EADN WORKING PAPER No. 40 (2009)

Economic Integration Among ASEAN Countries: Evidence from Gravity Model

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Final Report of an EADN Individual Research Grant Project

February 2009

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ACKNOWLEDGEMENT

We would like to thank the East Asian Development Network for funding this research, without which this study would not have materialized. We would also like to thank Dr. Chalongphob Sussangkarn, EADN Regional Coordinator, Professor Dr. Peter Warr of Australian National University, Dr. Evan Due of International Development Research Centre and other fellow participants of *The 2007 EADN Annual Forum*, held on 28-29 February 2008 in Bangkok, Thailand, for their valuable input to improve this project during our presentation of the Mid-term Report.

Our appreciation also goes to our colleagues at the Department of Economics, International Islamic University Malaysia for the useful and fruitful discussions with them in the course of conducting this research. Finally, special thanks to Professor Dr. Mansor H. Ibrahim, Dean, Faculty of Economics & Management Sciences, International Islamic University Malaysia for his continuous support since the proposal stage of this project.

ABSTRACT

This study aims at investigating whether intra-ASEAN trade is trade creating (higher trade with efficient members) or trade diverting (higher trade with inefficient members) for both inter-industry and intra-industry trade. Since integration efforts within ASEAN had to be geared toward “open regionalism”, factors that affect trade, both inter-industry as well as intra-industry trade at the sectoral level are also identified. The study adopts the extended gravity model at the total as well as the disaggregated level using the one-digit Standard International Trade Classification (SITC) Revision 2. Trade creation is found to be present for total exports, for beverages & tobacco (SITC 1), chemicals & materials (SITC 5), machinery & transport equipment (SITC 7), and miscellaneous manufactures (SITC 8). Income levels, transportation costs as well as level of development have significant effects on total trade as well as most sectors. Relative development affects only food & live animals (SITC 0), crude materials (SITC 2), chemicals & materials (SITC 5), and manufactured goods (SITC 6). Factor endowments are important determinants of total trade as well as trade in animal & vegetable fat (SITC 4), chemicals & materials (SITC 5), machinery & transport equipment (SITC 7), and miscellaneous manufactures (SITC 8). Tariffs do not seem to have any effect on trade except for the animal & vegetable fat sector (SITC 4), while exchange rate risk affects only beverages & tobacco (SITC 1), minerals & fuels (SITC 3), machinery & transport equipment (SITC 7), and miscellaneous manufactures (SITC 8). Based on the findings, in general, policies that promote growth and development in the region should be maintained. In addition, measures need to be undertaken to ensure low transportation costs that include improving both the physical infrastructure and the efficiency of transportation systems. Since tariffs are no longer much of an issue to promote trade, emphasis should be placed on other factors that may

affect export demand such as product development to improve the quality of exports and to meet the preferences of importing countries.

ECONOMIC INTEGRATION AMONG ASEAN COUNTRIES:

EVIDENCE FROM GRAVITY MODEL

1. INTRODUCTION

Over the past few decades, efforts at regional integration have increasingly become the central focus of various groups of countries. Economic integration, in particular, can lead to trade creation and other benefits in the form of a more competitive trade environment from the removal of trade barriers and the possibility of realizing economies of scale and higher economic growth. In addition, forming economic groupings can also stimulate investment in the member countries from both internal and foreign sources. It has been argued that integration can stimulate investment by reducing risk and uncertainty due to the larger market that producers become open to. Furthermore, foreign investors may wish to invest in productive capacity in a member country to avoid being excluded by trade restrictions and a high common external tariff (Appleyard, 1995).

In line with this idea, the ASEAN regional grouping was formed on 8 August 1967 by five countries, namely, Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Brunei Darussalam later joined in 1984, followed by Vietnam in 1995, Laos and Myanmar in 1997, and also Cambodia in 1999. Among the objectives of ASEAN are to enhance economic growth and other fields such as social, cultural, technical, and educational in the region through cooperation, and to promote regional peace and stability.

Although the initial concerns of ASEAN during its early period of establishment were issues related to political security in Southeast Asia, over time attempts at organized regional co-operation were established. It was not until 1976 that ASEAN members agreed to pursue coordinated investment projects to complement the economic structures among member countries. In 1977 the ASEAN preferential trading arrangements were established to promote greater intra-regional trade and to co-ordinate industrialization policies (Park, 1999). The ASEAN preferential trading arrangements sought to reduce tariff and non-tariff barriers to goods produced in member countries. However, the consensus from existing studies suggests that only negligible increases in trade in the region were achieved (Ariff, 1994; Garnaut & Drysdale, 1994; DeRosa, 1995). According to DeRosa (1995), this initiative was not fulfilled due to several reasons including the reliance on non-tariff barriers among member countries and opposition of national interests which is more concerned with the profitability of their local investments.

This scenario changed during the late 1980s and 1990s when the global market became more competitive with the formation of NAFTA and EU. It raised questions among the ASEAN heads of state on the accessibility of ASEAN exports to the North American and European markets. In addition, with the emergence of China as the main global economic player, ASEAN faced an intense competition to attract foreign direct investment into their countries. In response to the situation, in January 1992, the six member countries at that time (ASEAN-6)[1] agreed to establish the ASEAN Free Trade Area (AFTA) which among others, sought to reduce the level of its tariffs on imports of highly protected agricultural products and manufactures and to eliminate non-tariff barriers within ASEAN. The AFTA will be achieved mainly through the Common Effective Preferential Tariff (CEPT) which

[1] The six member countries were Brunei, Indonesia, Malaysia, Philippines, Singapore, and Thailand. Cambodia, Laos, Myanmar and Vietnam (CLMV) later become signatories upon joining ASEAN.

adopts a sectoral approach and less cumbersome than the product-by-product approach of PTAs (Pangestu, Soesatro and Ahmad, 1992). Based on the CEPT scheme, tariff rates levied on a wide range of products traded within the region which meet a 40% ASEAN content requirement should be reduced to 0-5%.

At the 30th Anniversary of ASEAN in 1997, the members adopted ASEAN Vision 2020, which sets out among others, to achieve an outward and forward looking ASEAN, living in peace, stability and prosperity in dynamic development that will forge closer economic integration within ASEAN. In line with this, the Hanoi Plan of Action (HPA) was adopted in December 1998, which promotes economic integration in ASEAN. The members would work together in economic development strategies, which emphasize on sustainable and equitable growth, and enhance national as well as regional resilience. They would build upon the existing cooperation efforts to narrow the gap in the level of development among member countries, and ensure that the multilateral trading system remains fair and open in the process of achieving global competitiveness.

Each member country is, therefore, committed to create a stable, prosperous and highly competitive ASEAN economic region in which there is a free flow of goods, services, capital and investments, equitable economic development and reduced poverty and socio-economic disparities. The member countries would also undertake the following:

- preserve regional macroeconomic and financial stability by encouraging closer consultations in macroeconomic and financial policies.
- promote economic integration and cooperation by adopting the following general strategies: fully implement the ASEAN Free Trade Area and speed up liberalization of trade in services, realize the ASEAN Investment Area by 2010 and

free flow of investments by 2020; strengthen and increase sub-regional cooperation in existing and new sub-regional growth areas; further unite and expand extra-ASEAN regional linkages for common benefit; assist to build up the multilateral trading system, and emphasize the role of the business sector as the engine of growth.

At the 9th ASEAN Summit in Bali on 7-8 October 2003 (also known as the Bali Concord II), it was agreed that the ASEAN Community be established by 2020 which consists of three pillars, namely, ASEAN Security Community, ASEAN Economic Community and ASEAN Socio-Cultural Community. The ASEAN Economic Community (AEC), in particular, is the end-goal of economic integration measures as outlined in the ASEAN Vision 2020. The objective of the AEC is to create a stable, prosperous and highly competitive ASEAN economic region in which there is a free flow of goods, services, investment and capital, equitable economic development and reduced poverty and socio-economic disparities in the year 2020. It will establish ASEAN as a single market and production base, turning the diversity that characterizes the region into opportunities for business complementation and making ASEAN a more dynamic and stronger segment of the global supply chain. In January 2007, the ASEAN Summit in Cebu, Philippines, has agreed to accelerate the establishment of the AEC and has brought forward the deadline by five years to 2015.

In moving towards the AEC, member countries have agreed to:

- introduce new mechanisms and procedures to reinforce the implementation of its existing economic initiatives including the ASEAN Free Trade Area (AFTA),

ASEAN Framework Agreement on Services (AFAS) and ASEAN Investment Area (AIA);

- speed up regional integration in air travel, agro-based products, automotives, e-commerce, electronics, fisheries, healthcare, rubber-based products, textiles and apparels, tourism, and wood-based products by 2010;
- assist movement of business persons, skilled labor and talents; and
- support the institutional mechanisms of ASEAN, including the improvement of the existing ASEAN Dispute Settlement Mechanism to guarantee speedy and legally-binding resolution of any economic disputes.

Despite the progress made in terms of tariff reductions,[2] the intra-ASEAN trade remains relatively stagnant over the years. In 1992-93 when the CEPT scheme was launched, the share of intra-ASEAN exports vis-à-vis total ASEAN exports was 21.14 percent with an insignificant increase to 21.7 percent in 2003. The main reason for this stagnant trade among ASEAN member countries is because ASEAN experienced robust trade with the rest of the World (Plummer, 2006), particularly their traditional industrial partners including the United States, Japan, the European Union, China and Republic of Korea in contrast to trade activities among member countries. For example, ASEAN's trade with non-ASEAN member countries recorded significant increases from around US$160 billion in 1993 to US$330 billion in 2003. In addition, the share of ASEAN's total trade with these five countries in 2004 was 14.08 percent, 13.72 percent, 11.50 percent, 7.00 percent and 4.06 percent, respectively (ASEAN, 2004-2005).

Hence, as mentioned by Plummer (2006), given the realities above, initiatives towards regional economic integration in ASEAN have to be considered within the context of a

[2] The next section provides the details of tariff reductions over the years under the CEPT scheme of AFTA.

global economy. In fact, this has been the main reason as to why integration efforts within ASEAN have been geared mainly toward "open regionalism", rather than inward-looking or a "Fortress ASEAN". This need for outward orientation and open regionalism is also explicitly mentioned in its most important documents. The Bali Concord II, for instance, in summarizing the ultimate goals of the AEC states that: " . . . *The ASEAN Economic Community shall establish ASEAN as a single market and production base, turning the diversity that characterizes the region into opportunities for business complementation making the ASEAN a more dynamic and stronger segment of the global supply chain*."[3] Since the ASEAN markets are relatively small, integration efforts are not for the purpose of gaining access to each other's markets *per se*, but rather the initiatives are a means to plug into the international marketplace and exploit globalization as in the European Union model (Plummer, 2006).

In a study by Baharumshah, Onwuka and Habibullah (2007) it has been shown that regional integration within ASEAN is moving towards multilateral trade liberalization. This is evidence that regional trade liberalization in ASEAN is not a hindrance, but rather is a precursor to the global integration process in the region. Higher integration provides the training ground for member countries to develop their capacities and compete with non-member countries when AFTA tariff cuts are later multilateralized, hence realizing a deeper level of integration. This would certainly be necessary if a Common External Tariff (CET) with non-member countries were to be adopted as suggested by Plummer (2006).

Since the AEC seeks to establish ASEAN as a single market place and production base, it will have to ensure that member countries develop their capacities and enhance the

[3] http://www.aseansec.org/19096.htm (Retrieved on 24/12/07)

efficiency of their production as a means to create comparative advantage in the various sectors. Hence, in the case of ASEAN that has a higher trade share with the rest of the World compared to intra-ASEAN trade, the issue is no longer merely to get higher intra-trade activities in the region but to have intra-ASEAN trade that are trade creating (higher trade with efficient members) rather than trade diverting (higher trade with inefficient members).

