# Trade Creation and Trade Diversion of ASEAN's Preferential Trade Agreements

Wanasin Sattayanuwat
Srinakharinwirot University, Thailand

Nantarat Tangvitoontham
Srinakharinwirot University, Thailand

## Abstract

This paper analyzes the effects of ASEAN Preferential Trade Agreements (PTAs) and employs the gravity model over 2007-2011. The regressions include all 6 ASEAN PTAs in a single regression which is run separately. Our pool regression results show that ASEAN members trade with each other at a level higher than without preferential trade agreements. RCEP displays intra-bloc trade creation so as to ACFTA, AJCEP, and AIFTA. There have been stumbling-blocs in AANZFTA. Our results show that export trade diversion in AKFTA and most of the import extra-bloc trade dummies are not statistically significant. PTAs with higher external tariffs is likely to be associated with trade diversion. Also, the finding confirms that the results for the pooled regression and the results for individual regressions are different. Simultaneous estimation for all PTAs in a single regression enables us to avoid bias in the results by accounting for interactions among PTAs.

**Keywords:** preferential trade agreements, gravity model, ASEAN, Poisson pseudo-maximum-likelihood (PPML) estimation

## Introduction

The Association of Southeast Asian Nations (ASEAN)[1] has signed six preferential trade agreements (PTAs[2]) with her trading partners since 1992. The ASEAN Free Trade Area (AFTA) is considered a "deep" FTA relative to others among developing countries because of its comprehensive coverage, ambitious liberalization to zero or near-zero rates, and timely implementation (Calvo-Pardo, Freund, & Ornelas, 2011). The Common Effective Preferential Tariff (CEPT) entered into force in 1993, developed to be the ASEAN Trade in Goods Agreement (ATIGA) in 2010 and intends to complete the ASEAN Economic Community[3] (AEC) in December 2015.

ASEAN has emerged as the integration hub for PTA activity in East Asia. Since 2007 five ASEAN+1 FTAs[4] have come into force, namely the ASEAN-Australia-New Zealand FTA (AANZFTA), the ASEAN-China FTA (ACFTA), the ASEAN-India FTA (AIFTA), the ASEAN-Japan Comprehensive Economic Partnership (AJCEP) and the ASEAN-Republic of Korea FTA (AKFTA). The start of the Regional Comprehensive Economic Partnership (RCEP) negotiations was announced officially in November 2012. ASEAN is taking further steps to establish the RCEP which will bring large advantages for ASEAN members and partners. There are four main areas of improvements that RCEP can bring about. First, the current ASEAN+1 FTAs have not yet achieved a fully liberalized region. The level of tariff liberalization is not sufficiently high and rules of origin (ROOs) are not liberal enough in some ASEAN+1 FTAs. Secondly, RCEP, being a common free trade framework across the East Asia region, will have more convergent rules which will reduce the "noodle-bowl" effects[5]. Third, The RCEP will help the region to achieve the Asia production network. Fourth, the RCEP will help strengthen the ASEAN Centrality being posed challenges by the "China-Japan-Korea FTA" and the Trans-Pacific Partnership[6] (TPP) (Fukunaga & Isono, 2013).

More interestingly, seven of sixteen countries in RCEP namely; China, Indonesia, Japan, the Republic of Korea, Malaysia, Singapore, Thailand; are the so-called "growth miracles," having achieved fast and high sustained growth in the postwar period (Word Bank, 2008). RCEP member countries' share of the world economy increased from 23.7 percent in 1992 to 26.8 percent in 2011. During the same period, their share in the total world exports and in the world imported increased from 18.8 percent to 26.8 percent and 17.6 percent to 26.7 percent respectively. In addition, compared to the rest of the world, trade in parts and components in RCEP member countries has grown faster than total world trade in manufacturing and has

[1]ASEAN is one of the world's most successful regional organizations. In 2012, ASEAN member nations had a combined population of 616.6 million at 8.6% of the total world population (NAFTA and the EU-28 had a combined population of 466 million and 507 million, respectively). ASEAN's combined GDP stands at US$ 2,311 billion (during the 2009-2012, ASEAN's GDP has grown at an average rate of 17 %). Total trade of around US$ 2,476 billion (during the 2009-2012, ASEAN's total trade has grown at an average 20.4%). The average tariff rate on intra-ASEAN6 imports has been reduced to just 0.04% (AFTA stated at more than 12%) while of CLMV was at 1.37%. ASEAN's FDI inflow was US$110 billion (ASEAN, 2013). ASEAN was established in 1967 by Indonesia, Malaysia, the Philippines, Singapore, and Thailand.

2 In this study, we use the generic term PTA to denote all forms of reciprocal preferential trade agreements, including bilateral and plurilateral agreements. Note that the World Trade Organization employs the term PTA for all both all reciprocal agreements and for nonreciprocal preferential agreements such as the Generalized System of Preferences (GSP).

[3] AEC envisage four parts; a single market and production base, a competitive economic region, equitable economic development, and integration into the global economy.

[4] Date of Entry into Force: AANZFTA (2010), ACFTA (2010), AIFTA (2009), AJCEP (2008), AKFTA (2006). ASEAN-USA and ASEAN-European Union are under negotiation.

[5]As of December 2014, the number of concluded PTAs includes Brunei (8), Cambodia (6), Indonesia (7), Laos (9), Malaysia (13), Myanmar (6), Philippines (7), Singapore (43), Thailand (10), Vietnam (8), China (18), Japan (14), Korea (12), Australia (10), New Zealand (9), and India (11) (www.aric.adb.org downloaded December 2014).

