent conditional trade liberalization. The lowering of tariff rates is offered only to members (i.e. discrimination), whereas their actual impact on trade depends on the restrictiveness of rules of origins (ROOs) the rules proving the origin of goods for the purpose of determining any eligibility for tariff concessions. How ROOs are designed and implemented has a considerable effect on trade impact.

Interestingly, the number of FTAs grew at a phenomenal rate between the mid 1990s and 2011, reaching 505 by November 2011 up from 124 in 1994[2] . It seems inevitable that any implementation of FTAs engenders far-reaching implications not only for the philosophy and operation of the multilateral trading system, but also for the day-to-day conduct of cross-border trade. Hence, there are a number of empirical studies assessing the trade impact of FTAs. These studies can be classified into two groups: ex ante and ex post. Any assessment of a trade simulation effect in the former uses the Computable General Equilibrium experiment and GTAP in particular. This was popular before the onset of FTAs. However, with the increasing preponderance of effective FTAs, the latter has been gaining more attention.

However, any application of the gravity equation to assess FTA trade impact is subject to at least two shortcomings. The first is how to capture the trade impact. Particularly, the trade impact is captured by the binary (zero-one) dummy variable. The dummy is assigned to be one when the FTA is signed. It implies the trade impact occurs instantaneously and remains identical across periods. In fact, tariff reduction in FTAs is usually scheduled over a year. This is especially true for FTAs involving developing countries. For example, AFTA, signed in 1990, had a 15 year transitional period. In addition, the net impact largely depends on the gap between MFN and preferential tariff rates, which can vary across FTA partners. The larger the gap, the more the trade impact we would expect. The gap can vary across FTAs and over time. Hence, the gap would represent a better proxy for capturing the trade impact of FTAs.

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[1] The average world tariff in Tokyo Round (1973 – 79) reduced substantially in total industrial products (33%), raw materials (52%), semi – manufactures (30%), and finished manufactures (33%); This resulted in the expansion of world trade with an annual average growth of 250% between 1980 and 1999 (IMF, 2003).

[2] Further details are available at http://www.wto.org.

Secondly, the general practice in previous studies was to ignore the possibility of different behaviors across different product categories. That is, the dependent variable is total exports, imports or total trade. In theory, the international trade of agricultural and manufacturing products is expected to behave differently. Only the former depends on several uncontrolling supply-side factors, such as epidemics, climate changes and other forms of natural disaster, so the supply of agricultural products is highly uncertain. In addition, the ability to comply with rules of origin is vastly different. Agricultural products rely heavily on local inputs, whereas electronics depend on imported parts from global suppliers.

More importantly, the increasing importance of the global production network of multinational enterprises (MNEs) can be observed. This has certainly played a pivotal role in the continuing dynamism of East Asian economies and an increasing intra-regional economic interdependence, especially trade in parts and components (Athukorala and Yamashita, 2006). It is worth examining the trade impact of FTAs on the network trade. The nature of such products could influence trade relationships, so lumping them together might misrepresent their behavior.

Against this backdrop, this paper aims to examine the trade impact of FTAs, using Thailand as the case study. To capture the trade impact, the tariff gap is used as alternative measure, compared to the binary dummy variable widely used in the existing literature. In addition, the nature of products will be taken into account in the analysis. Products will be categorized into three groups, i.e. total products (agriculture plus manufacturing), manufacturing goods, and SITC 7 representing the network trade.

Thailand is an interesting and enlightening representative of developing countries for two reasons. Firstly, Thailand is widely regarded as a successful case study in pursing an export-led growth strategy (Kohpaiboon, 2006). Export performance was attributable to unilateral tariff reductions and the success of multilateral agreements in the context of the WTO. From 2001, Thailand has been one of East Asia's most enthusiastic FTA users. Thailand is simultaneously engaged in 16 FTAs, five of which are still under consideration of how and when liberalization will take place.

Secondly, Thailand is the most broad-based industrialised nation in Southeast Asia. The country is a major exporter of many products, including rice, natural rubber canned tuna, canned pineapple, garments, hard disk drives, automotives, and many electrical appliances (Kohpaiboon, 2010). The nature of industrialization allows us to undertake a sensitivity analysis of a products' nature.

All in all, this paper employs a gravity equation to assess the impact of tariff margins between MFN and preferential tariff rates on Thailand's trade flows which use panel data of exports and imports, and relevant variables of Thailand with 173 trading partners during 1991-2010. Importantly, this paper focuses on FTAs in only AFTA (Indonesia, Philippines, Malaysia, Singapore, and Vietnam), TAFTA, TNZCEP, JTEPA, and ASEAN-China FTA.

2. Literature Review

The gravity equation firstly used by Tinbergen (1962) has become popular in international trade analysis when assessing the effects of FTA[3]. This equation was applied from Newton's Law of physics[4] postulating that trade flows are directly proportional to the economic size of the two nations (represented by their GNP or GDP) and inversely proportional to the distance between them. This device gave considerable empirical robustness and explanatory power for explaining trade flows, despite its lack of a strong theoretical foundation. Later, many studies were often augmented by the inclusion of other variables, such as GDP per capita or population of the two countries, a dummy variable for a common border, a common official language, and common free trade agreements (FTAs).

As mentioned above, to capture the effects of FTAs on trade flows, a binary (zero-one) dummy variable is introduced as an additional explanatory variable to the standard gravity equation. That is, the dummy variable is equal to one when a FTA in focus takes effect, and zero otherwise. The positive coefficient corresponding to the dummy indicates the trade impact of a FTA. There have been many studies implementing this approach to assess FTA effects on trade flows, such as Bergstrand (1985), Bergstrand (1989), Gilbert et al. (2004), and Huot and Kakinaka (2007).

Even though using dummy variables to capture the effects of FTAs on trade flows is widespread in many studies, these analyses fail in the sense that they do not tell us conclusively whether or not such regional economic institutions have strong trade diversion effects. The reason for this is that the methods used by these researchers do not distinguish between trade creation and trade diversion. In the late 1990s, Endoh (1999a) firstly proposed an examination of trade creation and trade diversion by introducing two new kinds of dummy variables into the gravity equation, which is considered appropriate in responding to the issues raised above.

Endoh's approach comprised three characteristics into each FTA dummy variable (including the traditional dummy variable). Firstly, dummy variables are used to capture exports from a non-member country to a member country, which represents trade diversion. The negative relationship of these variables would imply the members have switched their importing activities from non-member economies to member nations. This is called "import trade diversion". Secondly, the dummy variables are used to capture exports among members (the traditional dummy variable), which represents trade creation. To capture trade creation, the positive relationship of these variables would imply that members have traded with other members more than before setting FTAs. Lastly, the dummy variables are used to reflect exports from members to non-members, which represent trade diversion. The negative relationship of these variables indicates that a FTA has caused members to prefer member countries to non-member economies in their exporting activities. This new preference is termed "export trade diversion". Examples of studies using this approach are Endoh (1999a), Endoh (1999b), Elliot and Ikemoto (2004), and Sarkera and Jayasinghe (2007).

Among the studies of FTAs mentioned above, each has specific characteristics which give a different meaning of FTA variables within each study. Considering these, three discussions are proposed to clarify each format of FTA study by the gravity equation. That is what datasets are used between cross-sectional data or panel data, what product types are used between aggregated or disaggregated, and what type of country are analyzed between multilateral or specific.

2.1 Datasets Analysis

Datasets mostly used in gravity equation studies are cross-sectional data and panel data. Each type of dataset also has an appropriate estimation method deemed suitable. The first type of dataset is cross-sectional data which is based on a single year or an average of a period. The meaning of FTA coefficient represents the effects of FTAs on trade flows only in that year or that period. This kind of dataset is able to use only the ordinary least square (OLS) to estimate. Examples of studies using cross-sectional data are Tinbergen (1962), and Linnemann (1966).