Past studies have shown that, in general, intra-trade activities within ASEAN is trade creating (Plummer, 2006). However, this general finding provides no information on the nature of intra-trade activities at the sectoral level. Such an investigation is pertinent since intra-industry trade (for products which have more scope for variety, such as electronics and automotives) is becoming quite significant among ASEAN countries as opposed to inter-industry trade (for relatively homogenous products, such as oil, natural gas, rubber and certain agricultural items) (Plummer, 2006; Oktaviani, Rifin, & Reinhardt, 2007). However, despite the increase in intra-industry trade, Oktaviani, Rifin, & Reinhardt (2007) found that member countries that export these products (with the exception of Malaysia) do not seem to possess comparative advantage. This situation may result in trade diversion for these sectors which could have been offset by trade creation in other sectors, hence resulting in an overall positive effect of intra-ASEAN trade as found in earlier studies.

Given the above scenario, in order to create an ASEAN single market and production base which is competitive, it would be necessary to identify which sectors experience higher efficiency from intra-regional trade and which do not, or in other words, which sectors exhibit trade creation and which exhibit trade diversion, if any. Such information would be necessary in order to formulate the appropriate policies to enhance efficiency and create

comparative advantage for the relevant sectors. It will also assist in ensuring the presence of trade creation, rather than trade diversion particularly in the ASEAN priority sectors[4] that will enable member countries to compete better as one with the rest of the World at the multilateral level. Also in this regard, identifying the determinants of both inter-industry and intra-industry trade is also necessary to understand better the trade patterns of ASEAN countries and to formulate essential policy measures for trade as a whole as well as for the specific sectors.

Therefore, based on the discussion above, this study aims at investigating whether intra-trade in general and at the sectoral level has caused a shift in the product origin from a domestic producer who faces higher costs to a member producer with lower resource costs, leading to a higher efficiency (trade creation) or whether it has caused the product origin to shift from a non-member producer who faces lower costs to a member producer whose resource costs are higher, leading to a fall in efficiency and welfare (trade diversion). In doing so, the study will also identify which sectors benefit from intra-regional trade within ASEAN in terms of promoting trade in efficient sectors.

This study also attempts to determine the factors that affect trade, both inter-industry as well as intra-industry trade at the sectoral level. Particularly, it investigates whether economic sizes, level of development, relative development, trade policy, geographical factors, exchange rate risk, factor endowments, membership in ASEAN, and

[4] There are currently 11 priority sectors, namely electronics, e-ASEAN, healthcare, wood-based products, automotives, rubber-based products, textiles and apparels, agro-based products, fisheries, air travel and tourism (http://www.aseansec.org/16620.htm). However, as in Oktaviani, Rifin, & Reinhardt (2007) only 9 priority sectors are relevant for this study, namely, agro-based products, automotive products, electronics, fisheries, healthcare, information and communication technology (ICT), rubber-based products, textiles and apparel, and wood-based products.

transportation costs (as proxied by geographical distance), are important determinants of both inter-industry as well as intra-industry trade.

This study adopts the extended gravity model at the total as well as the disaggregated level using the one-digit Standard International Trade Classification (SITC) Revision 2. From the findings, some general policy recommendations are later provided so as to enable member countries to align their policies, not only for enhancing regional economic integration *per se*, but more importantly to develop the ability to compete with the rest of the World as a single regional market and production base.

The next section discusses the ASEAN Free Trade Area (AFTA) and the tariff reductions that have taken place under the Common Effective Preferential Tariff (CEPT) system. This is followed by a survey of previous works on ASEAN economic integration and applications of the gravity model. Section 4 explains the extended gravity model adopted in this study and provides the description of the data. The analysis of results for each model estimated is provided in section 5, followed by a discussion of the overall findings and policy recommendations based on the findings in Section 6. The last section concludes.

2. THE ASEAN FREE TRADE AREA (AFTA)

It has been said that the AEC has a high probability of being fully realized by 2020 since the building blocks towards achieving an integrated ASEAN market are already in place, such as the AFTA. Although the deadline for the stipulated tariff reductions was originally set to be 2008, the free trade area target in ASEAN was subsequently moved forward to

2003. However, during the financial crisis of 1997-98, in its reaffirmation to its commitment to AFTA, ASEAN members agreed that the original six AFTA signatories would accelerate many planned tariff cuts by one year, to 2002 from 2003 (ASEAN Secretariat, 2007).

The timetable for accelerating AFTA was adopted (see Table 1) with tariff reductions implemented in both the "fast" and "normal" tracks. Tariffs on goods in the fast track were largely reduced to 0-5% by 2000. Tariffs on goods in the normal track were to be reduced to this level by 2002, or 2003 for a small number of products.

Table 1

Timetable for Accelerating AFTA for the Original Six ASEAN Countries

Year	Commitment
2000	A minimum of 90% of the six countries' total tariff lines must have tariffs of 0-5%. Individually, each country would commit to achieve a minimum of 85% of the Inclusion List with tariffs of 0-5%.
2001	Each country would achieve a minimum of 90% of the Inclusion list in the 0-5% tariff range.
2002	100% of items in the Inclusion List would have tariffs of 0-5%, but with some flexibility.

Source: Asean Secretariat (http://www.aseansec.org/11456.htm)

In principle, the free trade area covers all manufactured and agricultural products. The "Inclusion List" (as stated in Table 1) refers to products that have to undergo immediate liberalization through reduction in intra-regional (CEPT) tariff rates, as well as removal of quantitative restrictions and other non-tariff barriers. Tariffs on these products were to be reduced to a maximum of 20% by 1998 and to 0-5% by 2002. The four new members of ASEAN have up to 2006 (Vietnam), 2008 (Laos and Myanmar) and 2010 (Cambodia) to meet the targets. The target was by the year 2000, there should be 53,294 tariff lines in the Inclusion List representing 82.78% of all tariff lines in ASEAN.

There are three cases in which ASEAN members have the option to exclude products from the CEPT: (1) Temporary exclusions; (2) Sensitive agricultural products; and (3) General exceptions. Temporary exclusions refer to products for which tariffs will ultimately be lowered to 0-5%, but which are being protected temporarily by a delay in tariff reductions. However, all these products would have to be transferred into the Inclusion List and begin the stipulated process of tariff reduction. Beginning 1 January 1996, annual installments of products from the Temporary Exclusions List (TEL) have been transferred into the Inclusion List. The target was by the year 2000, there should remain 9,674 tariff lines in the TEL representing about 15.04% of all tariff lines in ASEAN. Temporary exclusions are permissible under the AFTA agreement, and are spelled out under a Protocol Regarding the Implementation of the CEPT Scheme Temporary Exclusion List. Malaysia invoked this protocol in 2000, delaying tariff reductions on completely-built-up (CBU) automobiles, and automobile completely-knock-down (CKD) kits, in order to protect its local auto industry.

The Sensitive List contains a small number of unprocessed agricultural products, which are given a longer time frame before inclusion for tariff reductions. The commitment to reduce tariffs to 0-5%, remove quantitative restrictions and other non-tariff barriers is extended up to the year 2010. The new members of ASEAN, however, are given a longer deadline: Vietnam has up to 2013, Laos and Myanmar to 2015, and Cambodia has up to 2017 to meet the targets. The target was by the year 2000, there should be 370 tariff lines in the Sensitive List making up 0.58% of all tariff lines in ASEAN. The process of tariff reduction on these products was scheduled to begin from 2000 to 2005, depending on the country and the product (ASEAN Secretariat, 2007).

General Exceptions (GE) refer to products which are permanently excluded from the free trade area for reasons of protection of national security, public morals, human, animal or plant life and health and articles of artistic, historic and archaeological value. In 1999, there were 1,036 tariff lines in the GE List representing about 1.61% of all tariff lines in ASEAN (ASEAN Secretariat, 2007).

Table 2

AFTA: Common Effective Preferential Tariff (CEPT) List for 2001

Country	Inclusion List	Temporary Exclusion List	General Exception List	Sensitive List	Total
Brunei	6,284	0	202	6	6,492
Indonesia	7,190	21	68	4	7,283
Malaysia	9,654	218	53	83	10,008
Philippines	5,622	6	16	50	5,694
Singapore	5,821	0	38	0	5,859
Thailand	9,104	0	0	7	9,111
ASEAN-6 Total	**43,675**	**245**	**377**	**150**	**44,447**
Percentage	**98.26**	**0.55**	**0.85**	**0.34**	**100**
Cambodia	3,115	3,523	134	50	6,822
Laos	1,673	1,716	74	88	3,551
Myanmar	2,984	2,419	48	21	5,472
Vietnam	4,233	757	196	51	5,237
New Members Total	12,005	8,415	452	210	21,082
Percentage	**56.94**	**39.92**	**2.14**	**1.0**	**100**
ASEAN Total	**55,680**	**8,660**	**829**	**360**	**65,529**
Percentage	**84.74**	**13.40**	**1.28**	**0.55**	**100**

Source: ASEAN Secretariat (http://www.aseansec.org/11456.htm)

The CEPT scheme was to cover nearly 98 percent of all tariff lines in ASEAN by the year 2003, when the only products not included in the CEPT Scheme were those in the General Exceptions category and sensitive agricultural products. The CEPT list for 2001 and the average AFTA/CEPT tariff rates from 1998 to 2003 are given in Tables 2 and 3, respectively. Table 2 shows that by 2001, 98.26% of ASEAN-6's tariff lines were already

in the Inclusion List while 56.94% of the four new members' tariff lines were in the List. By 2003 as shown in Table 3, the average AFTA/CEPT tariff rates of all members have been reduced to 0-5% as planned.

Table 3

Average AFTA / CEPT Tariff Rates

	1998	1999	2000	2001	2002	2003
Brunei	1.35	1.29	1.00	0.97	0.94	0.87
Indonesia	7.04	5.85	4.97	4.63	4.20	3.71
Laos	5.00	5.00	5.00	5.00	5.00	5.00
Malaysia	3.58	3.17	2.73	2.54	2.38	2.06
Myanmar	4.47	4.45	4.38	3.32	3.31	3.19
Philippines	7.96	7.00	5.59	5.07	4.80	3.75
Singapore	0.00	0.00	0.00	0.00	0.00	0.00
Thailand	10.56	9.75	7.40	7.36	6.02	4.64
Vietnam	6.06	3.78	3.30	2.90	2.89	2.02
ASEAN	**5.37**	**4.77**	**3.87**	**3.65**	**3.25**	**2.68**

Source: ASEAN Secretariat (http://www.aseansec.org/11456.htm)

Following the signing of the Protocol to Amend the CEPT-AFTA Agreement for the Elimination of Import Duties on 30 January 2003, ASEAN-6 has committed to eliminate tariffs completely on 60 percent of their products in the Inclusion List by the end of the same year. Tariffs on 64.12 percent of the products in the Inclusion List of ASEAN-6 have so far been eliminated. The average tariff for ASEAN-6 under the CEPT Scheme is now down to 1.51 percent from 12.76 percent when the tariff cutting exercise started in 1993.[5]

Products that remain out of the CEPT-AFTA Scheme are those in the Highly Sensitive List (i.e., rice) and the General Exceptions List. The Coordinating Committee on the Implementation of the CEPT Scheme for AFTA (CCCA) is currently undertaking a review

[5] http://www.aseansec.org/12022.htm (Retrieved on 22/12/07)

of all the General Exception Lists to ensure that only those consistent with Article 9(b)1 of the CEPT Agreement are included in the lists.

In August 2006, 99.77% of the products in the CEPT Inclusion List of ASEAN-6 have been brought down to the 0-5% tariff range. Products in the Inclusion List which continue to have tariffs above 5% are only those which have been transferred from the Temporary Exclusion List (TEL), Sensitive Lists (SL), and General Exception Lists (GE) in 2004. The CLMV countries are not far behind with 90.96% of the products they trade in the region have been moved into the Inclusion List and tariffs on 76.86% of these items have already been brought down to the 0-5% tariff band.