[6] As of December 2014, there are 4 ASEAN countries participate TPP, Brunei, Malaysia, Singapore, and Vietnam (http://tppinfo.org/).

grown faster than anywhere else in the world (Athukorala, 2011). Accordingly, RCEP economic status has become significant in the world.

The intra-ASEAN trade by means of the intraregional trade intensity index,[7] ranging between 3.59 percent and 4.35 percent during 2007–2012, indicates that in ASEAN trade there is a regional bias. In other words, ASEAN trade among member countries is greater than would be expected given ASEAN's importance in world trade. The ASEAN score on this index is also significantly higher than for other region, including the European Union, North American, Africa, Latin America, and Middle East, except the Central and West Asia. However, the slight decline in ASEAN's intraregional trade intensity over the past five years shows that intra-ASEAN trade is decreasing relative to the world's share of trade with ASEAN.

Table 1: The intraregional trade intensity index 2007–2012 (percent)

| Region | 2007 | 2008 | 2010 | 2012 | 2015 |
|---|---|---|---|---|---|
| European Union | 1.74 | 1.76 | 1.88 | 1.95 | 1.99 |
| North America | 2.06 | 2.12 | 2.03 | 2.03 | 1.85 |
| Africa | 3.83 | 3.58 | 4.44 | 4.30 | 5.64 |
| Latin America | 3.66 | 3.65 | 3.26 | 2.99 | 2.76 |
| Middle East | 2.88 | 2.39 | 2.99 | 2.39 | 3.88 |
| Central and West Asia | 10.60 | 6.73 | 9.08 | 7.46 | na |
| South Asia | 2.96 | 2.51 | 1.95 | 1.70 | 2.18 |
| ASEAN | 4.32 | 4.27 | 3.77 | 3.57 | 3.25 |
| ASEAN+3 | 2.00 | 1.97 | 1.79 | 1.74 | 1.69 |
| ASEAN+6 | n.a. | | | | |

Source: ASIA Regional Integration Center (Accessed November 10, 2017)

This paper aims at investigating the performance of the PTAs in ASEAN, using PPML with a current dataset, from 2007–2011. We estimate the trade effects from RCEP and the other 6 ASEAN RTAs simultaneously using internal-external trade-creation-diversion models.

## Theoretical Framework for Economic Analysis of PTAs

Since Viner (1950), we know that the formation of a PTA can bring to trade creation and/or trade diversion. There is a sizable literature that contributes to the theory of PTAs since Viner's pioneering work. Plummer, Cheong, and Hamanaka (2010) conducted a review of the theoretical framework for economic analysis of PTAs.

Before Viner's model, the conventional wisdom was that PTAs would tend to improve welfare. Viner's single partial equilibrium model shows that PTAs allows some domestic production to be replaced by imports from more efficient firms located in preference-receiving countries, leading to welfare gains (trade creation). At the same time, PTAs may reduce imports from more efficient non-member countries, implying a welfare loss (trade diversion). The net

[7] Intra-regional trade intensity index is the ratio of intra-regional trade share to the share of world trade with the regional. It is computed as: $(T_{ii}/T_i)/(T_i/T_w)$ where $T_{ii}$ is exports of region i to region i plus imports of region i from region i; $T_i$ is total exports of region i to the world plus total imports of region i from the world; and the $T_w$ is total world exports plus imports. This index determines if trade within the region is greater or smaller than should be expected on the basis of region's importance in world trade. An index of more than one indicates that trade flow within the region is larger than expected given the importance of the region in world trade (ARIC, 2013). The intraregional trade intensity index is the better measure than the intraregional trade shares (Frankel, 1996).

welfare effect of PTAs depends on the relative magnitude of these opposing effects. Meade (1955), Lipsey (1970), and Wonnacott and Wonnacott (1982) formulated a general framework based on general equilibrium models. Meade-Lipsey and Wonnacotta-Wonnacott models conclude that a group of small countries may gain from a PTA rather than unilateral liberalization if outsiders have high trade barriers against them or the group faces high transport costs in exporting to outsiders. The model also points out that countries do not engage in PTAs simply to reduce their own tariffs, countries do it in order to open up access to their PTA partner's markets, then a PTA produces gains for its members. Lloyd and Maclaren (2004) present higher dimensions in terms of commodities and trading partners to evaluate the welfare impact of a PTA. This model also estimates the magnitude of changes in a country's welfare and does assume away noncompetitive behavior and economies of scales. Panagariya and Krishna (2002) extended Kemp-Wan Theorem (1976) to consider whether PTA can always be efficient if constructed correctly. The model required three elements. First, if there is potential trade diversion from one outsider market, then external tariffs would have to be lowered to insure that the discrimination inherent in the PTA does not change trade with that market. Second, the PTA would have to embrace total internal free trade, thereby leading to greater efficiency through trade creation. Third, in the case of countries being worse off with an agreement, there would have to be a compensation mechanism. However, there are at least two problems with this type of open regionalism in the real world. First from a political perspective, it is somewhat ingenuous to expect that PTA members would extend liberalization efforts to outsiders without any reciprocity. Second, it is difficult to implement a compensation mechanism (Plummer, Cheong, & Hamanaka, 2010).

In addition, there are dynamic implications of PTAs. The dynamic effects in the context of PTAs are: economies of scale and variety of goods, technology transfer and foreign direct investment (FDI), structural policy changes and reform, and competitiveness and long-run growth effects (Plummer, Cheong, & Hamanaka, 2010).