The second type of dataset is panel data which consists of not only cross-sectional data, but also time series data. Therefore, this can analyze in two ways. The first analysis is a year by year study which is able to capture the effects of FTAs on trade flows in each year, so it is easy to observe what year that FTAs impacts positively on trade flows, or what year FTAs do not have any affect by seeing statistical values. Since this analysis is a cross-sectional estimation, only the OLS estimation method is used in this case. Example studies utilizing this approach are Bergstrand (1985), Bergstrand (1989), Endoh (1999a),Endoh (1999b),and Gilbert et al. (2004).

The second analysis is pooled study which is able to capture the effects of FTAs on trade flows in the long term. Pooled OLS is commonly used in this case in research projects such as Gilbert et al. (2004), Huot and Kakinaka (2007), and Sarkera and Jayasinghe (2007). However, this type of dataset is able to be estimated by the fixed effects approach. This offers several advantages such as the possibility of capturing the relationships over variables in time and observing individual effects between trading partners for a more accurate coefficient capturing FTAs. The studies of Matyas (1997), Baltagi et al. (2003), Egger and Pfaffermayr (2003), and Cheng and Wall (2005) suggested that an omission of one or more interaction effects can result in biased estimates and misleading inference.

Nevertheless, much of the recent literature suggests that most studies using the log-normal estimation of the gravity equation will face three crucial weak points. First, using log-linearized models must suffer biased estimators because of Jensen's inequality. Second, since the log-normal model assumes homoskedasticity in the error terms, this might lead to inefficient results if the data possesses heteroskedasticity. Third, the log-normal model cannot deal with zero-valued trade flows because of an undefined zero logarithm. Thus, they must always omit zero-valued trade flows in the dataset and estimate the gravity equation without those observations. Hence, excluding this important information could lead to inconsistent results. Therefore, to deal with these issues, they should use nonlinear methods for estimating the gravity equation. Santos Silva and Tenreyro (2006) simulated nonlinear estimation methods, such as nonlinear least squares (NLS), gamma and poisson pseudo maximum likelihood (GPML and PPML). They indicated that PPML is robust in the case of heteroskedasticity with log-normal transformation models. However, Burger et al. (2009) claimed that the PPML is still weak because of an over dispersion problem (the conditional variance is not equal to the conditional mean), so they proposed the negative binomial pseudo maximum likelihood (NBPML) which already relaxes the equidispersion assumption to non-equidispersion by determining the degree of dispersion in predictions. Consequently, the NBPML should represent the most efficient estimation method employed recently.

2.2 Product Analysis

In general, many studies have employed aggregated products to study the impact of FTAs on trade flows, but few studies (i.e. Bergstrand, 1989; Gilbert et al., 2004; and Sarkera and Jayasinghe, 2007) split the total product into subdivided categories; that is, Bergstrand (1989) separated by the Standard International Trade Classifications (SITC), Gilbert et al. (2004) divided by the characteristics of each product (i.e. merchandise, agricultural, and manufacturing), and Sarkera and Jayasinghe (2007) subdivided agricultural products into red meat, grains, vegetables, etc. The results of these studies indicated that FTAs affected trade flows in some product types.

2.3 Country Analysis

Most studies have used multilateral countries to study the impacts of FTAs on trade flows. The advantages of this are to obtain larger sample sizes to estimate and ascertain an explanation of FTAs' impacts on trade flows in total. However, this methodology is unable to investigate whether each FTA is suitable for each individual country. Against this backdrop, some studies (i.e. Huot and Kakinaka (2007)) focused on a specific country for investigating the FTA policy of a particular nation. Therefore, the results must be different from studies scrutinizing multilateral countries as they are able to analyze the impacts of each FTA on the trade flows of a specific country.

3. Trade Policy in the New Millennium

Since the dawn of the new millennium, the Thai international trade policy has changed from multilateral to bilateral liberalization. That is, in the early 1980s, Thai trade policy focused on a form of multilateralism known as the General Agreement of Trade and Tariff (GATT). This was later renamed the World Trade Organization (WTO). In 1993, Thailand embraced a program of regionalism with neighbor countries in Southeast Asia called AFTA (ASEAN Free Trade Area). However, after the beginning of the millennium, the focus of Thailand's trade policy changed to prefer free trade agreements (FTAs). Since 2002, Thailand has signed enthusiastically on FTAs in the form of Bilateral Trade Agreements with many countries, such as Bahrain, US, Peru, Australia, New-Zealand, Japan, India, and BIMSTEC. Thailand also signed FTAs in the form of Regional Trade Agreements, such as ASEAN-China, ASEAN-Japan, ASEAN-Korea, ASEAN-Australia-New Zealand, and ASEAN-India. Furthermore, there are additional candidates currently under consideration, such as Pakistan, Southern African Custom Union (SACU), Chile, ASEAN + 3 (East Asia Free Trade Area: EAFTA), ASEAN + 6 (Comprehensive Economic Partnership in East Asia: CEPEA), ASEAN-EU.

The exact starting point from which the Thai government initiated thinking about the FTA approach is hard to specify, but probably dates back to the late 1990s (Nagai, 2002). One of the major contributing factors that spurred Thailand into adopting this kind of international trade policy was the suffering endured as a consequence of the financial crisis in 1997. Since Thailand accepted the International Monetary Fund's (IMF) recovery plan, there was pressure brought to bear on the ChuanLeekpai government to find any way to increase foreign reserves. Thus the government launched an initiative to seek opportunities to pursue the FTA approach which had the potential of guaranteeing the inflow of foreign exchange though international trade (Chirathivat and Mallikamas, 2004). As a result, Supachai Panichpakdi, who was the Deputy Prime Minister and Minister of Commerce, began to consider FTAs with the Czech Republic and Croatia in 1998 or 1999 when he visited Europe, followed by Chile in 2001; and South Korea, Australia, and New Zealand in 2002 (Nagai, 2002). However, all of the FTAs under consideration experienced slow progress and were stalled as a result of the weak leadership of Chuan Leekpai and other government preoccupations at that time (Chirathivat and Mallikamas, 2004).

FTA activity has become more prominent on the agenda of development since Thai political situation changed to be dominated by the Thai Rak Thai party led by Thaksin Shinawatra in 2001. In his role as a "CEO style" of prime minister he was very much pro-FTA and this was supported by many additional factors, such as the Asian crisis, a wave of nationalism, anti-IMF sentiment, the stumble of WTO liberalization negotiation at that time, and especially Thailand not wanting to be left behind by Singapore and other countries already using FTAs to access new markets and to establish potential markets. Therefore decision making concerning adopting FTAs by the Thai government were made in haste with many negotiations being concluded over a short period of time. This resulted in a lack of careful preparation including confusion in policy direction for negotiators. Most negotiations were completed without adequate consultation with government officials and lack of discussion with the public (Phongpaichit and Baker, 2004), (Sally, 2007). Nevertheless, as a result, seven FTAs still were signed over the duration of Thaksin's government throughout its' six years (Table 1).

A transformation in trade policy occurred again after the coup in 2006. The bilateral FTA-led liberalization stopped as a result of amendments by the revolutionary council, especially Article 190 which was drafted in order to prevent any rushed conclusions in international trade agreement without careful study and public consultation. Hence, subsequent international trade agreements had to be subject to sufficient prior study and extensive country-wide public hearings (Kohpaiboon, 2010). Furthermore, the scope of FTA policy also shifted from Bilateral Trade Agreements to Regional Trade Agreements. Prominent in the 2000s have been a series of regional FTAs, for instance, ASEAN-Japan (AJCEP) in2008, ASEAN-Korea, ASEAN-Australia-New Zealand (AANZFTA), and ASEAN-India (AIFTA) in 2009, and BIMSTEC in 2010.