Vietnam has transferred her remaining items under TEL and SL into the Inclusion List on 1 January 2006 as committed under the Protocol on the Accession of Vietnam to the CEPT Agreement. As such, Vietnam has no more products under TEL and SL. Laos also has no more products in her TEL and only 1.9% of her products remain in her SL, which would be phased into the Inclusion List by 2008. As for Myanmar, only her unprocessed Agriculture Products (UAP), which accounts to 0.72% of her total numbers of tariff lines, remain in the TEL while Cambodia has 22.89% of her total tariff lines in the TEL. The TEL products of Myanmar and Cambodia would be phased into the Inclusion List by 2007. The ASEAN-6 has no more TEL products since 2005. Products in the GE list have been significantly reduced to only 0.68% of total tariff lines.

In general, ASEAN members have so far managed to meet the targets of tariff reductions. In fact, in some cases members have successfully adopted tariff cuts earlier than the stipulated deadlines. The Work Programme on Elimination of Non-Tariff Barriers (NTBs)

has also been endorsed, which aims at aligning the elimination of identified NTBs with the elimination of tariffs that would ensure the realization of free flow of goods, as mandated in the Bali Concord II.

3. SURVEY OF THE LITERATURE

3.1. REVIEW ON ASEAN ECONOMIC INTEGRATION

Since first pioneered by Viner (1950), there has been a vast growth of literature on economic integration of various regional groupings and its economic effects. This includes numerous studies on ASEAN and AFTA that range from analyzing the economic effects of ASEAN regional grouping *per se* and in comparison with other regional groupings (Kreinin and Plummer, 1992, Plummer, 1997, Clarete, Edmonds and Wallack, 2003), to analyzing the effects of ASEAN free trade arrangements (FTAs) with other countries and at the sectoral level (Naya and Plummer, 2006). In addition, the study by Naya and Plummer (2006) also examines whether the ASEAN regional grouping can be described as a 'natural economic bloc'. Other studies examine a number of issues such as evaluating the most efficient way for Asian countries (including ASEAN) to form economic integration (Batra, 2006), and whether regional trade blocs are precursors to multilateral trade liberalization (Baharumshah, Onwuka and Habibullah, 2007).

In the study by Plummer (1997), it is argued that ASEAN will continue to benefit from AFTA and further "deepening" measures through the effects on strengthening macroeconomic stability, encouraging investment flows, enhancing technology transfer, minimizing intra-regional transactions costs to conducting business, and fostering policy reform in the region. The study also predicts that ASEAN regional integration will help

ASEAN countries to prevail over periodic crises by, among others, incorporating regional economic reform and providing information sharing with regards to crisis management.

In evaluating the effect of the proposed NAFTA at that time and the second enlargement of the European Community (EC) and EC-1992 on ASEAN and South Korea, Kreinin and Plummer (1992) matched the commodities exported by ASEAN or South Korea to NAFTA members with those exported to the same NAFTA member country from "internal" sources (from among member country) to identify the industries that would be affected. The study found that the estimated total trade diversion would be about 4% of ASEAN exports and 5% of South Korean exports to North America, and 8 and 5% of their respective exports to the EC.

Similar to Kreinin and Plummer (1992) in comparing the effects of various PTAs on trade flows, Clarete, Edmonds and Wallack (2003) extended the analysis to within and across membership groupings as well as the effect of PTAs on members' trade with Asian countries. Following Soloaga and Winters (2001), they used a combination of dummy variables in the gravity model that allows the separate identification of the effects of PTA on intra-bloc trade as well as trade between members and the rest of the world. Preferential trading agreements are categorized into three groups based on whether they tend to foster intra-bloc trade, foster greater trade with trading partners worldwide, or they reduced trade in general without changing their respective intra-bloc trade. Contrary to earlier studies (Frankel, 1997; and Soloaga and Winters, 2001), AFTA and NAFTA were found to be the PTAs that have not changed their intra-bloc trade but reduced their overall trade with the world. This contradiction may be due to the inclusion of newer members of

AFTA (Cambodia, Laos, Vietnam and Myanmar) who are relatively less integrated in the world economy compared to the founding members of AFTA.

There are also studies that analyze the effects of ASEAN free trade agreements (FTAs) with other countries rather than PTAs. Naya and Plummer (2006), for instance, considered the economic effect of the ASEAN-US free trade agreements by employing a number of techniques which include (i) the gravity model, in order to describe the extent of trade bias in the ASEAN-US economic relationship, with the objective of evaluating if these agreements would be described as "natural" economic blocs; (ii) the Computational General Equilibrium (CGE) model based on the work of Gilbert (2003) to review economy-wide estimates of these agreements; and (iii) a disaggregated technique to identify the sectors that will be most significantly affected by the FTAs.

Results from the gravity model show that there exists a trade bias in favor of ASEAN for both the United Sates and the European Union. The economic effects of ASEAN-US FTAs using CGE model is found to be quite small, with the exception of the Philippines whose GDP would rise by 3.1% with a bilateral FTA. The effect on the US economy is found to be less than 1%, and actually negative in the case of Indonesia and Singapore.

Although the estimated effects of the CGE model on ASEAN and US aggregate welfare are low, the sectoral effects are fairly substantial. The aggregate values of trade expansion for Indonesia, Malaysia, the Philippines, Thailand, Brunei and Singapore exports to the US are about $300 million (3% of total exports), $179 million (1% of total exports), $212 million (3% of total exports), $340 million (3% of total exports), $8 million (10% of total

exports), and $44 million (0.7% of total exports), respectively. Among the top 40 products, electronics sector is expected to be a prime beneficiary of the ASEAN-US FTAs.

In an attempt to evaluate the most efficient way for Asian countries to form economic integration, Batra (2006) defines Asia to include ASEAN member countries, plus three economies of China, Japan, and Korea (ASEAN+3) and also India (ASEAN+4). Batra analyzed the trends in intra-regional trade of the ASEAN+4 economies to determine whether there is a major trade bias evident among the member countries. The trade intensity index, trade bias, and complementarity indices were used to establish the case for ASEAN+4 as a regional economic group. The results show that a prior alignment with ASEAN in the ASEAN+1 framework could be a more cost efficient way to entering the ASEAN+4 group for all the plus four economies. Batra pointed out that the costs of aligning with ASEAN in the plus one framework are lowest for China. The study emphasized that initiatives need to be taken within the region to ensure that the ASEAN+1 agreement can perform effectively as a catalyst to an ASEAN+4 agreement.

Bhagwati (1993), Krugman (1991a), Levy (1997), McLaren (2002), and Viner (1950) are among those, according to Baharumshah, Onwuka and Habibullah (2007), who argued strongly that regionalism promotes discriminatory trade policy which hinders global free trade. The trade diversion effect of regional blocs is said to usually dominate the trade creation effect and hence, the current recent wave of regionalism is likely to be harmful to the world trading system. On the other hand, Baharumshah, Onwuka and Habibullah (2007) also highlighted other studies (Krugman, 1991b; Lawrence, 1999; Leamer, 1994; Wei & Frankel, 1996) that offer the view that regional trading blocs do contribute toward multilateralism. Baharumshah, Onwuka and Habibullah (2007) further attempted to

answer the question of whether regional trade blocs are precursors to multilateral trade liberalization by examining whether there is a long-term relationship between the terms of trade for regional and multilateral trade liberalization for the ASEAN-5 countries over the period 1967-2000. The study found that ASEAN-5 is moving towards multilateral trade liberalization, and that membership in regional trade blocs contributes to the advancement of multilateral trade liberalization. These findings suggest that trade policies initiated in the ASEAN countries are the beginning of the formation of free trade since regional trade liberalization appears not to hinder the global integration process in the region.

3.2. APPLICATIONS OF THE GRAVITY MODEL

The gravity model has been extensively used for empirical studies in economic integration. The model has also been successfully applied to flows of varying types such as migration and foreign direct investment. Early applications of the gravity model were viewed with skepticism. However, the work of scholars among others, Anderson (1979) and Oguledo and Macphee (1994), provided a sound theoretical foundation for a gravity model analysis of trade flows. Anderson (1979), for example, made the first formal attempt to derive the gravity equation from a model that assumed product differentiation. Oguledo and Macphee (1994) derived the gravity equation from a linear expenditure system in an attempt to answer criticism that the theoretical foundation of the gravity model is weak. As a result of these works, there has been a wider acceptance and more frequent application of the gravity model to explain international trade flows among nations.

When specifically applied to the flow of international trade, the gravity model states that the volume of trade flows between two nations is determined by the supply and demand conditions of the exporting and importing states or restraining forces relating to the specific flows between the two states. According to Oguledo and Macphee (1994), the first justification of the gravity model is based on physics. The model appeals to the physical law of gravitation and electrical forces to conclude that the flow of goods from one country to another equals the product of the potential trade capacities of the two states divided by a resistance or distance factor. According to the basic gravity model, the volume of exports between two states is a function of their incomes (GDPs), populations, geographical distance and a set of dummies.

There is a large number of empirical works in the literature of international trade, which have in some ways contributed to the improvement of the performance of the gravity equation. The study by Martinez-Zarzoso and Nowak-Lehmann (2003) used the augmented gravity model which was introduced by Bougheas, Demetriades, and Morgenroth (1999) to analyze trade flows between Mercosur and the European Union. Martinez-Zarzoso and Nowak-Lehmann improved the model by introducing a new infrastructure index to improve measurement of transport cost which is not only a function of distance but also public infrastructure. Greenway and Milner (2002) discussed and addressed econometric issues confronted when applying the gravity model to analyze trade between regional or economic blocs. Loungani, Mody and Razin (2002) and Hutchinson (2002), among others, contributed to the refinement of the explanatory variables considered in the analysis and to the addition of new variables.

Gravity models have been extensively used to evaluate the trade effects between regional blocs. Martinez-Zarzoso (2003) used the gravity model to evaluate the effects of preferential agreements between several regional blocs: the European Union (EU), the North American Free Trade Area (NAFTA), the Caribbean Community (CARICOM), the Centro-American Common Market (CACM) and other Mediterranean states (MEDIT). Martinez-Zarzoso found that the dummy variables for the membership of trade blocs show mixed results. However, he found that as a result of trade preference schemes among member states of a particular trade bloc, there is an increase in intra-trade among the member states. In his study, Martinez-Zarzoso found that there is an increase in intra-trade among EU members and the NAFTA members.

In two separate studies, Tang (2003) applied the gravity model to examine the effect of European Union integration on trade with the APEC states, and Hassan (2003) examined intra-trade among the South Asian Association for Regional Cooperation (SAARC) member states. In contrast to other studies, Tang did not include distance as an independent variable to analyze trade between the EU and APEC states, which is not in line with the basic structure of the gravity model. On the other hand, distance is included in Hassan as an independent variable, but it is not transformed into the logarithmic form as is the standard practice in most other studies such as Aitken (1973), Pelzman (1974), Loungani, Mody, and Razin (2002). This shortcoming raises questions on the validity of the findings of Hassan's study.

As in Bougheas, Demetriades, and Morgenroth (1999) and Martinez-Zarzoso and Nowak-Lehmann (2003), Batra (2004) employed the augmented gravity model approach in an attempt to analyze India's global trade potential. The dummy variable for intra-regional

trade is found to be highly significant, implying that regional trading arrangements (RTAs) led to trade creation among member countries.