Empirical analysis of PTAs falls into two categories ex-ante which is to anticipate the possible economic consequences of any given PTA and ex-post which is to analysis the effects of a PTA once it is already in place. Ex-ante assessments are usually based on computable general equilibrium model (CGE). Ex-post assessment employs data available and focuses on the effect of PTAs on the trade shares of members and nonmembers and the gravity model is the key ex-post technique (Rivera-Batiz & Oliva, 2004) (Plummer, Cheong, & Hamanaka, 2010).

In our study, we utilize the gravity model. The definitions of the terms trade creation and trade diversion differ from the welfare-effect definitions given by Viner (1950). We follow the definitions in Johnson (1962) and Endoh (1999).

## Gravity Model[8] and Data

The first extended use of three dummy variables[9] in order to offer a simple and clear distinction between trade creation and trade diversion was done by Soloaga and Winters (2001).This paper is an influential study on the gravity model to test the PTA effect. They indicated that both are

[8] The first introduced the gravity model in the international trade by Nobel laureate Timbergen (1962) and Linnemann (1966) made the first attempt to provide theoretical support for the model.

[9]Aitken (1973) was the first applied gravity model to RTAs by using regional dummy variable. Bayoumi & Eichengreen (1995) added a second dummy to capture the effects of extra-bloc trade. Later, Soloaga and Winter (2001) added three dummies.

needed because bloc member's imports and exports could follow different patterns after the formation of a PTA.

Here we follow MacPhee and Sattayanuwat (2014). They employed three dummies following Soloaga and Winters (2001) and expressed a typology of trade creation and diversion drawn up by Trotignon (2010).

The first dummy captures trade creation and the second and the third dummy variables capture import trade diversion and the export trade diversion, respectively.

Equation (1) is a gravity model explaining bilateral trade flows with GDP, population, language, distance, adjacency, real exchange rate, and trade policy variables.

$X_{ijt}$ = f ($Y_{it}, Y_{jt}, N_{it}, N_{jt}, LANG_{ij}, ADJ_{ij}, DIS_{ij}, RER_{ijt}, TAF_{ijt}, PTA2_{kijt}, PTAimp_{kijt}, PTAexp_{kijt}$, ) (1)

where

$X_{ijt}$ = the value of exports from exporter country i to importer country j in year t,

$Y_{it}$ = the gross domestic product of exporter country i in year t,

$Y_{jt}$ = the gross domestic product of importer country j in year t,

$N_{it}$ = the population size of exporter country i in year t,

$N_{jt}$ = the population size of importer country j in year t,

$LANG_{ij}$ = a dummy variable indicating that country i and country j have a commonlanguage,

$ADJ_{ij}$ = a dummy variable indicating that country i and country j have a commonborder,

$DIS_{ij}$ = the distance between country i and country j,

$RER_{ijt}$ = the real exchange rate between country i and country j in year t,

$TAF_{ijt}$ = the average tariff rate between country i and country j in year t,

$PTA2_{kijt}$ = a dummy variable indicating that country i and j are members of the same

RTA k in year t. A positive coefficient indicates that the intra-bloc trade would be greater. This effect refers to as "Intra-bloc Trade Creation (ITC)."

$PTAimp_{kijt}$ = a dummy variable for country i that is not member of the group k of which country j is a member in year t. A positive coefficient for this variable indicates that number countries are importing more from non-member. This refers to as "Import Trade Creation (MTC)."

$PTAexp_{kijt}$ = a dummy variable indicating that country i is a member of the group k of which country j is not a member in year t. A positive coefficient for this variable indicates that number countries are exporting more to non-members. This effect refers to as "Export Trade Creation (XTC)."

The model includes the import-country-fixed effect, the export-country-fixed effect, and the year-fixed effect to overcome the problem of heterogeneity which is omitted from the rest of

model specification, such as preferences, institutional difference and so on. Note that several studies suggested a fixed-effects specification[10] to deal with the problem.

In summary, we interpret the respective signs and relative values of the intra-bloc (RTA2) and extra-bloc (RTAexp and RTAimp) coefficients in Table 2.

Our empirical study consists of a panel of 153 countries for the period from 2007 to 2011. The main purpose of this study is to test the impact of the PTAs among ASEAN using the gravity model. We use unbalanced panel data of export taken from the PC-TAS-HS Revision 2 2007–2011, International Trade Centre; covering 156 countries covering a 5-year period from 2007–2011 with 49,708 observations. GDP and population are from the World Economic Outlook Database, IMF. The data on tariffs is from the United Nations TRANS, World Integrated Trade Solution (WITS). The data on geographical and cultural proximity, such as distance, adjacency and common language, come from the CEPII database.

We estimate two types of specifications of equation (1). The first includes 7 ASEAN PTAs in a single regression in order to examine the overall effects of trade. The second estimation estimates each ASEAN PTA alone in 7 separate regressions.