Since many FTAs are in effective around 2010 which caused shortage data (Table 1), this study will focus intensively on agreements which had been in effect prior to 2010; the ASEAN Free Trade Area (AFTA) (Philippines, Indonesia, Malaysia, Singapore, and Vietnam), Thailand-Australia FTA (TAFTA), Thailand-New Zealand (TNZFTA), Japan-Thailand Economic Partnership Agreement (JTEPA), and Thailand (including ASEAN countries) and China (ASEAN-China FTA).

4. Gravity Equation

4.1 Basic Concept

The gravity equation has become a workhorse for modeling bilateral trade flows. While the essential data in estimating equations are readily available, its performance is robust and stable in bilateral trade predictions. Besides, using a gravity equation allows us to sensibly compare our results with others to draw inferences on FTA proxy.

Pioneered by Tinbergen (1962), bilateral trade between countries is similar to the force of gravity between objects: Newton's Universal Law of Gravitation. Objects with a larger mass or closer to each other have a greater gravitational pull between them. In the original work of Tinbergen (1962), countries with larger economic activities (measured by GDP) or that are closer to each other, have more trade between them. This can be summarized in Equation (1);

$$t_{ij} = \alpha \frac{GDP_i^{\beta_1} * GDP_i^{\beta_2}}{dist_{ij}^{\beta_3}}, \tag{1}$$

where t_{ij} = trade between countries *i* and *j*

GDP_i and GDP_j = GDP of countries *i* and *j*,

$dist_{ij}$ = geographical distance between countries *i* and *j*

Equation (1) indicates that trade between countries i and j positively depends on economic activities in both countries and is inversely proportional to geographical distance. The parameter α in Equation (1) captures the effects on bilateral trade of other factors such as tariffs, FTAs, and real change rates. A log-linear transformation of Equation (1) is expressed in Equation (2).

A reduced form of the gravity equation taking logarithms of both sides of the equation (4.1) and adding a random disturbance term can be expressed as:

$$\ln T_{ij} = \ln \alpha + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j - \beta_3 dist_{ij} + \varepsilon_{ij} \qquad (2)$$

In practice, there are three remarks pertinent to employing the gravity equation. The first remark is related to the choice of the dependent variable used. In general, T_{ij} can be measured by exports, imports or total trade (exports plus imports). When either exports or imports are separated in the analysis, it is referred to as partial analysis. Analysis of total trade is known as the total analysis. Nonetheless, the partial analysis becomes a norm in a gravity equation analysis as it is free from the assumption that the gravity effect on imports and exports is identical[5]. Instead this can be empirically tested. In addition, for small open economies, long integrated into a MNE's production network like Thailand, imports and exports in response to the emergence of FTA preferential trade can behave differently, so that our preferred choice is to separate exports and imports.

Table 1 FTAs Involved in Thailand from 1990 Onward

FTA	Signed	Effective	Remarks
ASEAN	1990	2006	
ASEAN - China	Nov – 02	Jul – 03	
Bahrain	Dec – 02		Under Negotiation
US	Oct – 03		Under Negotiation
Peru	Oct – 03	Jul – 10	
India	Oct – 03	Jan – 04	Very little progress
Australia	Jul – 04	Jan – 05	
New Zealand	Apr – 05	Jul – 05	
Japan	Apr – 07	Nov – 07	
ASEAN – Japan	Apr – 08	Jun – 08	
ASEAN – Korea	Feb – 09	Jan – 10	
ASEAN – Australia – New Zealand	Feb – 09	Mar – 10	
ASEAN - India	Aug – 09	Jan – 10	
BIMSTEC	Jul – 10	2013	Not yet in force
Pakistan			Under consideration
Southern African CU			Under consideration
Chile			Under consideration
ASEAN + 3 (EAFTA)			Under consideration
ASEAN + 6 (CEPEA)			Under consideration
ASEAN – EU			Under consideration

Source: Author's compilation from Department of Trade Negotiation.

[5] For example, see Athukorala (2012) and works cited therein.

The second remark concerns how GDP variables are incorporated into the gravity model. Some studies use the product of GDP and impose an identical impact on trade. Other studies separate them on the grounds that the GDP of exporting and importing countries can have different impacts. To a certain extent, it is related to the choice made of the dependent variable. Generally, the product of GDP is used in total analysis where the magnitude, instead of direction, of trade is concerned. This is often observed in studies to evaluate the empirical validity of theories, such as the presence of intra-industry versus intra-product trade. In the partial analysis, exporting and importing countries' GDPs are usually separated[6].

The last issue concerns the role of distance. While the empirical result of the effect of distance on trade is negative and robust[7], in theory the economic rationale regarding how geographical distance can affect trade remains unclear. It is treated as given in the theoretical literature (e.g. Anderson 1979; Eaton and Kortum, 2002; Chaney 2008). Although Krugman (1980), the seminal piece in American Economic Review, explained the found negative coefficient corresponding to the distance variable as a proxy for trade barriers. This seems unsatisfactory as several rounds of multilateral trade negotiations lower trade barriers substantially and advances in transportation and communication technology are able to dilute the negative impact of distance to some extent.

4.2 Unique Feature and Standard Additional Controlling Variables

The empirical model used in this paper is different from standard practice in applying gravity equation concerning at least two features. The first feature is to take into account the heterogeneous nature of tradable products. According to the literature regarding production networks (e.g. Athukorala 2005; Jongwanich, 2010; Kohpaiboon 2009), each product category could behave differently. Trade patterns of agricultural and manufacturing products are expected to behave differently. The former's trade volume largely depends on several supply-side factors, such as epidemics, climate, and incidence of natural disaster-most of which are uncontrollable. The latter is less sensitive to such uncontrollable factors. Besides, products categorized in SITC 7 (machinery and transport equipment) in which the production network is pronounced are liable to behave differently from other traditional manufacturing products. Hence, our partial analysis will be conducted focusing on three product categories; total products (agriculture plus manufacturing), manufacturing (SITC 5+6+7+8-68) and machinery and transport equipment (SITC 7).

Secondly, a FTA impact variable is constructed. In the existing literature, the impact of FTAs in studies assessing the ex post FTA trade impact is proxied by a binary (zero-one) dummy variable. That is, the FTA dummy is one when a FTA is signed i.e. Emdoh (1999b), and Elliot and Ikemoto (2004) in the case of AFTA or in effect i.e. Sarkera and Jayasinghe (2007) in the case of NAFTA. Such a proxy can capture other shocks occuring at the same time a FTA is signed. In addition, given the fact that FTAs with developing countries are generally associated with long implementation schedules, signing a FTA does not always mean the presence of preferential trade.

In fact, the trade impact of a FTA largely depends on the gap between MFN and preferential tariff rates. The larger the gap, the greater the trade impact we would expect.

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[6] For example, Tinbergen (1962), Bergstrand (1985), and Matyas (1997)

[7] See Meta-analysis of 1,467 estimates of the distance coefficient in Disdier and Head (2008).

The gap can vary across FTAs and over time due to different implementation schedules among FTA partners.