The study by Yamarik and Ghosh (2005) provides an important examination of the robustness of variables used in the gravity model literature. By using a variant of Leamer's extreme bounds analysis, the sign and significance of the variables of interest to changes in the conditioning set of variables are tracked and the fragility of the coefficient estimates are tested to identify which independent variables are robustly linked to bilateral trade. Fifty variables were identified based on past studies, where bilateral trade treated as the dependant variable, the product of real GDP and bilateral distance treated as core variables. The remaining forty-seven variables were grouped into eight categories, namely, level of development, relative development, trade policy, linguistic and historical ties, geographic factors, exchange rate risk, relative factor endowments, and regional trading arrangements (RTAs). Yamarik and Ghosh (2005) found twenty variables that are robustly linked to bilateral trade, with the variables corresponding to the level of development, trade policy, linguistic and colonial ties, geographic factors, relative population density, common currency, and membership in five RTAs, i.e., CACM, Caricom, Mercosur, ANZCERTA, and APEC. These findings can serve as a point of reference for selecting new potential determinants of international trade in future studies that use the gravity model analysis.

Gravity models have also been applied in studies on ASEAN economic integration, such as the study by Tayyebi (2005). Tayyebi argued that any attempt at estimating a gravity equation assuming the intercept is homogeneous for trading-partner pairs yield biased results. Allowing the country pair intercept terms to vary, Tayyebi estimated a panel data on ASEAN member countries and their major trade partners for the period 1994-2000

using the Fixed Effects model. The results indicate that trade integration has increased trade flows among the ASEAN member countries. The study also found that integration in ASEAN has led to increase in the exports and imports of ASEAN members to non-members.

In estimating the economic effect of ASEAN-U.S FTAs using the gravity model, Naya and Plummer (2006) included currency union, common language, common land border, whether one of the countries is landlocked, whether one of the countries is an island, and whether the two countries were recently colonies of the same country. They also added two dummy variables for two specifications of ASEAN partnership, (i) where both trading partners for a given bilateral trade flow are in ASEAN; and (ii) where one of the trading partners is an ASEAN member. The purpose of including these dummy variables is not only to capture ASEAN membership, but also to understand how well ASEAN countries have performed in general. The study found that being part of ASEAN as a regional grouping does indeed matter. Controlling for all other variables, Naya and Plummer found that ASEAN countries trade more with each other. Another highlight of the finding is that the estimated coefficient for the second ASEAN dummy variable is statistically significant in all regressions, but is especially large in the case of U.S and EU bilateral trade.

In a very recent study, DeRosa (2007) employed a variation of the gravity model formulated by Rose (2004) to examine the trade effects of preferential trading arrangements (PTAs). This study was actually conducted to examine “new” evidence found in a study undertaken by the Australian Productivity Commission (APC) that indicates that the majority of PTAs today lead to trade diversion. DeRosa (2007) estimated the augmented Rose (2004) gravity model incorporating both bilateral total trade

data and bilateral data on trade in manufacturing to investigate whether free trade arrangements (FTAs) and PTAs lead to trade creation or trade diversion. Within Rose's (2004) augmented gravity model, DeRosa (2007) explored the effects of PTAs using the ordinary random effects (RE) regression model and Tobit RE regression model. DeRosa (2007) obtained mixed results on the coefficient estimates for the PTA indicator variables. Some PTAs are found to be trade diverting, whereas some are trade creating. DeRosa (2007), however, reported that the frequency of net trade creating versus net trade diverting PTAs is considerably higher than 50% across the different interval and estimation techniques used in the study.

The discussion above has shown that there have been a considerable number of studies that examine regional economic integration in ASEAN through employing various methods including the gravity model. However, very few studies have looked at the effects of regional integration at the sectoral level, and none that employs a systematic disaggregation based on the Standard International Trade Classification (SITC) one-digit level. In addition, the inclusion of variables in the augmented gravity models is found to be rather ad hoc in nature which may affect the consistency of the results. This study attempts to provide a deeper analysis of ASEAN economic integration using the augmented or extended gravity model by examining the effects at the sectoral SITC Revision 2, one-digit level, in addition to re-examining the overall presence of trade creation or diversion within ASEAN. The variables included in the extended gravity model are mainly those that are found to be robust based on Yamarik and Ghosh (2005). The policy implications of the results are also provided which is found to be lacking in most of the related studies in the past.

4. METHODOLOGY AND DATA

As presented in Anderson (1979) and Oguledo and Macphee (1994), the gravity equation is derived from a linear expenditure system. The case of many commodity classes of goods flowing between each country *i* and *j* is considered in this study, integrating transport costs proxied by distance. In deriving the gravity equation, the overall preference function is assumed to be weakly separable with respect to the partition between traded and non-traded goods, while preferences for traded goods are assumed to be identical across countries and homothetic. Accordingly, for the purpose of simplicity, the utility function is assumed to take the Cobb-Douglas form with identical preferences and expenditure shares. Given the level of expenditure on traded goods, demands for individual traded goods are determined as if a homothetic utility function in traded goods alone was maximised subject to a budget constraint involving expenditure on traded goods. The traded goods share varies across regions and countries and has been found to be explained well by income and population (see Kuznets, 1966; Maizels, 1968). In addition, the linear or log-linear regression lines of traded goods' shares on income and population tend to be stable over time.

The gravity model used in this study describes the relationship between bilateral trade to core factors such as GDP and distance. Rather than extending the gravity model beyond the core in an ad hoc manner as found in many earlier works, this study extends the gravity model by including additional factors that are found to be robust in the sensitivity analysis of gravity models conducted by Yamarik and Ghosh (2005). These factors include level of development as represented by the sum of manufacturing exports as a percentage of merchandise exports, factor endowment as represented by population, geographical

factors as represented by adjacency of one country to another and surface area, regional trading arrangement represented by membership in the ASEAN, as well as trade policy as represented by tariff rates. However, two additional variables are also included in the extended gravity model, namely relative development as represented by the log difference of real GDP per capita and exchange rate risk as represented by exchange rate volatility. This is for the purpose of investigating whether member countries' similarities or dissimilarities matter in determining trade, as well as whether there is a need to establish exchange rate policy coordination within ASEAN in order to ensure stable exchange rates in promoting trade.

The dependent variables are total bilateral exports as well as exports at the one-digit Standard International Trade Classification (SITC) disaggregated level, i.e., from SITC 0 to SITC 9.[6] Hence, eleven gravity equations are formulated and estimated using the Panel Data procedure for the five founding members of ASEAN, namely Indonesia, Malaysia, the Philippines, Singapore, and Thailand and their three major trading partners, namely Japan, the UK, and the US. Due to constraints in obtaining complete data for all the pairs of trading countries, estimations that exclude tariff as well as volatility utilize data from 1989 until 2006 while for estimations that include volatility the data spans only from 1992 to 2006.[7] Estimations that include tariff face even larger data constraints to the extent that estimations can only be done for four years, i.e., 2001, 2003, 2005 and 2006.

[6] For SITC 2 and SITC 5, Singapore's exports to Indonesia had to be omitted in all the estimations due to incomplete data.

[7] This is due to unavailable monthly exchange rate data for Indonesia' and the Philippines from the Bloomberg database, which is one of the most comprehensive online real time database for data on global financial markets, among others.

Following Yamarik and Ghosh (2005) and taking into consideration bilateral trade data with zero data values,[8] this study estimates the gravity model by scaling the trade values by adding the number 'one' to the export values. Thus, the extended gravity model (without tariff) can be written as:

Without volatility:

$$\ln(1+X_{ij}) = \alpha_0 + \alpha_1 \ln Y_i Y_j + \alpha_2 \ln Distance + \alpha_3 Abs \ln(YPC_i - YPC_j) + \alpha_4 Border + \alpha_5 \ln(A_i A_j) + \alpha_6 \ln(N_i N_j) + \alpha_7 \left(\frac{manuf}{X_i} + \frac{manuf}{X_j} \right) + \alpha_8 ASEAN + \varepsilon_{ij} \quad (1)$$

With volatility:

$$\ln(1+X_{ij}) = \alpha_0 + \alpha_1 \ln Y_i Y_j + \alpha_2 \ln Distance + \alpha_3 Abs \ln(YPC_i - YPC_j) + \alpha_4 Border + \alpha_5 \ln(A_i A_j) + \alpha_6 \ln(N_i N_j) + \alpha_7 \left(\frac{manuf}{X_i} + \frac{manuf}{X_j} \right) + \alpha_8 ASEAN + \alpha_9 Volatility_{ij} + \varepsilon_{ij} \quad (2)$$

Both models are later re-estimated individually using disaggregated exports from SITC 0 to SITC 9 as dependent variables. In order to see the effects of tariffs, cross-section estimations of equations (1) and (2) are also undertaken for the years 2001, 2003, 2005 and 2006. All variable definitions and sources are given in Table 4. Hence, four main models are estimated in this study:

Model I: Extended gravity model without tariffs and volatility (1989-2006)

Model II: Extended gravity model without tariffs and with volatility (1992-2006)

Model III: Extended gravity model with tariffs and without volatility (2001, 2003, 2005, 2006)

[8] Zero data values may reflect small trade values (i.e., less than USD 0.5 million) that still need to be captured in the estimation.

Model IV: Extended gravity model with tariffs and volatility

(2001, 2003, 2005, 2006)

The effects of income variables (Y_i,Y_j) on trade flows are expected to be positive. This is due to the fact that an increase in income will result in greater production available for exports. In addition, a rise in income usually leads to an increase in imports. *Distance*[9] is a proxy variable for natural trade resistance which is a composite of transportation costs and transport time (Aitken, 1973). Long distance between trading countries, *ceteris paribus*, leads to higher costs and a lower profit margin to the importer. Consequently, *Distance* is hypothesized to have a negative effect on exports.

The sign of the coefficients of the absolute difference in per capita income $Abs(\ln YPC_i - \ln YPC_j)$ which represents relative development is, however, indeterminate since real GDP per capita can be either trade enhancing or trade inhibiting. If trade is driven more by the theory of comparative advantage, then the variable is trade enhancing and the sign is positive. The more countries differ, the more they will trade with each other. On the other hand, it is also possible that the more alike countries are, the more trade will take place since countries with similar levels of development have similar preferences. This is also known as the Linder hypotheses, in which case relative development is considered to be trade inhibiting, hence the sign is negative (Seyed Komali Tayyebi, 2005, and Yamarik and Ghosh, 2005).

[9]Despite extensive efforts made, data on actual transportation cost for each country could not be obtained. Hence, the variable *Distance* has been maintained as a proxy to transportation cost as is the standard practice for gravity models.

In order to examine the effects of the adjacency of countries that represents a geographic factor, the *Border* dummy variable is included in the model. Since neighborliness generally stimulates trade due to similarity of tastes and an awareness of common interests (Balassa, 1961), the coefficient of the variable is expected to be positive. The sign of the coefficients of another geographic factor namely $\ln(A_i A_j)$ is expected to be negative. It is argued that countries with larger surface area should have a higher transportation cost, *ceteris paribus* than the countries with smaller surface areas, thus can affect negatively the volume of trade (Yamarik and Ghosh, 2005).

The sign of the coefficients of the population variables $\ln(N_i N_j)$ is, however, indeterminate since population size can be trade enhancing as well as trade inhibiting. According to Oguledo and Macphee (1994), a large population may, on the one hand, indicate large resource endowment, self-sufficiency and less reliance on international trade. On the other hand, it is possible that a large domestic market (or population) would promote division of labour, and thus, create an opportunity for trade in a wide variety of goods. Based on the latter argument, the expected sign of the population coefficient is positive.

One of the variables that capture the level of development is the manufactures export as a percentage of merchandise exports which is denoted by $\frac{manuf}{X_i} + \frac{manuf}{X_j}$ in the model. The sign of the coefficient of this variable is expected to be positive since the more developed the economies are, the higher the trade will be (Yamarik and Ghosh, 2005).

ASEAN is a dummy variable representing preferential trading agreements among the Association of South East Asian Nations. A positive coefficient indicates trade creation among the ASEAN members while a negative coefficient indicates trade diversion (DeRosa, 2007).