Table 2: Trade Creation, Trade Diversion, and Typology of Blocs

| Expected Sign | | | Differences in Absolute Size | Building Bloc vs. Stumbling Blocs[11] |
|---|---|---|---|---|
| PTA2 | PTAexp | PTAimp | | |
| + ITC | + XTC | + MTC | | Building Blocs |
| + ITC | + XTC | - MTD | PTA2 > \|PTAimp\| | Building Blocs |
| | | | PTA2 < \|PTAimp\| | Stumbling Blocs |
| + ITC | - XTD | + MTC | PTA2 > \|PTAexp\| | Building Blocs |
| | | | PTA2 < \|PTAexp\| | Stumbling Blocs |
| + ITC | - XTD | - MTD | PTA2 > \|PTAexp + PTAimp\| | Building Blocs |
| | | | PTA2 < \|PTAexp + PTAimp\| | Stumbling Blocs |

Source: Adapt from (Trotignon, 2010), Table 4, p.242
Note: ITC = Intra-bloc Trade Creation, XTC (D) = Export Trade Creation (Diversion), and MTC = Import Trade Creation (Diversion)

We review and update the recent empirical literature published during 2000–2014; focusing on ASEAN. We focus only on the study that utilizes an extension of three dummy variables

[10] Mátyás (1997) made the first propose of a triple-index model. Anderson and van Wincoop (2003) showed theoretically that the traditional specification of the gravity model suffers from omitted variables bias and proposed a country-specific fixed-effects specification. Kepaptsoglou et al. (2010) summarized the related empirical studies published over 1999–2009 and concluded that the fixed-effects model tends to provide better results.

[11] A building block is to PTA assist to the multilateral trading system or at least do not hinder multilateralism. A stumbling block is to PTA damage to the multilateral trading system or slow multilateral tariff cutting. There are differences in opinion regarding international trade integration arrangements. For the debate on whether regional arrangements are building or stumbling blocks, the literature has not reached any consensus. See (Baldwin & Seghezza, 2010) (Bagwell & Staiger, 1998) (Bhagwati, 1995, 2008) (Bhagwati, Greenaway, & Panagariya, 1998) (Baldwin, Cohen, Sapir, & Venables, 1999) (Ethier, 1998) (Estevadeordal, Freund, & Ornelas, 2008) (Frenkel, 1997) (Krugman, 1991, 1995) (Krueger, 1999) (Laird, 1999) (Limão,2007) (Lipsey & Smith,1989, 2011) (McLaren, 2002) (Panagariya, 1999, 2000) (Snape, 1996) (Schiff & Winters, 2003).

capturing trade creation, export trade creation, and import trade creation in the gravity model. Most of the literatures conclude that ASEAN trade bloc has been found to generate intra-trade creation namely Endoh (2000), Carrere (2004, 2006), Elliott &Ikemoto (2004), Kien & Hashimoto (2005), Kien (2009), Acharya et al. (2011), Cissokhoet al. (2013), and MacPhee & Sattayanuwat (2014). A few studies show that ASEAN have intra-trade diversion namely Soloaga & Winters (2001) and Tumbarello (2007). In addition, MacPhee & Sattayanuwat (2014) found that the results for the pooled regression and the results for individual regression are different and they conclude that simultaneous estimation for all 12 RTAs in a single regression enables us to avoid bias the results by accounting for interactions among RTAs.

Table 3: Recent Literature using three Regional Dummy Variables Studying ASEAN's PTA

| Study | Empirical Approach | Period & # of countries | Results |
|---|---|---|---|
| (Endoh, 2000)* | OLS | 1995 | ASEAN: RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>EAEC: RTA2 = (+), RTAexp = (+), RTAimp = (+) |
| (Soloaga & Winters, 2001)* | Tobit | 1980-1996<br>58 Countries | ANDEAN: RTA2 = (+), RTAexp = (-), RTAimp = (-)<br>ASEAN: RTA2 = (-), RTAexp = (+), RTAimp = (+)<br>CACM: RTA2 = (+), RTAexp = (-), RTAimp = (-)<br>EU: RTA2 = (-), RTAexp = (+), RTAimp = (+)<br>EFTA: RTA2 = (n), RTAexp = (+), RTAimp = (+)<br>GULFCOOP:RTA2 = (+), RTAexp = (-),RTAimp = (n)<br>LAIA: RTA2 = (+), RTAexp = (-), RTAimp = (-)<br>MERCOSUR:RTA2 = (+), RTAexp = (n),RTAimp = (-)<br>NAFTA: RTA2 = (n), RTAexp = (n), RTAimp = (+) |
| (Carrere C. , 2004)* | Hausman-Taylor | 1962-1996 | ANDEAN: RTA2 = (+), RTAexp = (-), RTAimp = (-)<br>ASEAN: RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>CEMAC: RTA2 = (+), RTAexp = (-), RTAimp = (-)<br>COMESA: RTA2 = (n), RTAexp = (-), RTAimp = (n)<br>ECOWAS: RTA2 = (+), RTAexp = (-), RTAimp = (+)<br>MERCOSUR: RTA2 = (+), RTAexp = (+), RTAimp = (-)<br>SADC: RTA2 = (+), RTAexp = (+), RTAimp = (-)<br>UEMOA: RTA2 = (+), RTAexp = (-), RTAimp = (-) |
| (Elliott & Ikemoto, 2004)* | | 1982-1999 | ASEAN: RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>EU: RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>NEFTA: RTA2 = (+), RTAexp = (-), RTAimp = (-) |
| (Kien & Hashimoto , 2005)* | Hausman-Taylor | 1988-2002<br>39 countries | ASEAN: RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>EU: RTA2 = (-), RTAexp = (n), RTAimp = (-)<br>MERCOSUR:RTA2 = (+), RTAexp = (-),RTAimp = (+)<br>NAFTA: RTA2 = (+), RTAexp = (-), RTAimp = (+) |
| (Carrere C. , 2006) | | 1962-1996<br>130 countries | ANDEAN: RTA2 = (+), RTAexp = (-), RTAimp = (-)<br>ASEAN: RTA2 = (+), RTAexp = (+), RTAimp = (-)<br>CACM: RTA2 = (+), RTAexp = (n), RTAimp = (-)<br>EU: RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>EFTA: RTA2 = (n), RTAexp = (-), RTAimp = (n)<br>LAIA: RTA2 = (+), RTAexp = (n), RTAimp = (-)<br>MERCOSUR: RTA2 = (n),RTAexp = (n), RTAimp = (-)<br>NAFTA: RTA2 = (n), RTAexp = (n), RTAimp = (-) |