Against such a backdrop, this paper develops a continuous zero-one dummy variable using information of tariff margins and cost estimates in compiling with RoO to capture the trade impact of FTAs. The dummy variable is measured by the effective tariff margin, the gap between most-favored-nation (MFN) tariff and its corresponding FTA preferential rate, adjusted by the cost incurred to firms in compiling with the rules of origin. As argued in many studies e.g. Kohpaiboon (2010), Cadot et al. (2002); Estevadeodal and Suominen (2004); and Falvey and Reed (2002) complying with rules of origin is costly instead of costless. Being deflated by MFN tariff rates makes our results more accurate as opposed to other studies using the traditional zero-one dummy variable. This is expressed in Equation (3).

$$ETMI_t = \frac{MFN\,tariff\;rate_t - \left(FTA\,cost\,rate_t + FTA\,tariff\;rate_t\right)}{MFN\,tariff\;rate_t} \qquad (3)$$

Both MFN tariff rate and FTA tariff rate are the average of them weighted by the six – digit Harmonized System trading values. Total export and import are used by all of tariff lines, but in the case of manufacturing and SITC7 the tariff lines are used by the definition of SITC which come from the conversion and correlation tables in the database of UN.

Our freshly constructed dummy variable is for individual FTA partners of Thailand. For example, *AusETMI* is the dummy for Australia in capturing the trade impact of FTAs on Thai exporters to Australia under the Thailand-Australia Free Trade Agreement (TAFTA).Its value will be between zero and one since 2006 when the FTA began in effect. Otherwise, it is zero. For other trading partners but Australia, the dummy variable is always zero.

Theoretically, ETMI should capture the impact of FTA on trade flows better than zero – one dummy because of the wide range of ETMI. The value of ETMI starts with zero. The zero ETMI implies there is no trade impact as tariff cuts under FTA plus compiling costs are equal to MFN rates, there is no trade impact. In the case of eliminating the FTAs tariff process, the value of ETMI according to the equation (3) would be between zero and one. Hence, the positive relationship between ETMI and trade is theoretically expected. Note that in some cases where MFN tariff rates are less than the sum between FTA tariff and compiling costs, ETMI would be treated as zero.

Another factor with a considerable influence on trade flows is real exchange rate. This shows prices in the exporting country relative to prices in the importing countries. Many developing countries have to consider this because an undervaluation of the real exchange rate means the products of the exporting country becomes relatively cheaper in comparison to the products of other countries which implies the exports of the depreciated country may increase through the laws of demand. Although an undervaluation of real exchange rate strategy has some usefulness in promoting exports, it allows the costs of production to rise because the relative prices of imports of necessary goods such as new technology machines, raw materials, automobile component parts etc. will increase. According to the importance of the real exchange rate cited above, this paper also includes this variable into the gravity equation. However, this variable is adapted by using both real exchange rate and bilateral nominal exchange rate as follows:

$$RER_{ij,t} = \frac{e_{ij,t}P_{j,t}}{P_{i,t}} \quad (4)$$

Where $e_{ij,t}$ indicates the exchange rate of a country i per country j at year t, $P_{j,t}$ indicates the average prices of a country j estimated by GDP deflator at year t, and $P_{i,t}$ indicates the average prices of country i estimated by GDP deflator at year t. All in all, the $RER_{ij,t}$ is called the real exchange rate index of country i relative to country j at year t.

Finally, zero-one binary dummy variables are introduced. Two binary dummy variables are introduced to capture the possible effects of crises occurring during the study period, 1997-98 and 2009 dummies for the Asian Financial and Sub-prime crises, respectively. Binary dummy variables for each FTA individual partner are introduced to capture any FTA partner-specific effects. There are nine binary dummy variables, the Philippines, Indonesia, Malaysia, Singapore, Vietnam, Australia, New Zealand, Japan and China.

Furthermore, since this study uses panel data for the period between 1991-2010, which encompasses the Asian financial crisis (starting in 1997) and the subprime mortgage crisis (starting in 2009), to avoid the omitted variables, zero-one dummy variables ($FinDum_t$ and $SubDum_t$) are added into the models and appear as one if the years are 1997, 1998 and 2009, since a negative GDP of Thailand is found in these years.

4.3 Gravity Equation, Econometric Procedure and Empirical models

The theory – based gravity equation was firstly presented by Anderson (1979) and continued extensions by Bergstrand (1989 and 1990) and Deardorff (1998). Until the early 2000s, the publication of Anderson and van Wincoop (2003) showed the theoretically sophisticated derivation, and gave the final form mostly liked the traditional equation; however, their equation is difficult to estimate because the terms of multilateral resistance

are unobserved. Later, Feenstra (2004) proposed the simple way to capture the multilateral resistance by using importer and exporter fixed effects. Since then, we have had the theoretical gravity equation with an easily empirical approach. However, the theoretical gravity equation cannot apply to this paper because the interesting variables (ETMI) that varied across year and countries would violate the assumption of symmetrical trade which occurred when Anderson and van Wincoop solved their model. Therefore, this work uses the traditional gravity equation to assess the ETMI on trade flows.

The econometric procedure begins with undertaking the standard panel data estimation. The advantages of panel data estimation over pooled data estimation are; for example, since the panel data combines time series of cross-section observations, this could give more informative data, not only variations across time, but also across observation trading partners. Furthermore, since our panel data relates to trading partner individuals, the major problem always occurring is the heterogeneity effect which returned the bias results.

Panel data estimation in this paper follows the standard practice where both the fixed effects model (FEM) and the random effects model (REM) is conducted. With the FEM the intercept in the model is permitted to differ among partners which might have their own trading characteristics. FEM is suitable for this if a specific property may be correlated with at least one explanatory variable in the model. On the other hand, the intercept of REM is assumed by random drawing from a much larger observation with a constant mean value. REM is appropriate when the intercept of cross-sectional intercept is uncorrelated with the explanatory variables. Furthermore, REM can estimate the time-invariance variables such as distance between Thailand and trading partners which in the FEM would be swept out.

In practice, to choose between these two alternatives, the Huasman test is used. The null hypothesis underlying the Hausman test is that the estimation results of both FEM and REM do not statistically differ. If the null hypothesis is rejected, the REM would not be appropriate since the random effects might correlate with one or more explanatory variables.

Practically, when estimating gravity equations we must encounter a problem where the trade value is negligible. In addition, such trade transactions might be across only some years. As argued by Santos Silva and Tenreyro (2006) and Burger et al. (2009) including such observations would create a major problem in the functional form of distribution. Particularly, including them might cause a statistical distribution with fat tails. This violates the standard assumption in panel data estimation procedure, residual normality. This would lead to in consistent coefficients.

To overcome the distribution problem, Burger et al. (2009) suggested two alternatives. The first is to include only major trading partners and follow the standard panel data estimation. The major shortcoming of this method is the shrinking number of observation which might result in a lack of some information about the rest of the trading partners worldwide.

The second is to use a count data model such as the negative binomial pseudo maximum likelihood (NBPML) which could fix the problems above by using the non – logarithm form on dependence variables (trading values), then the zero-valued trade flows being estimated naturally by this procedure. This estimation method could relax the distribution from normal to negative binomial, within which the latter is more suitable to the natural characteristic of trade value. However, this paper will employ both for robustness check.

The models which suited the NBPML method are shown as follows:

$$\begin{aligned} F_{Thaij,t} = {} & \beta_0 + \beta_1 \ln(GDP_{j,t}) + \beta_2 \ln(GDP_{Thai,t}) + \beta_3 \ln(RER_{Thaij,t}) \\ & + \beta_4 \ln(D_{Thaij}) + \beta_5 AusETMI_t + \beta_6 NewETMI_t \\ & + \beta_7 IndETMI_t + \beta_8 MalETMI_t + \beta_9 PhiETMI_t \\ & + \beta_{10} SinETMI_t + \beta_{11} VieETMI_t + \beta_{12} JapETMI_t \\ & + \beta_{13} ChiETMI_t + \beta_{14} FinDum_t + \beta_{15} SubDum_t + \varepsilon_{Thaij,t}. \end{aligned} \tag{5}$$

where subscripts *Thai* and *j* refer to Thailand and the partner countries at year *t*. The used variables are listed and defined below, with the postulated sign of the empirical results for the explanatory variable are in parentheses.