Since the variability of bilateral exchange rates can also affect the export volume of two countries, the $Volatility_{ij}$ variable is added in the model. It measures the standard deviation of the first difference in monthly bilateral real exchange rate for every year (Yamarik and Ghosh, 2005). The sign of the coefficient is, however, indeterminate since volatility can either have positive or negative effects on trade. Previous studies such as Brada & Mendez, (1988) and Yamarik and Ghosh (2005) reported negative values, whereby an increase in exchange rate risk tend to lower trade flows. In contrast, other research such as Poon, Choong & Habibullah (2005) and Chou (2000) showed mixed results, whereby the signs of the exchange rate volatility were both found to be positive and negative. The positive sign implies that an increase in the exchange rate volatility imposes cost on risk averse market participants which then respond by trading at the margin and thus induces exports.

As mentioned earlier, an additional variable namely tariff is regressed on cross-section estimations of equations (1) and (2) for the years 2001, 2003, 2005 and 2006. The variable $Trf_i + Trf_j$ is the sum of average tariff of the trading partners. The sign of the coefficient of the tariff variable is expected to be negative, as higher trade restrictions decrease trade (Yamarik and Ghosh, 2005).

Table 4:
List of Variables and Data Sources

Variable	Definition	Source
Dependent variable		
$\ln(1+X_{ij})$	Scaled export values (i.e., 1+ export values) between countries *i* and *j* in logarithmic form (measured in real US million dollars).	*United Nations COMTRADE Data*, World Integrated Trade Solution (WITS) Database.
$\ln(1+X_{ij}^{PC})$	Scaled export values (i.e., 1+ export values) of 1-digit level product classification between countries *i* and *j* in logarithmic form (measured in real US million dollars).	
Core factors		
$\ln Y_i Y_j$	Gross domestic product of countries *i and j* in multiplicative and logarithmic form (measured in real US million dollars).	*International Financial Statistics, CD-ROM* (2007)
$\ln Distance$	Distance between two countries from capital cities in logarithmic form (measured in kilometers).	http://www.chemical-ecology.net/java/lat-long.htm
Relative development $Abs(\ln YPC_i - \ln YPC_j)$	The difference of real GDP per capita of countries *i and j* in logarithmic and absolute form (measured in real US million dollars).	*International Financial Statistics, CD-ROM* (2007)
Level of development $\frac{manuf}{X_i} + \frac{manuf}{X_j}$	The sum of manufactures exports (% of merchandise exports)	*United Nations COMTRADE Data*, World Integrated Trade Solution (WITS) Database.
Trade Policy $Trf_i + Trf_j$	Sum of mean tariff rates of trading partners (measured as ratio of import duties to imports)	*United Nations TRAINS Data*, World Integrated Trade Solution (WITS) Database.

Geographical factor Border $\ln(A_i A_j)$	A dummy variable which takes the value of one if two countries have a common border and zero otherwise. Product of surface areas of both countries in logarithmic form	 *World Development Indicators Database*
Exchange rate risk $Volatility_{ij}$	Standard deviation of first difference in monthly bilateral real exchange rate during previous 5-year period	*Bloomberg Professional Service Database*
Factor endowment $\ln(N_i N_j)$	The sum of population (measured in millions) of exporter country *i* and importer country *j* in logarithmic form.	*International Financial Statistics, CD-ROM* (2007).
Regional trading arrangements *ASEAN*	A dummy variable which takes the value of one if the exporting country is a member of the ASEAN and zero otherwise	

5. ANALYSIS OF RESULTS

5.1 GRAVITY MODEL RESULTS WITHOUT TARIFFS

In this part of the analyses, eleven[10] panel data estimations[11] were performed, without and with volatility. Using the Hausman Test, the fixed effect approach was found to be applicable for all the equations.[12] In addition, all the estimation results have been corrected for autocorrelation where necessary.

Table 5 shows the results of panel data estimations of 630 observations of ASEAN members with their major trading partners for the years 1989 to 2006 for each of the eleven equations. The variables of the gravity models are found to explain the variation of export trade values quite well where the adjusted *R*-squared varies from 71.9 per cent (for SITC 9) to as high as 98.2 per cent (for total trade). The estimation results show that the gross domestic product (GDP) has a significant positive effect on trade as expected. Except for SITC 9 in which it is negative, all the GDP coefficients show consistent results and the elasticities are found to be between 0.156 per cent (total exports) and 0.811 per cent for chemicals & materials (SITC 5).

[10] The first estimation uses total bilateral exports, while the second until the last estimations use disaggregated bilateral exports at SITC 0 to SITC 9.

[11] Panel data estimation is preferred to the ordinary least squares method due to the fact that the latter assumes the intercept is homogenous for trading-partner pairs and yields biased results. In addition, the use of panel data methodology has several advantages over cross section OLS analysis. First, panel data captures the relevant relationships among variables over time. Second, panel data is able to monitor the possible unobservable trading-partner pairs' individual effects (Martinez-Zarzoso and Nowak-Lehmann, 2003).

[12] There are two approaches in panel data estimations, namely the random effect approach and the fixed effect approach. The former assumes the intercept of each cross-sectional unit is random and uncorrelated with the independent variables while the latter allows the intercept to differ (Gujarati, 2003). In order to determine whether the random effect of the fixed effect model is applicable, a formal test developed by Hausman in 1978 is normally utilized as a standard procedure in panel data estimations. In this study, the null hypothesis that the independent variables and the individual effects are uncorrelated is rejected at the 1 per cent significance level for all the models estimated.

Although negative for almost all classifications, the coefficients of *Distance* are significant for only SITC 0, SITC 2, SITC 6 and SITC 7. This finding implies that distance have a negative effect on exports for food & live animals, crude materials, manufactured goods and machinery & transport equipment, respectively. In contrast, the coefficient of relative development (i.e., $Abs(\ln YPC_i - \ln YPC_j)$) has a significant positive sign for SITC 2 only. This result implies that the more the two countries differ, the more trade will take place for the crude materials category, hence conforming to the standard comparative advantage theory for this item.

The *Border* dummy variable examines the effect of adjacency of countries on trade. It is found that the coefficient estimate of *Border* is positive only for SITC 1 while the rest of the coefficients are either insignificant or negative. Hence, it seems that neighborliness only stimulates export of beverages and tobacco (SITC 1).

Surface area, namely $\ln(A_i A_j)$, as another geographic factor is found to be negatively related to trade only for chemicals & materials (SITC 5). This finding implies that countries with larger surface areas, in general, do not necessarily have a higher transportation cost than countries with smaller surface areas and does not necessarily affect the volume of trade in a negative sense.

Table 5 also suggests that the variable $\ln(N_i N_j)$, which reflects factor endowments of the two countries, is significant but with opposite signs for SITC 5 and SITC 9. The positive coefficient of 0.737 for SITC 5 suggests that differences in factor endowment increases export volume of chemicals & materials, while the negative coefficient of -2.797 for SITC 9 suggests otherwise for other commodities.

The sum of manufactures export as a percentage of merchandise exports which is denoted by $\frac{manuf}{X_i} + \frac{manuf}{X_j}$ captures the level of development. It is found to have a positive impact on trade for beverages & tobacco (SITC 1), chemicals & materials (SITC 5), machinery & transport equipment (SITC 7) and miscellaneous manufactures (SITC 8). The findings imply that the more developed the economies are, the higher the trade will be in these four product classifications.

The final results in Table 5 are the estimates associated with *ASEAN* in which it reflects the integration effect of five ASEAN members on the trade flows of ASEAN and their major trading partners. A positive and significant coefficient which indicates trade creation among the ASEAN members is found in beverages & tobacco (SITC 1) and chemicals & materials (SITC 5), while a negative and significant coefficient which indicates trade diversion is found in machinery & transport equipment (SITC 7), miscellaneous manufactures (SITC 8) and other commodities (SITC 9).

The estimation results of gravity model specification with the additional variable $Volatility_{ij}$ is obtained and summarized in Table 6. As for the core variables namely, GDP and distance, the coefficient estimates are similar as in Table 5. However, for other variables there are some variations from Table 5 in the signs and significance levels of the estimates. Overall, the variables of gravity model explain the variation of export trade values reasonably well where the adjusted *R*-squared varies from as low as 71.8 per cent (for SITC 9) to as high as 97.9 per cent (for total trade).

The coefficient for *ASEAN* is found to be positive and significant for SITC 1 and negative and significant for SITC 9. Hence, the evidence of trade creation only appears for beverages & tobacco (SITC 1) while the evidence of trade diversion seems to occur for other commodities (SITC 9).

The coefficient of $Volatility_{ij}$, defined as the standard deviation of the first difference in monthly bilateral real exchange rate on a yearly basis, is found to conform to *a priori* expectation which is negative for SITC 3 and SITC 7. This finding implies that an increase in exchange rate risk lower trade flows for these 2 product classifications namely minerals and fuels and machinery and transport equipment.

Table 5:
Model I: Estimation Results of Gravity Model Specification 1989-2006 (Without Tariffs and Volatility)

	Dependent variable: $ln(1+X_{ij})$	**Dependent variable:** $\ln(1+X_{ij}^{PC})$									
	Total	**SITC 0**	**SITC 1**	**SITC 2**	**SITC 3**	**SITC 4**	**SITC 5**	**SITC 6**	**SITC 7**	**SITC 8**	**SITC 9**
lnY_iY_j	0.156*** (4.443)	0.175*** (3.117)	0.447*** (3.109)	0.475*** (3.434)	0.595** (2.315)	0.470** (2.536)	0.811*** (4.289)	0.266*** (4.607)	0.179*** (2.621)	0.279*** (5.009)	-0.805*** (-2.993)
ln Distance	-0.583 (-1.099)	-0.939* (-1.791)	0.057 (0.094)	-0.893* (-1.871)	-1.465 (-1.504)	-0.807 (-1.074)	-0.390 (-0.549)	-1.476** (-2.407)	-0.968** (-2.109)	-0.597 (-1.156)	-1.540 (-1.546)
$Abs(\ln YPC_i - \ln YPC_j)$	0.030 (0.551)	0.068 (0.828)	-0.033 (-0.196)	0.466*** (3.341)	0.140 (0.492)	0.215 (0.995)	0.181 (1.037)	-0.017 (-0.196)	-0.082 (-0.869)	-0.022 (-0.265)	-0.007 (-0.024)
Border	-0.364 (-0.378)	-0.229 (-0.239)	1.895* (1.717)	0.047 (0.051)	1.515 (0.858)	0.470 (0.343)	1.197 (1.259)	-0.574 (-0.511)	-0.346 (-0.417)	0.414 (0.438)	-1.360 (-0.750)
$\ln(A_iA_j)$	0.343 (1.485)	0.153 (0.687)	-0.161 (-0.638)	0.228 (1.411)	-0.650 (-1.630)	0.449 (1.461)	-0.389** (-2.195)	0.439 (1.621)	0.095 (0.501)	0.211 (0.957)	0.856** (2.034)
$\ln(N_iN_j)$	-0.779 (-1.635)	0.100 (0.222)	0.050 (0.099)	-0.358 (-1.050)	1.292 (1.604)	-0.754 (-1.224)	0.737** (2.420)	-0.358 (-0.670)	-0.218 (-0.555)	-0.376 (-0.841)	-2.797*** (-3.301)
$\frac{manuf}{X_i}+\frac{manuf}{X_j}$	-0.001 (-0.646)	-0.002* (-1.709)	0.002 (0.509)	0.007** (2.302)	0.011 (1.512)	-0.004 (-0.771)	0.013*** (3.188)	0.001 (0.946)	0.022*** (12.189)	0.009*** (6.188)	-0.113*** (-14.585)
ASEAN	0.072 (0.071)	-0.797 (-0.844)	2.228* (1.889)	-1.520 (-1.464)	1.253 (0.654)	0.534 (0.364)	2.493** (2.151)	-0.437 (-0.395)	-1.496* (-1.870)	-1.703* (-1.899)	-8.566*** (-4.336)
Constant	18.213*** (4.362)	13.687** (3.186)	3.764 (0.675)	6.791 (1.292)	16.773* (1.826)	3.422 (0.492)	1.965 (0.302)	13.899*** (2.817)	17.390*** (4.563)	11.688*** (2.822)	59.436*** (6.296)
R^2	0.982	0.960	0.849	0.893	0.831	0.817	0.889	0.949	0.963	0.979	0.724
Adjusted-R^2	0.982	0.959	0.846	0.892	0.828	0.815	0.887	0.948	0.963	0.979	0.719
Durbin-Watson	2.085	2.302	2.158	2.068	2.569	2.458	2.053	2.407	2.448	2.489	2.344
F-statistics	3558.887	1553.321	364.081	560.071	317.079	291.144	533.268	1216.374	1695.771	3013.334	170.240

Notes: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Figures in parentheses represent *t*-values.