| | | | |
|---|---|---|---|
| (Tumbarelle, 2007)* | Log linear / OLS | 1984-2005<br>182 countries | ASEAN: RTA2 = (-), RTAexp = (+), RTAimp = (+)<br>APEC: RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>CER: RTA2 = (+), RTAexp = (+), RTAimp = (-)<br>EU15: RTA2 = (-), RTAexp = (+), RTAimp = (+)<br>EAEC: RTA2 = (n), RTAexp = (+), RTAimp = (-)<br>MERCOSUR: RTA2 = (+),RTAexp = (+),RTAimp = (-)<br>NAFTA:RTA2 = (n), RTAexp = (+), RTAimp = (n)<br>SAFTA:RTA2 = (n), RTAexp = (+), RTAimp = (+) |
| (Kien, 2009) | Hausman-Taylor | 1988-2002<br>32 countries | ASEAN: RTA2 = (n), RTAexp = (+), RTAimp = (+)<br>EU15: RTA2 = (-), RTAexp = (-), RTAimp = (-)<br>MERCOSUR:RTA2 = (+),RTAexp = (+), RTAimp = (-)<br>NAFTA: RTA2 = (+), RTAexp = (-), RTAimp = (-) |
| (Acharya, Crawford, Maliszewska, & Renard, 2011) | Country-pair dummies & a time dummy | 1970-2008<br>179 countries | ASEAN:RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>ANZCERTA: RTA2 = (n), RTAexp = (-), RTAimp = (n)<br>CACM:RTA2 = (n), RTAexp = (+), RTAimp = (+)<br>CAN:RTA2 = (+), RTAexp = (+), RTAimp = (n)<br>CARICOM:RTA2 = (-), RTAexp = (-), RTAimp = (-)<br>CEFTA:RTA2 = (n), RTAexp = (-), RTAimp = (-)<br>CEMAC:RTA2 = (n), RTAexp = (+), RTAimp = (+)<br>CIS:RTA2 = (-), RTAexp = (+), RTAimp = (+)<br>COMESA: RTA2 = (-), RTAexp = (-), RTAimp = (-)<br>EAC:RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>ECOWAS:RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>EFTA:RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>EU:RTA2 = (+), RTAexp = (+), RTAimp = (n)<br>Euromed:RTA2 = (+), RTAexp = (+),RTAimp = (+)<br>GCC:RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>MERCOSUR: RTA2 =(+),RTAexp = (+),RTAimp = (+)<br>NAFTA:RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>PATCRA:RTA2 = (n), RTAexp = (+), RTAimp = (+)<br>SADC:RTA2 = (+), RTAexp = (-), RTAimp = (n)<br>SAFTA:RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>WAEMU: RTA2 = (+), RTAexp = (+), RTAimp = (n) |
| (Cissokho, Haughton, Makpayo, & Seck, 2013) | Tobit | 2000, 2003, 2006<br>135 countries | ASEAN: RTA2 = (+), RTA_extra = (+)<br>COMESA: : RTA2 = (+), RTA_extra = (n)<br>ECOWAS: RTA2 = (+), RTA_extra = (-)<br>EU: RTA2 = (-), RTA_extra = (+)<br>MERCOSUR: RTA2 = (+), RTA_extra = (+)<br>NAFTA: RTA2 = (-),RTA_extra = (+)<br>SADC: RTA2 = (+), RTA_extra = (n) |
| (MacPhee & Sattayanuwat, 2014) | PPML / one single regression | 1981-2008<br>158 countries | ASEAN: RTA2 = (+), RTAexp = (n), RTAimp = (+)<br>ANDEAN: RTA2 = (n), RTAexp = (n), RTAimp = (-)<br>CEMAC: RTA2 = (n), RTAexp = (n), RTAimp = (-)<br>CIS: RTA2 = (+), RTAexp = (-), RTAimp = (-)<br>EAC: RTA2 = (+), RTAexp = (-), RTAimp = (-)<br>ECOWAS: RTA2 = (+), RTAexp = (n), RTAimp = (-)<br>GCC: RTA2 = (-), RTAexp = (n), RTAimp = (+)<br>MERCOSUR: RTA2 = (+),RTAexp = (n), RTAimp = (-)<br>PAFTA: RTA2 = (-), RTAexp = (+), RTAimp = (n)<br>SADC: RTA2 = (+), RTAexp = (+), RTAimp = (+) |

| | | | |
|---|---|---|---|
| | PPML / 12 RTAs in separate regression | | ASEAN: RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>ADEAN: RTA2 = (+), RTAexp = (+), RTAimp = (n)<br>CEMAC: RTA2 = (-), RTAexp = (-), RTAimp = (-)<br>CIS: RTA2 = (+), RTAexp = (-), RTAimp = (-)<br>EAC: RTA2 = (+), RTAexp = (+), RTAimp = (+)<br>ECOWAS: RTA2 = (+), RTAexp = (n), RTAimp = (n)<br>GCC:RTA2 = (-), RTAexp = (n), RTAimp = (-)<br>MERCOSUR: TA2 = (+), RTAexp = (+),RTAimp = (+)<br>PAFTA: RTA2 = (-), RTAexp = (+), RTAimp = (n)<br>SADC: RTA2 = (n), RTAexp = (+), RTAimp = (n) |

Source: * by (MacPhee & Sattayanuwat, 2014) and Authors' review

**Econometric Issues**

Silva and Tenreyro (2006) initially proposed the Poisson Pseudo-Maximum-Likelihood (PPML) estimation technique in order to solve the traditional problem of gravity models with heteroskedasticity and zero trade values. They showed that the proposed PPML estimation technique as being capable of solving those problems. PPML has become an influential estimation technique in the present decade. Also, it is easily applied to the gravity model because STATA contains a built in *poisson* command.[12] Given this, a number of empirical studies[13] of gravity models apply the PPML estimator.