Table 2 Definition of the Used Variables in Gravity Equations

Variable	Definition
$F_{Thaij,t}$	The export or import of three product types between *Thai* and *j* at year *t*
$GDP_{j,t}$	GDP of *j* at year *t* (+)
$GDP_{Thai,t}$	GDP of *Thai* at year *t* (+)

Variable	Definition
$RER_{Thaij,t}$	The real exchange rate index between *Thai* and *j* at year *t* (export: + import: -)
D_{Thaij}	The distance between *Thai* and *j* (-)
$AusETMI_t$	The effective tariff margin index of Australia at year *t* (+)
$NewETMI_t$	The effective tariff margin index of New Zealand at year *t* (+)
$IndETMI_t$	The effective tariff margin index of Indonesia at year *t* (+)
$MalETMI_t$	The effective tariff margin index of Malaysia at year *t* (+)
$PhiETMI_t$	The effective tariff margin index of the Philippines at year *t* (+)
$SinETMI_t$	The effective tariff margin index of Singapore at year *t* (only import: +)
$VieETMI_t$	The effective tariff margin index of Vietnam at year *t* (+)
$JapETMI_t$	The effective tariff margin index of Japan at year *t* (+)
$ChiETMI_t$	The effective tariff margin index of China at year *t* (+)
$FinDum_t$	The binary dummy variable of the Asian financial crisis appeared as one for years 1997 and 1998 (-)
$SubDum_t$	The binary dummy variable of the Subprime mortgage crisis appeared as one for year 2009 (-)
β_0	The constant term
$\varepsilon_{Thaij,t}$	The stochastic error term, representing the omitted variable influencing the trade flows

Source: Author's compilation from empirical models

Equations (5) are used to assess the impact of ETMI on Thailand's trade flows for both exports and imports in three types of products (total, manufacturing, and SITC7). Moreover, as for a sensitivity analysis, dummy variables of each FTA are used and replaced with an abbreviation of "Dum". Hence, the equations (5) change to (6) respectively, as follows:

$$\begin{aligned} F_{Thaij,t} &= \beta_0 + \beta_1 \ln(GDP_{j,t}) + \beta_2 \ln(GDP_{Thai,t}) + \beta_3 \ln(RER_{Thaij,t}) \\ &\quad + \beta_4 \ln(D_{Thaij}) + \beta_5 AusDum_t + \beta_6 NewDum_t \\ &\quad + \beta_7 IndDum_t + \beta_8 MalDum_t + \beta_9 PhiDum_t \\ &\quad + \beta_{10} SinDum_t + \beta_{11} VieDum_t + \beta_{12} JapDum_t \\ &\quad + \beta_{13} ChiDum_t + \beta_{14} FinDum_t + \beta_{15} SubDum_t + \varepsilon_{Thaij,t}. \end{aligned} \tag{6}$$

where the dummy variables are denoted with expected signs in brackets as in Table 3.

Table 3 Definition of the Additional Dummy Variables used in Gravity Equations

Variable	Definition
$AusDum_t$	To be one in case of TAFTA between 2005 and 2010 (+)
$NewDum_t$	To be one in case of TNZCEP between 2005 and 2010 (+)
$IndDum_t$	To be one in case of AFTA between 1994 and 2010 (+)
$MalDum_t$	To be one in case of AFTA between 1994 and 2010 (+)
$PhiDum_t$	To be one in case of AFTA between 1994 and 2010 (+)
$SinDum_t$	To be one in case of AFTA between 1994 and 2010 (+)
$VieDum_t$	To be one in case of AFTA between 1994 and 2010 (+)
$JapDum_t$	To be one in case of JTEPA between 2008 and 2010 (+)
$ChiDum_t$	To be one in case of ASEAN – China FTA between 2004 and 2010 (+)

Source: Author's compilation from empirical models

4.4 Variable Measurement and Data Sources

Data source used in this empirical studies, both exported and imported trade flows data used the annual import data from the 173 destination partners (see Appendix A) between 1991 and 2010 in millions of dollars which obtained from the United Nations Commodity Trade Statistics Database (UN COMTRADE database). GDP, GDP per capita, GDP deflator, and real exchange rate data are taken from World Development Indicators and Global Development Finance (World Bank). The distances between Thailand and partners used data from the CEPII database.

With respect to the component of ETMI variables, the data of MFN were received from the International Trade Statistics of International Trade Centre (UNCTAD/WTO), and the data of each FTA were found on the website of the Department of Trade Negotiations. However, data for AFTA exist only for the year 2001 onward, while date for other FTAs is complete.

In theory, the amount of incurred costs can vary according to products and firms so that the actual costs are generally unavailable. In this paper, cost estimates at the country level by Kohpaiboon (2010) are used (see Appendix B). In Kohpaiboon (2010), the cost estimates are based on the inter-product panel data estimation where the dependent variable, the ratio of preferential to actual trade, is a function of tariff margins and other controlling variables, such as initial trade before signing a FTA.

Note that there are four missing cost estimates for New Zealand, China Thailand and Japan. To overcome the missing estimates, we use the Australian estimate for New Zealand (2 percent), the Vietnamese estimate for China (4 percent) and Malaysian estimates for Thailand (4 percent). This is based on the rationale that countries sharing the same range of income would have more or less the same institutional quality, so that the cost of compiling with RoO would be the same. While Japan would use 0.5 percent since it has considerable FTA experience with many countries until the approval process was enhanced gradually, its costs might be less than Australia which has more limited FTA experience. All the unseen costs are shown in Table 4.

Table 4 Unseen Costs Used for Calculation of ETMIs

Country	Cost estimates (percent)
Japan	0.5
Australia and New Zealand	2
Malaysia and Thailand	4
Vietnam and China	4
Indonesia	10

Source: Kohpaiboon (2010)

5. Empirical Results

Tables 5 and 6 illustrate the NBPML estimation of total, manufacturing, and SITC7 on both export and import, respectively. The selection between the fixed effects model (FEM) and random effects model (REM) is used by the Hausman test and show only the best case between them. In addition, there are many occasions where NBPML cannot generate results due to a failure of statistical convergence such as the total export in the case of using dummy, so the another model would be used.

The standard controlling variables in the gravity equation, i.e. partners and reporter GDP, distance obtain the theoretical expected sign and are statistically different from zero. That is, there is a positive effect of GDP, but negative effect of distance on bilateral trade. The results are found from both export and import sides. The Asian crisis dummy was found statistically significant only on the export while the recent sub-prime crisis was found statistically significant both sides.

According to the relationship between the RER and trade flows, the coefficient associated to the RER variable is statistically significant relationship on both sides of manufacturing and SITC7 except total export and total import. On the export side, there is no statistically significant relationship between the RER and total export while there are found on both manufacturing and SITC7 export at 10 and 1 percent levels respectively. This suggests that only non – agricultural exports are sensitive to RER.