Table 6:
Model II: Estimation Results of Gravity Model Specification 1989-2006 (Without Tariffs and With Volatility)

	Dependent variable: $ln(1+X_{ij})$	**Dependent variable:** $\ln(1+X_{ij}^{PC})$									
	Total	**SITC 0**	**SITC 1**	**SITC 2**	**SITC 3**	**SITC 4**	**SITC 5**	**SITC 6**	**SITC 7**	**SITC 8**	**SITC 9**
lnY_iY_j	0.165*** (4.582)	0.158*** (2.942)	0.488*** (3.668)	0.268*** (3.447)	0.527** (2.027)	0.446** (2.454)	0.102* (1.735)	0.252*** (4.420)	0.162*** (2.624)	0.210*** (3.830)	-0.690*** (-2.683)
ln Distance	-0.429 (-0.989)	-0.772 (-1.458)	0.066 (0.111)	-1.649*** (-3.097)	-1.475 (-1.524)	-1.000 (-1.194)	1.684 (0.558)	-1.399* (-1.938)	-0.754* (-1.668)	-0.826 (-0.996)	-1.746** (-2.126)
$Abs(\ln YPC_i - \ln YPC_j)$	0.037 (0.652)	0.070 (0.849)	-0.116 (-0.711)	-0.196* (-1.834)	0.284 (0.988)	0.270 (1.193)	-0.071 (-0.635)	-0.027 (-0.299)	0.000 (-0.003)	-0.096 (-1.081)	-0.083 (-0.315)
Border	-0.160 (-0.201)	-0.001 (-0.001)	2.091* (1.924)	-0.758 (-0.765)	1.016 (0.574)	0.140 (0.091)	3.497 (0.637)	-0.267 (-0.201)	-0.203 (-0.246)	-0.490 (-0.321)	-2.627* (-1.728)
$\ln(A_iA_j)$	0.217 (1.166)	0.117 (0.523)	-0.157 (-0.634)	0.179 (0.758)	-0.425 (-1.065)	0.626* (1.784)	1.672*** (2.595)	0.433 (1.362)	0.146 (0.764)	0.592 (1.557)	0.978*** (2.808)
$\ln(N_iN_j)$	-0.503 (-1.313)	0.172 (0.373)	0.092 (0.185)	0.358 (0.715)	0.903 (1.118)	-1.120 (-1.588)	-3.714*** (-2.620)	-0.287 (-0.447)	-0.285 (-0.713)	-0.966 (-1.280)	-3.055*** (-4.329)
$\frac{manuf}{X_i}+\frac{manuf}{X_j}$	0.001 (1.369)	0.000 (-0.038)	0.003 (0.787)	-0.006** (-2.333)	0.011 (1.267)	-0.010 (-1.623)	0.002 (0.786)	0.005*** (3.018)	0.024*** (12.571)	0.012*** (7.266)	-0.113*** (-12.506)
$Volatility_{ij}$	0.000 (0.322)	0.000 (0.596)	0.000** (2.392)	0.000** (2.002)	-0.001** (-2.382)	0.000 (-1.439)	0.000 (1.442)	0.000 (-0.008)	-0.0001* (-1.710)	0.000 (0.625)	0.001 (1.466)
ASEAN	0.142 (0.172)	-0.331 (-0.341)	2.417** (2.141)	-1.263 (-1.210)	1.300 (0.685)	0.225 (0.143)	3.934 (0.789)	-0.268 (-0.206)	-0.833 (-1.064)	-1.142 (-0.756)	-8.176*** (-4.844)
Constant	16.409*** (4.795)	12.235*** (2.844)	2.394 (0.450)	15.817*** (3.888)	15.390* (1.691)	5.054 (0.681)	0.754 (0.041)	12.678* (2.203)	14.477*** (3.941)	10.603 (1.627)	58.561*** (7.184)
R^2	0.979	0.962	0.866	0.953	0.817	0.825	0.966	0.950	0.964	0.979	0.723
Adjusted-R^2	0.979	0.961	0.863	0.952	0.814	0.821	0.966	0.949	0.963	0.978	0.718
Durbin-Watson	2.028	2.189	2.081	2.198	2.586	2.695	2.262	1.933	2.051	2.372	2.115
F-statistics	2389.689	1280.389	326.918	1002.298	225.424	237.932	1414.831	962.876	1357.947	2345.439	132.079

Notes: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Figures in parentheses represent *t*-values.

5.2 GRAVITY MODEL RESULTS WITH TARIFFS

5.2.1 WITHOUT VOLATILITY

Tables 7 – 10 show the results of the estimations of the augmented gravity model with tariff for the years 2001, 2003, 2005, and 2006. The estimation results show that the dummy variable for ASEAN is found to be positive and significant for the four selected years. This shows that regional arrangement resulted in trade creation among ASEAN member countries. The coefficients of ASEAN dummy variables are found to be significant for all years in beverages and tobacco (SITC 1), minerals & fuels (SITC 3), chemicals & materials (SITC 5), and machinery & transport equipment (SITC 7). The results indicate that there is trade creation in these sectors as a result of trade arrangements in ASEAN economies.

Result on tariff shows that it is not a significant determinant of intra-trade among ASEAN countries. Tariff is found to be important influencing trade for food & live animals (SITC 0) for 2001, crude materials (SITC 2) for 2006, and animals & vegetable fat (SITC 4) for all years. However the sign of the tariff coefficients for SITC 0 and SITC 2 is positive.

For the core variables, our results are consistent with the gravity model which predicts that trade would increase with GDP and decrease with distance. Regression results on total trade for all the years show that bilateral trade depends positively upon the size of the two economies represented by the product of real GDP. Results on the other core variable, i.e., distance, confirm *a priori* expectation that distance has a negative influence on bilateral trade. The GDP variable also performs well in the estimations at the sectoral level. GDP is found to be an important factor affecting international trade in all sectors except for

animals and vegetable fat (SITC 4) and other commodities (SITC 9). At the sectoral level, distance is found to negatively influence trade for food & live animals (SITC 0), crude materials (SITC 2), minerals & fuels (SITC 3), manufactured goods (SITC 6), and machinery & transport equipment (SITC 7).

Our results seem to support both hypotheses on the effects of the relative level of development on international trade, firstly the theory of comparative advantage which argues that the more countries differ the more likely that they will trade with each other. Secondly, the Linder (1961) hypothesis that states that countries with the same levels of development will have same the tastes and are likely to trade more with each other. We find that at the sectoral level, the variables that represent relative development, $Abs(\ln YPC_i - \ln YPC_j)$ is important in influencing bilateral trade for food & live animals (SITC 0), chemicals & materials (SITC 5), manufactured goods (SITC 6), and miscellaneous manufactures (SITC 8). With regards to the level of development which is represented by the variable, $\frac{manuf}{X_i} + \frac{manuf}{X_j}$, the results indicate that it is not an important factor in determining trade between the country pairs for all sectors except for machinery & transport equipment (SITC 7).

The results show that variables that represent geographical factors; *Border*, a dummy variable with a value of 1 if the two countries share a common land border and $\ln(A_i A_j)$, which is the log product of the surface areas of country *i* and *j*, are not significant in determining intra-trade among ASEAN countries. Results at the sectoral level also show that common border does not play a significant role in influencing trade except for beverages and tobacco (SITC 1). The coefficients of the log product of the surface areas of

country *i* and country *j* are found to be significant for animals & vegetable fat (SITC 4) and machinery & transport equipment (SITC 7), however, the signs are contrary to expectations.

Results on the variable that represents factor endowment, $\ln(N_i N_j)$ is significant with a negative sign. As explained by Oguledo and Macphee (1994), a large population may indicate large resource endowment and self-sufficiency, therefore less reliance on international trade. The results at the sectoral level indicate that the coefficients of $\ln(N_i N_j)$ are significant only for SITC 7 (machinery & transport equipment) with also negative signs.

Table 7:
Model III(a): Estimation Results of Gravity Model Specification 2001 (Without Volatility)

	Dependent variable: $ln(1+X_{ij})$	**Dependent variable:** $\ln(1+X_{ij}^{PC})$									
	Total	**SITC 0**	**SITC 1**	**SITC 2**	**SITC 3**	**SITC 4**	**SITC 5**	**SITC 6**	**SITC 7**	**SITC 8**	**SITC 9#**
lnY_iY_j	1.360*** (10.688)	2.025*** (5.490)	1.365** (2.758)	1.006** (2.629)	4.581*** (4.197)	0.762 (1.163)	1.711*** (5.077)	1.168*** (4.576)	1.374*** (11.097)	1.350*** (6.226)	1.033 (1.490)
ln Distance	-0.549*** (-3.082)	-0.736* (-2.057)	0.199 (0.286)	-1.889*** (-3.551)	-2.121* (-1.970)	-1.033 (-1.221)	-0.807* (-1.761)	-1.073*** (-3.184)	-0.468** (-2.690)	-0.217 (-0.715)	-0.299 (-0.360)
$Abs(\ln YPC_i - \ln YPC_j)$	0.175** (2.750)	0.247* (1.912)	0.075 (0.298)	0.103 (0.539)	-0.076 (-0.202)	0.004 (0.013)	-0.436** (-2.648)	0.229* (1.932)	0.180*** (2.908)	0.318*** (2.885)	-0.339 (-0.951)
Border	-0.081 (-0.243)	0.941 (1.380)	2.398* (1.804)	-1.273 (-1.228)	-0.003 (-0.001)	-1.630 (-1.001)	-0.225 (-0.253)	-0.295 (-0.474)	-0.321 (-0.983)	0.427 (0.735)	0.756 (0.493)
$\ln(A_iA_j)$	0.106 (1.253)	0.007 (0.051)	-0.296 (-0.856)	0.318 (1.418)	-0.893 (-1.536)	0.717* (2.016)	-0.029 (-0.139)	0.099 (0.480)	0.228** (2.677)	0.146 (1.098)	-0.363 (-0.479)
$\ln(N_iN_j)$	-0.642*** (-4.184)	-0.561 (-1.507)	0.112 (0.168)	-0.566 (-1.264)	0.439 (0.493)	-0.701 (-0.950)	-0.474 (-1.207)	-0.418 (-1.252)	-1.003*** (-6.395)	-0.805*** (-3.111)	0.436 (0.203)
$\frac{manuf}{X_i}+\frac{manuf}{X_j}$	0.921** (2.698)	-0.017 (-1.254)	0.020 (0.910)	-0.013 (-0.732)	-0.028 (-0.368)	0.041 (1.477)	-0.016 (-1.102)	-0.017 (-1.684)	0.042*** (6.207)	0.006 (0.595)	0.031 (0.905)
ASEAN	0.893*** (4.878)	4.575*** (3.318)	5.204** (2.395)	-0.079 (-0.048)	11.958*** (3.699)	4.371 (1.619)	4.099*** (2.879)	1.372 (1.320)	2.943*** (5.490)	1.555 (1.637)	2.393 (0.924)
$Trf_i + Trf_j$	2.113 (0.686)	0.175*** (3.052)	0.017 (0.897)	-0.027 (-0.234)	1.132 (0.928)	-0.430*** (-4.540)	0.000 (-0.001)	0.045 (0.873)	0.036 (0.972)	0.000 (0.015)	-0.329 (-0.668)
Constant	32.599*** (-3.071)	-51.951*** (-3.414)	-55.074* (-1.867)	-2.621 (-0.122)	-167.586*** (-3.950)	-13.572 (-0.384)	-36.428* (-1.874)	-15.684 (-0.964)	-19.781** (-2.543)	-21.331* (-1.713)	-43.025 (-0.899)
R^2	0.921	0.739	0.476	0.588	0.643	0.617	0.687	0.754	0.946	0.897	0.570
Adjusted-R^2	0.893	0.645	0.288	0.434	0.515	0.479	0.570	0.666	0.926	0.861	0.383
Durbin-Watson	2.113	1.729	2.053	2.176	2.025	2.416	1.985	1.531	2.124	1.989	1.704
F-statistics	32.599	7.859	2.526	3.808	5.007	4.473	5.857	8.526	48.248	24.320	3.051

Notes: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Figures in parentheses represent *t*-values.