However, it suffers from failing to check for the existence of the estimates, and it is also sensitive to numerical problems. Silva and Tenreyro (2010) developed a better option, *ppml* command[14], which checks for the existence of the estimates before trying to estimate a Poisson regression and provides several warning about possible convergence problems (Santos Silva & Tenreyro, 2006) (Santos Silva & Tenreyro, 2011). We follow the *ppml* command.

It should be noted that some authors try to find an argument against the PPML estimator. A Gamma Pseudo-Maximum-Likelihood (GPML), a Nonlinear Least Squares (NLS) estimator, Feasible Generalized Least Squares (FGLS) estimator (Martínez-Zarzoso, 2013), and Negative binomial pseudo-maximum likelihood estimator (NBPML) (Sukanuntathum, 2013) are compared to the PPML. Recently the simulation results confirm that the PPML estimator is generally well behaved, even when the proportion of zeros in the sample is very large. In addition to being compared with FGLS, Tobit, and Heckman, the Ramsey RESET Test confirms that PPML the only one of the regression methods tested that is adequate (MacPhee, Cook, & Sattayanuwat, 2013)

**Regression Results**

The results of regressions are presented in Table 4. The first two regressions include all 6 ASEAN PTAs in a single regression. The other regressions run each ASEAN PTA separately. This is the unbalanced panel with 49,708 observations containing 153 exporters and 169 importers during the period of 2007–2011. All of the fixed effect regressions explain a high proportion, above 92 percent of the total variation of world export. Most of the control variables have the expected sign and are statistically significant namely the level of GDP and population of exporter and importer, distance, language, and contiguity.

[12] poisson depvar [indepvars] [if] [in] [weight] [, options]
[13] (An & Puttitanun, 2009), (Liu, 2009), (Shepherd & Wilson, 2009), (Siliverstovs & Schumacher, 2009), (Westerlund & Wilhelmsson, 2011), (Martínez-Zarzoso, 2013), (MacPhee & Sattayanuwat, 2014)
[14] ppml depvar [indepvars]

The PPML results indicate that during 2007–2011, the outcomes for the pooled regression differs from some of the ones of individual regressions. We focus on the pooled regression with the fixed effect model.

For AFTA regressions, the pooled result and individual AFTA result differed. The individual AFTA regression results indicate the AFTA agreement seems to continue increased trade among its members and export trade creation while the pooled regression result are insignificant. Both our pooled regression and individual ACFTA regressions contain the same coefficient sign for ACFTA2 and ACFTAexp that are positive and statistically significant. This suggests that the countries of ASEAN and China give rise to intra-bloc trade creation and export trade creation. Our results are consistent with Yang & Martínez-Zarzoso (2013) who found ACFTA yield not only intra-bloc trade creation but also extra-bloc export trade creation. Park et al (2008) present that economic modeling of ACFTA shows substantial mutual gains from trade (i.e trade creation). They estimate a 32.5% increase in ASEAN in ASEAN-PRC trade, with gains ranging from 20%–60% for individual countries (the higher end by Thailand and Viet Nam). They suggest that improving infrastructure connections to boost gain from trade. In sum, ACFTA favors not only ACFTA's intra-regional trade growth but also benefits extra-bloc countries.

For AJCEP regressions, the *AJCEP2* dummy is the only significant variable in the regression. Both the pooled result and individual result show intra-bloc trade creation. In the case of AKFTA, our pooled results indicate that AKFTA displays export trade diversion while the AKFTA individual regression result display the other way around.

The pooled regression results show that AANZFTA experienced intra-bloc trade diversion, export trade diversion, and import trade creation. On balance, the sum of the coefficients of the three statistically significant dummy variables [(-7.88) + (-8.94) + 0.03] equal -16.79. This indicates that the AANZFTA seems to have more trade flows among non-AANFTA random country pairs than its members.

In the case of AIFTA, our PPML estimates identified positive intra-bloc trade creation and export trade creation.

The last forth incoming ASEAN PTA is RCEP. Both our pooled regression and individual RCEP regression suggest that RCEP give rise to intra-bloc trade creation and export trade creation. In other words, RCEP is favorable to both regional integration and globalization.

## Conclusion

We summarize the ASEAN's PTA trade effects in table 5. On average, during 2007–2011, ASEAN members trade with each other at a level higher than without preferential trade agreements.

Our first major finding is that not all of the ASEAN's PTAs reaches intra-bloc trade creation Most of the ASEAN's PTA displays building-blocs, namely ACFTA, AJCEP, AIFTA and RCEP. There were stumbling-blocs in AKFTA and AANZFTA. The results show that export trade diversion in AKFTA.

The second finding is that RCEP coefficients show higher magnitude than other of ASEAN's PTAs. This interprets that the RCEP is more desirable than the ASEAN's bilateral PTAs. RCEP

tend to enhance trade flows than ASEAN bilateral trade agreements. In sum, the 2007–2011 effects of the gravity model results provide a strong rationale for supporting RCEP. The result also implies that since most of the ASEAN's PTA indicate the building-blocs, thus RCEP is able to provide deeper economic cooperation that those in the ASEAN+1 PTAs.