Interestingly, on the SITC7 import, the RER estimate turns out to be positive. Our explanation of the positive effect of RER on SITC7 import would be due to the fact that Thailand has long been engaged in the production network of multinational enterprises especially on SITC7 goods. In many cases, SITC7 exports are heavily reliant on imports of intermediate SITC7 goods. Hence, when RER depreciates, there are two effects running in the opposite direction. The RER depreciation discourages imports (known as the direct effect), so the overall effect is negative. On the other hand, it could have a positive effect on SITC7 exports creating demanding for imports of intermediate SITC7 goods as well as promoting overall economic growth (the indirect effect). In the case of SITC7 import, the estimation result here suggests the indirect effect is larger and a net positive effect is found.

As for the case of total import, there is no statistically significant relationship between the RER and total import. The explanation of this is an offsetting between the direct effect of manufacturing products except SITC7 and the indirect effect of oil & gas, and parts and components which have been the raw material or intermediate products depending on the exporting demand. Therefore, the sum of imported flows might not depend on the sensitivity of the bilateral RER.

When our main variable, effective tariff margin index (ETMI), is concerned our result suggests that a trade-enhancing effect from FTA is not always found to be statistically significant. On the export side, the FTA trade enhancing effects that are found in all product groups (total, manufacturing and SITC 7) are Australia and Vietnam, suggesting that exporters are positively responding to preferential tariffs. In other words, there is no discriminatory practice across products in applying FTAs for Australia and Vietnam. Interestingly, the FTA trade enhancing effect in the case of Indonesia is found only in manufacturing and machinery equipment (SITC 7). The statistical insignificance found in total exports suggests that there are some discriminatory practices toward Thai agricultural exports in applying FTA to the Indonesian market. To a certain extent, this is in line with findings in the previous study on presence of non-tariff barriers in agricultural import by Indonesia (Fane and Warr, 2008)[8]. Another statistical significant finding is the results in the case of Malaysia which are found only in manufacturing export at 5 percent level, and in the case of China which are found in total and manufacturing export at 10 percent level.

On the import side, the statistical significance coefficient is found in all product types of Indonesia and Philippines. This result supports Kohpaiboon (2010) that Thailand, Indonesia, and Philippines are within global automobile production networks which gained the positive effect from AFTA. In the case of Indonesia, CBU vehicle imports from Japanese car maker such as Toyota (Avanza and Innova) and Honda (Stream and Freed). On the other hand, the positive impact of the importing from Philippines is come from Ford (Laser and Escape) and Mazda (Protégé and Tribute). Furthermore, in the case of China, a statistically significant relationship of total and manufacturing imports is also found.

To examine the result sensitivity of FTA measures, ETMI is replaced by the zero-one dummy widely used in previous studies. In particular, the dummy is equal to 1 when a FTA is signed and zero otherwise. On the export side, the trade-enhancing effect of FTAs tends to be overestimated when using the dummy variable instead of ETMI. Almost all FTA dummies turn out to be statistically significant and positive (Table 5). This seems to be counter-intuitive as preferential tariffs under FTAs are still granted in many cases, e.g. New Zealand, Indonesia, Malaysia, China and the Philippines. On the import side, the overestimation of FTA trade enhancement is also found (Table 6). In particular, almost all FTAs except Australia, New Zealand, and Japan have a significant and positive effect on Thai imports when the dummy variable is employed. When ETMI is used, only coefficients associated with Indonesia, China and the Philippines are statistically significant. All in all, the FTA trade enhancing effect is sensitive to the way in which FTAs are measured. We argue that using a binary zero-one dummy variable in the year FTA is signed could mislead and overestimate the actual trade enhancing effect of a FTA.

[8] The same concern was raised in the local newspaper, Thairath 19 March 2012, http://www.thairath.co.th/content/eco/246420.

Table 5 Comparative between ETMI and Dummy Variables on the Export Side

Explanatory Variables	**Total export**		**Manufacturing export**		**SITC7 export**	
	ETMI (Z)	**Dummy (Z)**	**ETMI (Z)**	**Dummy (Z)**	**ETMI (Z)**	**Dummy (Z)**
$\log(GDP_{i,t})$	0.212***	0.187***	0.197***	0.196***	0.245***	0.244***
	-21.33	-18.87	-20.83	-20.49	-25.5	-25.2
$\log(GDP_{Thai,t})$	2.281***	2.370***	2.322***	2.355***	3.155***	3.187***
	-32.29	-33.3	-32.74	-33.32	-40.62	-41.29
$\log(RER_{iThai,t})$	0.007	0.018*	0.017*	0.021**	0.027***	0.033***
	-0.71	-1.81	-1.82	-2.21	-2.77	-3.37
$\log(D_{iThai,t})$	-0.687***	-0.628***	-0.588***	-0.551***	-0.647***	-0.626***
	(-14.27)	(-12.08)	(-12.51)	(-10.91)	(-14.53)	(-12.86)
$AusETMI_t$	1.743***	0.733***	1.615***	0.816***	1.476***	0.841***
	-3.27	-3.09	-3.6	-3.42	-3.36	-3.32
$NewETMI_t$	1.973	0.662**	1.663	0.758***	1.541	0.835***
	-1.12	-2.27	-1.03	-2.59	-1.2	-2.62
$IndETMI_t$	2.581	1.210***	2.982**	0.612**	3.300***	0.39
	-1.48	-4.08	-2.25	-2.03	-4.97	-1.24
$MalETMI_t$	0.721	0.994***	0.813**	1.249***	0.144	1.266***
	-1.45	-3.56	-2.03	-4.32	-0.35	-4.09
$PhiETMI_t$	1.181	1.243***	0.76	1.355***	0.496	1.283***
	-1.51	-4.19	-1.29	-4.47	-0.94	-4.03
$SinETMI_t$	N/A	-0.075	N/A	-0.21	N/A	-0.535*
		(-0.26)		(-0.72)		(-1.76)
$VieETMI_t$	2.047***	0.966***	1.543***	1.117***	0.983**	1.041***
	(4.95)	(3.79)	(3.94)	(4.11)	(2.46)	(3.48)
$JapETMI_t$	-0.719	-0.259	-1.029	-0.163	N/A	-0.308
	(-1.08)	(-1.01)	(-0.64)	(-0.63)		(-1.20)
$ChiETMI_t$	1.521*	0.801***	133.3*	1.066***	N/A	0.946***
	(1.70)	(4.43)	(1.93)	(5.78)		(4.85)
$FinDum_t$	-0.102**	-0.122**	-0.095*	-0.110**	-0.098*	-0.102*
	(-2.11)	(-2.57)	(-1.91)	(-2.28)	(-1.82)	(-1.94)
$SubDum_t$	0.069	0.060	0.016	0.015	0.005	0.002
	(1.48)	(1.35)	(0.32)	(0.32)	(0.10)	(0.04)
Constant	-57.55***	-59.76***	-59.21***	-60.38***	-81.60***	-82.59***
	(-32.65)	(-33.67)	(-32.87)	(-33.82)	(-41.33)	(-42.40)
χ^2	2,848***	2,793***	2,593***	2,676***	3,742***	3,887***
Hausman Test	70.40***	3,551***	84.35***	33.86***	3,582***	187.90***
Selected Model	FEM	FEM	FEM	FEM	FEM	FEM

Note: The number of asterisks indicates: *p<0.1, ** p<0.05, *** p<0.01.