Table 8:
Model III(b): Estimation Results of Gravity Model Specification 2003 (Without Volatility)

	Dependent variable: $ln(1+X_{ij})$	**Dependent variable:** $\ln(1+X_{ij}^{PC})$									
	Total	**SITC 0**	**SITC 1**	**SITC 2**	**SITC 3**	**SITC 4**	**SITC 5**	**SITC 6**	**SITC 7**	**SITC 8**	**SITC 9**
$ln Y_i Y_j$	1.332*** (9.743)	0.851*** (3.324)	1.051** (2.212)	1.151*** (3.138)	3.143*** (3.056)	0.587 (0.710)	2.028*** (5.795)	0.938*** (5.757)	1.492*** (10.764)	1.386*** (6.115)	0.344 (0.396)
ln Distance	-0.431*** (-3.124)	-0.874*** (-3.377)	0.016 (0.019)	-1.565*** (-3.243)	-1.618* (-1.921)	-1.428* (-1.738)	-0.543 (-1.178)	-1.227*** (-5.326)	-0.492** (-2.652)	-0.050 (-0.167)	-0.629 (-0.928)
$Abs(\ln YPC_i - \ln YPC_j)$	0.080* (1.797)	0.356*** (3.026)	-0.065 (-0.273)	0.069 (0.394)	0.242 (0.714)	-0.219 (-0.804)	-0.546*** (-3.287)	0.228** (2.413)	0.066 (1.002)	0.267** (2.500)	-0.129 (-0.451)
Border	0.020 (0.079)	0.834* (1.735)	1.591 (1.330)	-0.907 (-0.982)	-0.764 (-0.548)	-2.962* (-1.861)	-0.150 (-0.170)	-0.567 (-1.486)	-0.447 (-1.273)	0.714 (1.260)	-0.180 (-0.137)
$\ln(A_i A_j)$	0.115* (2.058)	-0.074 (-0.658)	-0.375 (-0.502)	0.308 (1.485)	-0.386 (-1.202)	1.287*** (4.028)	-0.066 (-0.319)	0.385** (2.040)	0.343*** (3.867)	0.193 (1.444)	-0.190 (-0.336)
$\ln(N_i N_j)$	-0.619*** (-5.806)	0.419 (1.563)	0.505 (0.380)	-0.412 (-1.002)	0.407 (0.305)	-2.316*** (-3.257)	-0.449 (-1.139)	-0.696** (-2.506)	-1.080*** (-6.256)	-0.819*** (-3.185)	0.331 (0.183)
$\frac{manuf}{X_i} + \frac{manuf}{X_j}$	0.013** (2.484)	0.025** (2.257)	0.043* (1.925)	0.008 (0.483)	0.060 (0.907)	-0.006 (-0.152)	-0.004 (-0.282)	0.019** (2.215)	0.045*** (7.521)	0.017* (1.832)	0.049 (0.962)
ASEAN	3.191* (5.856)	1.418 (1.438)	4.523* (1.992)	1.303 (0.763)	10.445*** (4.000)	1.275 (0.364)	5.939*** (3.678)	1.141 (1.627)	4.007*** (6.292)	2.389** (2.303)	-0.134 (-0.052)
$Trf_i + Trf_j$	-0.016 (-0.787)	-0.001 (-0.010)	0.013 (0.415)	-0.005 (-0.046)	0.191 (0.124)	-0.288*** (-3.901)	-0.053 (-0.636)	-0.006 (-0.097)	-0.028 (-0.976)	-0.014 (-0.533)	-0.822 (-1.015)
Constant	-23.605*** (-3.237)	-36.433*** (-3.372)	-55.157 (-1.176)	-20.974 (-0.983)	-132.649*** (-3.986)	49.112 (0.998)	-54.868** (-2.693)	-6.892 (-0.570)	-25.501*** (-3.070)	-27.179** (-2.092)	-12.749 (-0.346)
R^2	0.941	0.794	0.483	0.593	0.679	0.611	0.737	0.863	0.927	0.887	0.651
Adjusted-R^2	0.917	0.709	0.298	0.446	0.545	0.449	0.643	0.806	0.901	0.846	0.506
Durbin-Watson	2.247	2.203	1.972	2.382	1.892	2.048	2.170	2.123	2.240	2.146	1.708
F-statistics	38.550	9.272	2.600	4.042	5.070	3.776	7.801	15.159	35.246	21.784	4.477

Notes: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Figures in parentheses represent *t*-values.

Table 9:
Model III(c): Estimation Results of Gravity Model Specification 2005 (Without Volatility)

	Dependent variable: $ln(1+X_{ij})$	**Dependent variable:** $\ln(1+X_{ij}^{PC})$									
	Total	**SITC 0**	**SITC 1**	**SITC 2**	**SITC 3**	**SITC 4**	**SITC 5**	**SITC 6**	**SITC 7**	**SITC 8**	**SITC 9**
lnY_iY_j	1.417*** (10.250)	0.854*** (4.314)	1.024*** (2.978)	0.593 (1.252)	3.302*** (3.927)	0.901 (1.536)	2.233*** (4.701)	1.031*** (6.246)	1.648*** (11.113)	1.508*** (6.538)	1.596 (1.702)
ln Distance	-0.655*** (-4.161)	-1.011*** (-4.447)	-0.446 (-0.922)	-1.744*** (-3.865)	-1.796* (-1.826)	-1.564* (-2.053)	-0.549 (-1.098)	-1.360*** (-6.595)	-0.723*** (-3.727)	-0.220 (-0.709)	-1.317 (-1.483)
$Abs(\ln YPC_i - \ln YPC_j)$	0.014 (0.307)	0.342*** (3.699)	-0.220 (-1.071)	-0.074 (-0.508)	-0.002 (-0.006)	0.190 (0.702)	-0.445** (-2.638)	0.174** (2.161)	-0.033 (-0.478)	0.233** (2.150)	-0.384 (-1.226)
Border	-0.201 (-0.766)	0.360 (0.936)	0.650 (0.718)	-0.702 (-0.813)	-0.669 (-0.373)	-1.751 (-1.188)	0.079 (0.086)	-0.559* (-1.786)	-0.601 (-1.613)	0.550 (0.931)	-1.333 (-0.779)
$\ln(A_iA_j)$	0.074 (0.887)	-0.054 (-0.577)	-0.093 (-0.351)	0.208 (1.157)	-0.213 (-0.506)	1.167*** (3.405)	-0.416 (-1.183)	0.289* (1.841)	0.269** (2.781)	0.092** (0.619)	0.227 (0.410)
$\ln(N_iN_j)$	-0.555*** (-4.616)	0.424** (2.069)	0.150 (0.332)	-0.305 (-0.767)	-0.480 (-0.439)	-1.953*** (-2.888)	-0.100 (-0.219)	-0.394 (-1.617)	-0.879*** (-4.896)	-0.679 (-2.553)	-0.660 (-0.418)
$\frac{manuf}{X_i}+\frac{manuf}{X_j}$	0.001 (0.152)	0.019** (2.153)	0.031 (1.574)	-0.028 (-1.311)	-0.023 (-0.689)	0.002 (0.075)	-0.015 (-1.070)	0.015** (2.144)	0.031*** (5.085)	0.009 (0.952)	0.072* (1.760)
ASEAN	3.025*** (5.659)	1.129 (1.440)	4.192** (2.646)	-1.733 (-0.858)	8.855*** (2.907)	1.780 (0.697)	5.338*** (3.271)	1.567** (2.272)	4.188*** (6.518)	2.381** (2.349)	4.059 (1.340)
$Trf_i + Trf_j$	-0.002 (-0.030)	-0.020 (-0.369)	-0.003 (-0.146)	0.226 (1.356)	0.249 (0.624)	-0.282*** (-3.553)	0.255 (1.008)	-0.003 (-0.073)	-0.069 (-1.302)	0.047 (0.766)	-1.412 (-1.516)
Constant	-24.696*** (-3.101)	-34.659*** (-3.877)	-41.103* (-1.964)	10.261 (0.356)	-96.732** (-2.299)	24.336 (0.693)	-68.026** (-2.475)	-17.423 (-1.458)	-33.088*** (-3.578)	-32.759** (-2.377)	-41.500 (-0.966)
R^2	0.933	0.845	0.606	0.616	0.614	0.598	0.716	0.889	0.917	0.869	0.697
Adjusted-R^2	0.906	0.781	0.442	0.456	0.475	0.453	0.614	0.843	0.887	0.822	0.588
Durbin-Watson	2.504	1.757	2.016	2.181	1.912	2.251	2.167	1.807	2.287	1.971	2.227
F-statistics	33.682	13.120	3.691	3.846	4.412	4.124	7.020	19.221	30.547	18.471	6.391

Notes: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Figures in parentheses represent *t*-values.

Table 10:
Model III(d): Estimation Results of Gravity Model Specification 2006 (Without Volatility)