The third finding is that the stronger PTA, the higher the chance of stumbling blocs. On the other hand, weaker PTAs mean a higher chance of building blocs. This finding implies that PTA with the higher external tariff is likely to be associated with trade diversion.

Our fourth finding is that we confirm MacPhee & Sattayanuwat (2014) in that the results for the pooled regression and the results for individual regressions are different. Simultaneous estimation for all PTAs in a single regression enables us to avoid bias in the results by accounting for interactions among PTAs.

Table 4: Intra and Extra-Bloc Effects of ASEAN's Preferential Trade Agreements by PPML (2007-2011)

| Variable | All | AFTA | ACFTA | AJCEPA | AKFTA | AANZFTA | AIFTA | RCEP |
|---|---|---|---|---|---|---|---|---|
| Exp. GDP | 0.53*** | 0.52*** | 0.52*** | 0.52*** | 0.52*** | 0.52*** | 0.52*** | 0.52*** |
| | (0.14) | (0.19) | (0.19) | (0.18) | (0.18) | (0.18) | (0.18) | (0.17) |
| Imp.GDP | 0.75*** | 0.74*** | 0.74*** | 0.74*** | 0.74*** | 0.74*** | 0.74*** | 0.74*** |
| | (0.14) | (0.17) | (0.16) | (0.16) | (0.16) | (0.16) | (0.17) | (0.16) |
| Exp. Pop. | -2.24** | -2.23** | -2.21** | -2.22** | -2.22** | -2.23** | -2.23** | -2.24** |
| | (1.09) | (1.12) | (1.13) | (1.12) | (1.12) | (1.12) | (1.12) | (1.11) |
| Imp. Pop | 0.03* | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.05 |
| | (0.43) | (0.45) | (0.45) | (0.44) | (0.45) | (0.45) | (0.45) | (0.44) |
| Imp. Tariff | -0.11 | -0.10 | -0.11 | -0.10 | -0.11 | -0.11 | -0.11 | -0.10 |
| | (0.12) | (0.12) | (0.12) | (0.12) | (0.12) | (0.12) | (0.12) | (0.12) |
| EX. Rate | -0.33* | -0.34 | -0.34 | -0.34* | -0.34 | -0.34 | -0.34 | -0.34* |
| | (0.18) | (0.21) | (0.21) | (0.20) | (0.21) | (0.21) | (0.21) | (0.20) |
| Distance | -0.81*** | -0.71*** | -0.72*** | -0.69*** | -0.70*** | -0.69*** | -0.71*** | -0.78*** |
| | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) |
| Lang | 0.36*** | 0.37*** | 0.40*** | 0.39*** | 0.37*** | 0.38*** | 0.37*** | 0.36*** |
| | (0.04) | (0.04) | (0.04) | (0.04) | (0.04) | (0.04) | (0.04) | (0.04) |
| Contiguity | 0.61*** | 0.71*** | 0.71*** | 0.68*** | 0.69*** | 0.70*** | 0.71*** | 0.65*** |
| | (0.05) | (0.05) | (0.05) | (0.05) | (0.05) | (0.05) | (0.05) | (0.05) |
| Col | 0.32*** | 0.11 | 0.13 | 0.19** | 0.15 | 0.12 | 0.12 | 0.12 |
| | (0.09) | (0.10) | (0.09) | (0.09) | (0.10) | (0.10) | (0.10) | (0.09) |
| AFTA2 | -3.34 | 5.83*** | | | | | | |
| | (0.31) | (2.12) | | | | | | |
| AFTAexp | | 5.31** | | | | | | |
| | | (2.14) | | | | | | |
| AFTAimp | | 0.46 | | | | | | |
| | | (1.03) | | | | | | |
| ACFTA2 | 6.27*** | | 5.71*** | | | | | |
| | (2.31) | | (2.12) | | | | | |
| ACFTAexp | 5.62** | | 5.43** | | | | | |
| | (2.38) | | (2.15) | | | | | |
| ACFTAimp | 0.43 | | 0.62 | | | | | |
| | (0.96) | | (1.04) | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AJCEP2 | 0.71*** | | | 6.16*** | | | | |
| | (0.26) | | | (2.12) | | | | |
| AJCEPexp | -0.25 | | | 5.18** | | | | |
| | (0.22) | | | (2.15) | | | | |
| AJCEPimp | -0.22 | | | 0.35 | | | | |
| | (0.15) | | | (1.01) | | | | |
| AKFTA2 | -1.27 | | | | 6.00*** | | | |
| | (1.17) | | | | (2.12) | | | |
| AKFTAexp | -2.53** | | | | 5.27** | | | |
| | (1.20) | | | | (2.14) | | | |
| AKFTAimp | 0.23 | | | | 0.44 | | | |
| | (0.51) | | | | (1.02) | | | |
| AANZFTA2 | -7.88** | | | | | 6.05*** | | |
| | (3.67) | | | | | (2.12) | | |
| AANZFTAexp | -8.94** | | | | | 5.28** | | |
| | (3.83) | | | | | (2.14) | | |
| AANZFTAimp | 0.03** | | | | | 0.44 | | |
| | (1.59) | | | | | (1.02) | | |
| AIFTA2 | 4.23* | | | | | | 5.88*** | |
| | (2.21) | | | | | | (2.12) | |
| AIFTAexp | 3.77* | | | | | | 5.30*** | |
| | (2.28) | | | | | | (2.14) | |
| AIFTAimp | -0.23 | | | | | | 0.45 | |
| | (0.91) | | | | | | (1.02) | |
| RCEP2 | 7.08*** | | | | | | | 5.75*** |
| | (2.65) | | | | | | | (2.07) |
| RCEPexp | 7.54*** | | | | | | | 5.48** |
| | (2.74) | | | | | | | (2.13) |
| RCEPimp | 0.14 | | | | | | | 0.61 |
| | (1.38) | | | | | | | (1.01) |
| Constant | 18.96*** | 18.04*** | 18.07*** | 17.87*** | 18.00*** | 17.94*** | 18.01*** | 18.68*** |
| | (2.91) | (2.99) | (3.01) | (2.99) | (2.99) | (2.99) | (2.99) | (2.96) |
| **Pseudo $R^2$** | 0.942 | 0.922 | 0.922 | 0.927 | 0.923 | 0.923 | 0.922 | 0.928 |