Table 6 Comparative between ETMI and Dummy Variables on the Import Side

Explanatory Variables	Total import		Manufacturing import		SITC7 import	
	ETMI (Z)	Dummy (Z)	ETMI (Z)	Dummy (Z)	ETMI (Z)	Dummy (Z)
$\log(GDP_{i,t})$	0.415***	0.415***	0.492***	0.490***	0.510***	0.514***
	-40.97	-40.4	-45.44	-44.67	-41.68	-41.9
$\log(GDP_{Thai,t})$	1.120***	1.096***	1.155***	1.153***	1.307***	1.270***
	-16.23	-15.91	-15.85	-15.91	-15.06	-14.97
$\log(RER_{iThai,t})$	-0.004	-0.004	-0.028***	-0.026***	0.017*	0.022***
	(-0.52)	(-0.38)	(-3.28)	(-3.07)	-1.94	-2.6
$\log(D_{iThai,t})$	-0.532***	-0.500***	-0.401***	-0.361***	-0.439***	-0.389***
	(-13.02)	(-11.71)	(-10.28)	(-8.84)	(-11.67)	(-9.94)
$AusETMI_t$	N/A	0.686***	0.353	0.263	-0.366	-0.005
		-3.2	-0.09	-1.08	(-0.28)	(-0.02)
$NewETMI_t$	0.822	0.472	0.595	0.397	0.857	0.790**
	-1.53	-1.52	-1.15	-1.18	-1.59	-2.1
$IndETMI_t$	1.352***	0.738***	1.556***	0.849***	1.975***	0.948***
	-2.87	-2.77	-4.36	-3.06	-4.93	-3.06
$MalETMI_t$	0.813	1.104***	1.162	1.663***	1.517	2.334***
	-0.53	-4.05	-0.96	-5.55	-0.79	-7.27
$PhiETMI_t$	1.182***	1.719***	1.190***	2.006***	1.132**	2.570***
	-3.01	-6	-2.75	-6.62	-2.25	-7.87
$SinETMI_t$	-1.624	0.520*	1.272	1.352***	N/A	1.297***
	(-0.44)	-1.86	-0.24	-4.46		-4.07
$VieETMI_t$	0.201	0.697***	0.433	0.904***	0.838	1.878***
	-0.3	-2.65	-0.7	-3.13	-0.96	-5.64
$JapETMI_t$	N/A	0.1	N/A	0.198	N/A	0.049
		-0.55		-1.15		-0.2
$ChiETMI_t$	482.3**	0.921***	68.20**	1.015***	N/A	1.069***
	-2.25	-6.32	-2.54	-6.61		-5.42
$FinDum_t$	-0.056	-0.085*	-0.074	-0.102**	-0.031	-0.06
	(-1.16)	(-1.80)	(-1.44)	(-2.07)	(-0.49)	(-1.02)
$SubDum_t$	-0.099*	-0.101*	-0.084	-0.093*	0.049	0.018
	(-1.76)	(-1.90)	(-1.43)	(-1.70)	-0.73	-0.29
Constant	-34.31***	-33.98***	-38.51***	-38.80***	-43.26***	-42.86***
	(-19.53)	(-19.34)	(-20.94)	(-21.16)	(-19.60)	(-19.83)
χ^2	2,653***	2,920***	2,927***	3,207***	2602***	3,098***
Hausman Test	6.78	Failure on FEM	16.03	Failure on FEM	40.13***	Failure on FEM
Selected Model	REM	REM	REM	REM	FEM	REM

Note: The number of asterisks indicates: *p<0.1, ** p<0.05, *** p<0.01.

6. Conclusions and Implications

6.1 Summary

Motivated by the fact that most countries around the globe are switching their mode of trade liberalization towards preferential trade agreements, and free trade agreements (FTAs) in particular, this paper examines the trade enhancing effects arising from the adoption of FTAs, using Thailand as a case study. A gravity equation model, the popular trade model workhorse, is applied during the period between 1991 and 2010 with allowances for exports and imports performing differently within preferential trade schemes. Five major FTA partnerships composing nine countries are examined as follows: ASEAN under AFTA (Philippines, Indonesia, Malaysia, Singapore, and Vietnam), Australia under TAFTA, New Zealand under TNZCEP, Japan under JTEPA, and China under ASEAN-China FTA.

This paper is different from existing empirical studies in this area in three respects. Firstly, instead of using a zero-one dummy variable, actual tariff margin, the gap between MFN and preferential-FTA rates, is calculated to measure the effects from FTAs. In addition, an estimate of the costs of complying to rules of origin is included in the calculation. Hence, it not only considers the tariff gap, but also tariff reduction schedule that might be included in the FTA. This is especially true for a FTA that involves developing countries. Secondly, the nature of products is taken into consideration as this might affect the ability to use preferential trade. An analysis of total goods (primary and manufacturing goods), manufacturing goods (SITC 5-8 but 68) and machinery and transport equipments (SITC 7) is undertaken and compared. The possible difference between total and manufacturing goods reveals the suitability of primary products to the preferential trade schemes. The analysis of machinery and transport equipment is to examine whether products governed by the global production network respond better to the schemes as opposed to other manufacturing products. Third, due to the nature of bilateral trade data, which often contain either negligible trade records or discontinuity, the whole group of countries are covered regardless of their trade value and the negative binomial pseudo maximum likelihood (NBPML) method is used to overcome possible bias and inconsistent estimators resulting from discontinuous or incomplete trade records (fat-tail problems).

Our key finding is the method used to measure FTA effects matters to the outcome. When a zero-one dummy variable is used, it is more likely that a positive and statistically significant relationship between FTAs and trade is found. Secondly, a trade enhancing effect from FTAs is found only in FTAs trading intensively in motor vehicles (Australia on the export side, Philippines on the import side, and Indonesia on both export and import sides). Motor vehicles are always an exception in tariff structures where their tariff rate is generally higher than the average and the production and trade network is entirely governed by a handful number of multinational enterprises (MNEs). The second finding is that products under production networks dominated by parts and components are less likely to utilize preferential trade schemes. They usually are exempt from import duty, so there is no incentive to use preferential tariff rates. Thirdly, in the case of Indonesia, the empirical results support the former studies that FTAs could create the non-tariff trade barriers which appeared in agricultural products.

6.2 Policy Implications

Two policy inferences can be drawn from the paper. Firstly, signing a FTA cannot guarantee the further opening up of a market. Rather, its trade enhancing effect depends on FTA partners and the nature of bilateral trade between them. While there is uncertainty concerning the trade enhancing effect, signing a FTA incurs costs directly and indirectly. The former refers to costs from administrative procedures, including negotiating FTA party's agreements and other related administrative activities. All in all, in addition to the ambiguity of economic welfare grounds (i.e. trade diversion vs. trade creation), policymakers must be cautious of entering into a race to maximize FTAs. Policy focus should be on how to harness the benefit from FTAs already signed.

Lastly, to harness the benefits of signed FTAs, policy attention should be paid to the nature of rules of origin. The statistical significance of the tariff gap between MFN and preferential-FTA tariffs adjusted by the ROO compiling costs suggests that the simpler the rules of origin, the greater the trade enhancing effect to be expected. Whether the ROO are restrictive depends on how they are written and how they are implemented. While providing detailed recommendations on the appropriate ROO is far beyond the scope of the current paper, our brief response to the former would be to keep them as simple as possible and introduce some ROO-free items for products whose tariff rates are already low. When implementation is concerned, policymakers must work closely with firms who actually encounter problems. Such a policy recipe could be extended to about-to-be signed FTAs as well.

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Appendix A

List of Selected Countries

1	*Albania*	32	*Chile*
2	*Algeria*	33	*China*
3	*Angola*	34	*Colombia*
4	*Antigua and Barbuda*	35	*Comoros*
5	*Azerbaijan*	36	*Congo, Rep.*
6	*Argentina*	37	*Congo, Dem. Rep.*
7	*Australia*	38	*Costa Rica*
8	*Austria*	39	*Croatia*
9	*Bahamas, The*	40	*Cuba*
10	*Bahrain*	41	*Cyprus*
11	*Bangladesh*	42	*Czech Republic*
12	*Armenia*	43	*Benin*
13	*Barbados*	44	*Denmark*
14	*Belgium*	45	*Dominica*
15	*Bermuda*	46	*Dominican Republic*
16	*Bhutan*	47	*Ecuador*
17	*Bolivia*	48	*El Salvador*
18	*Botswana*	49	*Equatorial Guinea*
19	*Brazil*	50	*Ethiopia*
20	*Belize*	51	*Eritrea*
21	*Solomon Islands*	52	*Fiji*
22	*Brunei Darussalam*	53	*Finland*
23	*Bulgaria*	54	*France*
24	*Burundi*	55	*Djibouti*
25	*Cambodia*	56	*Gabon*
26	*Cameroon*	57	*Gambia, The*
27	*Canada*	58	*Germany*
28	*Cape Verde*	59	*Ghana*
29	*Central African Republic*	60	*Kiribati*
30	*Sri Lanka*	61	*Greece*
31	*Chad*	62	*Greenland*

63	*Grenada*	*97*	*Mali*
64	*Guatemala*	*98*	*Malta*
65	*Guinea*	*99*	*Mauritania*
66	*Guyana*	*100*	*Mauritius*
67	*Haiti*	*101*	*Mexico*
68	*Honduras*	*102*	*Mongolia*
69	*Hong Kong SAR, China*	*103*	*Morocco*
70	*Hungary*	*104*	*Mozambique*
71	*Iceland*	*105*	*Oman*
72	*Indonesia*	*106*	*Namibia*
73	*Iran, Islamic Rep.*	*107*	*Nepal*
74	*Ireland*	*108*	*Netherlands*
75	*Israel*	*109*	*Vanuatu*
76	*Italy*	*110*	*New Zealand*
77	*Cote d'Ivoire*	*111*	*Nicaragua*
78	*Jamaica*	*112*	*Niger*
79	*Japan*	*113*	*Nigeria*
80	*Kazakhstan*	*114*	*Norway*
81	*Jordan*	*115*	*Micronesia, Fed. Sts.*
82	*Kenya*	*116*	*Marshall Islands*
83	*Korea, Rep.*	*117*	*Palau*
84	*Kuwait*	*118*	*Pakistan*
85	*Kyrgyz Republic*	*119*	*Panama*
86	*Lao PDR*	*120*	*Papua New Guinea*
87	*Lebanon*	*121*	*Paraguay*
88	*Lesotho*	*122*	*Peru*
89	*Latvia*	*123*	*Philippines*
90	*Liberia*	*124*	*Poland*
91	*Lithuania*	*125*	*Portugal*
92	*Luxembourg*	*126*	*Guinea-Bissau*
93	*Macao SAR, China*	*127*	*Romania*
94	*Madagascar*	*128*	*Russian Federation*
95	*Malawi*	*129*	*Rwanda*
96	*Malaysia*	*130*	*St. Kitts and Nevis*

131	***St. Lucia***	***153***	***Togo***
132	***St. Vincent and the Grenadines***	***154***	***Tonga***
133	***San Marino***	***155***	***Trinidad and Tobago***
134	***Saudi Arabia***	***156***	***United Arab Emirates***
135	***Senegal***	***157***	***Tunisia***
136	***Seychelles***	***158***	***Turkey***
137	***Sierra Leone***	***159***	***Turkmenistan***
138	***India***	***160***	***Tuvalu***
139	***Singapore***	***161***	***Uganda***
140	***Slovak Republic***	***162***	***Ukraine***
141	***Vietnam***	***163***	***Macedonia, FYR***
142	***Slovenia***	***164***	***Egypt, Arab Rep.***
143	***South Africa***	***165***	***United Kingdom***
144	***Zimbabwe***	***166***	***Tanzania***
145	***Spain***	***167***	***United States***
146	***Sudan***	***168***	***Burkina Faso***
147	***Suriname***	***169***	***Uruguay***
148	***Swaziland***	***170***	***Venezuela, RB***
149	***Sweden***	***171***	***Samoa***
150	***Switzerland***	***172***	***Yemen, Rep.***
151	***Syrian Arab Republic***	***173***	***Zambia***
152	***Tajikistan***		

Appendix B

How to Calculate the Unseen Costs

According to Kohpaiboon (2010), the empirical model used to estimate the unseen costs is as follows:

$$FTAU_{i,t} = f(t_i - t_i^{FTA}, Z) \tag{B.1}$$

Where $FTAU_{i,t}$ indicates FTA utilization (the ratio between the official record of FTA implementation and actual exports) in industry i^{th} at time t. $t_i - t_i^{FTA}$ = the margin between general and preferential tariff rates in industry i^{th}. Z = Other explanatory variables which are not related to calculating the costs, such as the degree of backward linkage index, the degree of foreign presence, the degree of conglomeration, the export value averaged over the past three years, and the ratio of parts and components in total trade.

A significant degree of coefficient which comes from the empirical results between the regress and ($FTAU_{i,t}$) and the main regressor ($t_i - t_i^{FTA}$) plays an important role in capturing the unseen costs. The author hypothesized that since the tariff margin is one of the important factors in determining the utilization rate of a FTA, there might be a certain range of unseen costs which encouraged a firms' decision to use a tariff preference. In other words, the determination to use a FTA depends is the result of a deliberation between the benefit of the tariff margin and the waste of the unseen costs. Therefore, we used this property to illustrate the tariff rate covering the expense of costs, and implied that this cutting point would seemingly be the proxy of the unseen costs.

To estimate the unseen costs, the author noticed that the firms' decision to use a FTA tariff is certainly at the upper level of unseen costs because the return could mostly cover the unseen costs, but at the lower end of such a level firms might or might not use a preferential tariff since the returns might only cover part, or none at all, of the unseen costs. Hence, the author used a sample whose tariff margin is greater than X per cent, where X is a positive integer. If the coefficient still had a statistical significant result higher than the 10 per cent level, the tariff margin at X per cent will be changed to X plus one per cent and be estimated again and again until showing an insignificant relationship on the coefficient. The last X which had a statistical significance would be the unseen cost of that country.

Figure B1illustrates the empirical results when X are 9, 10, and 11 per cent, respectively. The Xs which are greater than 9 and 10 per cent demonstrated statistically significant coefficients at the 10 per cent level (one asterisk), while the latter showed insignificant coefficients. Therefore, under the assumption that the unseen costs tend to be fixed, this suggests the unseen cost of Indonesia should be 10 per cent.

Figure B.1 Example of the Unseen Cost Estimation

Indonesia	Greater than 9%		Greater than 10%		Greater than 11%	
	Coefficient	*Z*-stat	Coefficient	*Z*-stat	Coefficient	*Z*-stat
Intercept	0.08*	1.62	0.08*	1.39	0.06	0.52
$t_i - t_i^{FTA}$	**0.28***	**1.76**	**0.31***	**1.80**	**0.25**	**1.15**
$BL_{i,t}$	-0.29***	-2.98	-0.22**	-2.10	-0.25	-1.06
$BL^2_{i,t}$	0.22***	3.85	0.17***	2.82	0.20	1.42
$CON_{i,t}$	-0.06*	-1.35	-0.01	-0.31	-0.20***	-2.92
$FOR_{i,t}$	0.01	0.34	-0.04	-0.91	0.03	0.37
$INT_{i,t}$	0.01***	13.99	0.01***	12.62	0.01***	8.51
$PC_{i,t}$	0.12***	3.06	0.11**	2.58	0.17**	2.47
Log-likelihood	164.16		128.06		49.89	
Wald - χ^2	399.77		263.95		133.18	
#obs	1156		974		526	

Source: Kohpaiboon (2010)

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