Source: Authors' Calculation. Standard errors in parentheses* $p<10\%$ ** $p<5\%$ *** $p<1$

## References

Acharya, R., Crawford, J. A., Maliszewska, M., & Renard, C. (2011). Landscape. In J. P. Chauffour, & J. C. Maur (Eds.), Preferential trade agreement policies for development: A handbook (pp. 37–67). Washington DC: The World Bank.

Athukorala, P. C. (2011). Production networks and trade patterns in East Asia: Regionalization or Globalization. *Asian Economic Papers*, 10, pp 65–95. https://doi.org/10.1162/ASEP_a_00045

Calvo-Pardo, H., Freund, C., & Ornelas, E. (2011). Free trade agreement: Impact on trade flows and external trade barriers. In J. R. Barro, & J. W. Lee (Eds.) *Costs and benefits of economic integration in Asia* (p. 320). Oxford University Press.

Carrere, C. (2004). African regional agreements: Impact on trade with or without currency unions. *Journal of African Economics*, *13*(2), pp. 199–239.

Carrere, C. (2006). Revisiting the effects of regional trade agreements on trade flows with proper specification of the gravity model. *European Economic Review*, *50*(2), 223–247. https://doi.org/10.1016/j.euroecorev.2004.06.001

Cissokho, L., Haughton, J., Makpayo, K., & Seck, A. (2013). Why Is agricultural trade within ECOWAS so high? Journal of African Economies, 22(1), 22–51.

Elliott, R. J., & Ikemoto, K. (2004). AFTA and the Asian Crisis: Help or Hindrance ot ASEAN Intra-Regional Trade? *Asian Economic Journal*, *18*(1), 1–23.

Endoh, M. (2000). The transition of postwar Asia-Pacific trade relations. Journal of Asian Economics 10, 571–587.

FUKUNAGA, Y., & ISONO, I. (2013). Economic Research Institute for ASEAN and East Asia. Retrieved December 1, 2014, from http://www.eria.org/

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

Kien, N. T., & Hashimoto, Y. (2005). Economic analysis of ASEAN free trade area: By country panel data. Osaka University Graduate School/School of Economics. Retrieved November 2014, from http://www2.econ.osaka-u.ac.jp/library/global/dp/0512.pdf

MacPhee, C. R., & Sattayanuwat, W. (2014). Consequence of regional trade agreements to developing countries. *Journal of Economic Integration*, *29*(1), 64–96.

MacPhee, C., Cook, P., & Sattayanuwat, W. (2013). Transportation and the International trade of Eastern and Southern Africa. *South African Journal of Economics*, *81*(2), 225–239. https://doi.org/10.1111/saje.12002

Martínez-Zarzoso, I. (2013). The log of gravity revisited. *Applied Economics*, *45*(3), 311–327. https://doi.org/10.1080/00036846.2011.599786

Plummer, M. G., Cheong, D., & Hamanaka, S. (2010). Methodology for impact assessment of free trade agreements. Philippines: Asian Development Bank.

Rivera-Batiz, L. A., & Oliva, M. A. (2004). International trade: theory, strategies, and evidence. Oxford University Press.

Santos Silva, J., & Tenreyro, S. (2011). Poisson: Some convergence issues. *The Stata Journal*, *11*(2), 207–212.

Santos Silva, J., & Tenreyro, S. (2006). The log of gravity. *Review of Economics and Statistics*, *88*, 641–658.

Soloaga, I., & Winters, L. A. (2001). Regionalism in the nineties: What effect on trade? *The North American Journal of Economics and Finance*, 12(1), 1–29. https://doi.org/10.1016/S1062-9408(01)00042-0

Sukanuntathum, A. (2013). Robust estimation of gravity models under heteroskedasticity and data censoring. *The 2012 International (Spring) Conference on Asia Pacific Business Innovation and Technology Management*. Pattaya: Elsevier Ltd.

Trotignon, J. (2010). Does regional integration promote the multilateralization of trade flows? A gravity model using panel data. *Journal of Economic Integration*, *25*(2), 223–251. https://doi.org/10.11130/jei.2010.25.2.223

Tumbarelle, P. (2007). Are regional trade agreements in Asia stumbling or building blocks? Implications for the Mekong-3 countries. IMF Working Papers. Retrieved from: http://www.imf.org/en/Publications/WP/Issues/2016/12/31/Are-Regional-Trade-Agreements-in-Asia-Stumbling-or-Building-Blocks-Implications-for-the-20457

Word Bank. (2008). The growth report: Strategies for sustained growth and inclusive development. Washington, DC: World Bank.

**Corresponding author**: Wanasin Sattayanuwat
**Contact email**: wanasin@gmail.com