	Dependent variable: $ln(1+X_{ij})$	**Dependent variable:** $\ln(1+X_{ij}^{PC})$									
	Total	**SITC 0**	**SITC 1**	**SITC 2**	**SITC 3**	**SITC 4**	**SITC 5**	**SITC 6**	**SITC 7**	**SITC 8**	**SITC 9**
lnY_iY_j	1.610*** (9.123)	0.923*** (5.006)	1.249*** (4.221)	0.363 (0.736)	3.786*** (5.006)	0.623 (0.818)	1.942*** (4.565)	1.405*** (5.742)	1.755*** (10.897)	1.648*** (6.753)	2.456* (1.759)
ln Distance	-0.759*** (-3.747)	-0.977*** (-4.797)	-0.302 (-0.803)	-1.762*** (-4.333)	-1.551* (-1.790)	-1.448* (-2.025)	-0.766 (-1.603)	-1.207*** (-4.677)	-0.645*** (-3.643)	-0.285 (-0.919)	-1.330 (-1.462)
$Abs(\ln YPC_i - \ln YPC_j)$	0.051 (0.742)	0.311*** (3.835)	-0.161 (-0.901)	-0.160 (-1.242)	0.038 (0.113)	-0.037 (-0.159)	-0.427** (-2.538)	0.223** (2.262)	-0.026 (-0.489)	0.241** (2.262)	-0.566* (-1.926)
Border	-0.245 (-0.656)	0.401 (1.188)	1.038 (1.419)	-0.817 (-1.053)	-0.117 (-0.072)	-1.775 (-1.268)	0.014 (0.016)	-0.488 (-1.167)	-0.791** (-2.547)	0.376 (0.643)	-0.072 (-0.042)
$\ln(A_iA_j)$	0.108 (0.926)	-0.065 (-0.750)	-0.156 (-0.808)	0.245 (1.513)	-0.456 (-1.176)	1.010*** (3.467)	-0.230 (-0.980)	0.060 (0.307)	0.216*** (3.160)	0.125 (0.768)	0.443 (0.729)
$\ln(N_iN_j)$	-0.445** (-2.599)	0.471** (2.626)	0.181 (0.513)	-0.463 (-1.166)	0.177 (0.185)	-1.785*** (-2.820)	-0.125 (-0.295)	-0.109 (-0.372)	-0.817*** (-5.900)	-0.693** (-2.535)	-1.653 (-0.877)
$\frac{manuf}{X_i}+\frac{manuf}{X_j}$	0.014** (2.403)	0.025*** (3.337)	0.032* (1.967)	-0.043* (-1.984)	0.025 (0.692)	-0.027 (-0.948)	-0.008 (-0.573)	0.021** (2.500)	0.034*** (6.822)	0.013 (1.465)	0.069 (1.550)
ASEAN	3.735*** (5.547)	1.415* (1.998)	4.901*** (3.618)	-3.171 (-1.529)	10.956*** (3.692)	1.090 (0.359)	4.578** (2.745)	2.751*** (2.915)	4.638*** (7.341)	2.860** (2.739)	4.916 (1.342)
$Trf_i + Trf_j$	-0.102 (-0.890)	-0.038 (-0.797)	0.003 (0.185)	0.326* (1.894)	0.368 (0.950)	-0.314*** (-4.083)	0.046 (0.270)	0.060 (0.974)	-0.062 (-1.496)	0.019 (0.295)	-0.134 (-0.106)
Constant	-39.152*** (-3.778)	-40.323*** (-4.646)	-52.666*** (-2.949)	28.220 (0.897)	-146.876*** (-3.586)	38.548 (0.839)	-56.803** (-2.325)	-41.856** (-2.504)	-40.333*** (-4.366)	-39.629** (-2.668)	-50.295 (-1.002)
R^2	0.901	0.869	0.704	0.669	0.640	0.672	0.690	0.821	0.941	0.871	0.667
Adjusted-R^2	0.865	0.815	0.581	0.531	0.490	0.535	0.578	0.747	0.917	0.824	0.528
Durbin-Watson	2.550	1.806	1.970	2.188	1.923	2.052	2.149	2.118	2.140	1.933	2.032
F-statistics	25.171	15.936	5.705	4.855	4.267	4.915	6.172	11.033	38.472	18.723	4.803

Notes: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Figures in parentheses represent *t*-values.

5.2.2 WITH VOLATILITY

Adding volatility to the extended gravity model with tariffs, the estimation results show that there has been trade creation in total exports for all the four selected years. This net trade creation is enhanced by similar trade creation found for all years in beverages & tobacco (SITC 1), minerals & fuels (SITC 3), chemicals & materials (SITC 5), and machinery & transport equipment (SITC 7), as well as food & live animals (SITC 0) for 2001 and 2006, manufactured goods (SITC 6) for 2005 and 2006, and miscellaneous manufactures (SITC 8) for 2003, 2005 and 2006. Being a member of ASEAN has no effect on trade in crude materials (SITC 2), animal & vegetable fat (SITC 4) and other commodities (SITC 9). No trade diversion is found in this estimation.

An examination of the core variables shows income to be generally significant in total export and in almost all sectors except for animal & vegetable fat (SITC 4). Distance has a significant negative effect on total trade as well as for the specific sectors of food & live animals (SITC 0), crude materials (SITC 2), manufactured goods (SITC 6), machinery & transport equipment (SITC 7), minerals & fuels (SITC 3) for 2001, 2003 and 2005, and animal & vegetable fat (SITC 4) for 2005, 2006. This variable, however, has no significant effect on intra-industry trade among ASEAN members for beverages & tobacco (SITC 1), chemicals & materials (SITC 5), miscellaneous manufactures (SITC 8), and other commodities (SITC 9).

The negative sign of the population variable for total intra-regional export implies that factor endowment seem to conform to Oguledo and Macphee's (1994) argument that a large factor endowment may result in self-sufficiency and less reliance on international

trade. Similar results are found for five sectors at the disaggregated level, namely machinery & transport equipment (SITC 7) and miscellaneous manufactures (SITC 8) for all years, as well as animal & vegetable fat (SITC 4) for 2003, 2005 and 2006, crude materials (SITC 2) for 2006, and manufactured goods (SITC 6) for 2003. A large factor endowment is found to promote intra-industry trade (positive effect) only for food & live animals (SITC 0) for the years 2005 and 2006. This is reasonable for a food products industry where a large domestic market (or population) would promote division of labour, and thus, create an opportunity for trade (Mohd. Amin, Hamid and Md. Saad, 2005). Factor endowment is found to have no effect on trade in the remaining sectors.

The level of development as measured by the sum of manufacturing exports as a percentage of merchandise exports is found to have a positive effect on total exports for 2001 and 2003, for machinery & transport equipment (SITC 7) and miscellaneous manufactures (SITC 8) for all the four years, as well as food & live animals (SITC 0), beverages & tobacco (SITC 1) and manufactured goods (SITC 6) for the years 2003, 2005 and 2006. Intra-industry trade in the remaining sectors are found to be unaffected by the level of development.

The absolute log difference of real GDP per capita representing relative development shows a positive effect on total exports and for machinery & transport equipment (SITC 7), both only for 2001. Similar results are found for food & live animals (SITC 0) and manufactured goods (SITC 6) for the years 2003, 2005 and 2006, as well as chemicals & materials (SITC 5) for 2003. This finding conforms to that of Montenegro & Soto (1996) where countries trade more if economies differ, in line with the comparative advantage theory. However, for crude materials (SITC 2) and other commodities (SITC 9) for the

year 2006, and chemicals & materials (SITC 5) for the years 2001, 2005 and 2006, relative development shows a negative effect. This is consistent with Linder's (1961) hypothesis that the more alike countries are the more trade will occur since countries with similar levels of development have similar preferences. Thursby & Thursby (1987) and Egger (2000) also found similar results, arguing that countries with similar industrial structures & per capita GDP trade more with each other.[13] The variable has no significant impact on beverages & tobacco (SITC 1), minerals & fuels (SITC 3), animal & vegetable fat (SITC 4) and miscellaneous manufactures (SITC 8) for all the four years.

Geographical factors represented by border and log product of surface areas of both countries are found to be either insignificant or having the wrong signs. Contrary to *a priori* expectations, border is found to negatively affect trade for animal & vegetable fat (SITC 4) for 2003, manufactured goods (SITC 6) for 2005 and machinery & transport equipment (SITC 7) for 2006. Also, a larger surface area (implying higher transportation costs) seem to promote total trade as well as intra-industry trade in the region for miscellaneous manufactures (SITC 8) for 2003, animal & vegetable fat (SITC 4) and machinery & transport equipment (SITC 7) for all the four years, as well as manufactured goods (SITC 6) for 2003 and 2005.

Trade policy as measured by the sum of tariffs of the pairs of countries is found to have no significant impact on total trade in general, except for food & live animals (SITC 0) for 2001 and crude materials (SITC 2) for 2006. Similar to trade policy, exchange rate risk is also found to have no significant effect on total trade in general, except for crude materials (SITC 2) for 2006 and miscellaneous manufactures (SITC 8) for all the four years.

[13] See Yamarik & Ghosh (2005).

Table 11:
Model IV(a): Estimation Results of Gravity Model Specification 2001 (With Tariffs and Volatility)

	Dependent variable: $ln(1+X_{ij})$	**Dependent variable:** $\ln(1+X_{ij}^{PC})$									
	Total	**SITC 0**	**SITC 1**	**SITC 2**	**SITC 3**	**SITC 4**	**SITC 5**	**SITC 6**	**SITC 7**	**SITC 8**	**SITC 9**
lnY_iY_j	1.360*** (10.472)	2.064*** (5.489)	1.335** (2.693)	1.001** (2.565)	4.465*** (3.920)	0.761 (1.137)	1.711*** (4.970)	1.182*** (4.611)	1.374*** (10.877)	1.219*** (6.076)	1.074 (1.662)
ln Distance	-0.548*** (-2.986)	-0.780** (-2.131)	0.079 (0.112)	-1.917*** (-3.503)	-2.180* (-1.978)	-1.022 (-1.156)	-0.803 (-1.701)	-1.111*** (-3.264)	-0.465** (-2.594)	-0.329 (-1.314)	-0.154 (-0.205)
$Abs(\ln YPC_i - \ln YPC_j)$	0.176** (2.522)	0.208 (1.478)	-0.028 (-0.103)	0.068 (0.311)	-0.143 (-0.346)	0.012 (0.036)	-0.429** (-2.295)	0.186 (1.464)	0.184** (2.701)	0.151 (1.314)	-0.088 (-0.254)
Border	-0.080 (-0.234)	0.888 (1.283)	2.256 (1.688)	-1.285 (-1.217)	-0.087 (-0.043)	-1.618 (-0.966)	-0.223 (-0.245)	-0.349 (-0.557)	-0.317 (-0.947)	0.230 (0.467)	0.561 (0.411)
$\ln(A_iA_j)$	0.106 (1.228)	0.028 (0.185)	-0.300 (-0.868)	0.325 (1.416)	-0.814 (-1.322)	0.715* (1.953)	-0.029 (-0.137)	0.080 (0.387)	0.228** (2.626)	0.181 (1.409)	-0.399 (-0.546)
$\ln(N_iN_j)$	-0.642*** (-4.095)	-0.630 (-1.627)	0.120 (0.179)	-0.583 (-1.271)	0.411 (0.454)	-0.694 (-0.910)	-0.473 (-1.178)	-0.403 (-1.201)	-1.003*** (-6.267)	-0.812*** (-3.553)	0.493 (0.237)
$\frac{manuf}{X_i}+\frac{manuf}{X_j}$	0.015** (2.323)	-0.014 (-1.004)	0.031 (1.267)	-0.010 (-0.481)	-0.013 (-0.148)	0.040 (1.294)	-0.017 (-0.961)	-0.012 (-1.071)	0.041*** (5.255)	0.028** (2.770)	0.018 (0.552)
ASEAN	2.688*** (4.774)	4.644*** (3.329)	4.974** (2.277)	-0.162 (-0.095)	11.846*** (3.595)	4.385 (1.586)	4.107*** (2.817)	1.339 (1.285)	2.948*** (5.379)	1.045 (1.224)	2.494 (1.064)
$Trf_i + Trf_j$	0.022 (0.641)	0.186*** (3.111)	0.021 (1.116)	-0.014 (-0.112)	0.988 (0.771)	-0.432*** (-4.341)	-0.002 (-0.025)	0.058 (1.077)	0.034 (0.890)	0.015 (0.509)	-0.380 (-0.791)
$Volatility_{ij}$	0.000 (-0.039)	0.001 (0.734)	0.002 (1.004)	0.001 (0.366)	0.001 (0.447)	0.000 (-0.060)	0.000 (-0.079)	0.001 (0.931)	0.000 (-0.132)	0.002*** (3.020)	-0.005** (-2.164)
Constant	-23.108*** (-3.008)	-51.873*** (-3.377)	-54.684* (-1.854)	-2.199 (-0.100)	-165.022*** (-3.794)	-13.691 (-0.379)	-36.386* (-1.832)	-16.935 (-1.034)	-19.738** (-2.485)	-18.676* (-1.777)	-45.278 (-1.004)
R^2	0.921	0.745	0.497	0.591	0.646	0.617	0.687	0.763	0.946	0.926	0.644
Adjusted-R^2	0.889	0.638	0.288	0.413	0.499	0.457	0.551	0.664	0.923	0.888	0.466
Durbin-Watson	2.111	1.728	2.078	2.192	2.099	2.414	1.980	1.583	2.128	2.032	1.816
F-statistics	28.167	6.997	2.374	3.317	4.382	3.866	5.054	7.719	41.718	24.877	3.621

Notes: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Figures in parentheses represent *t*-values.

Table 12:
Model IV(b): Estimation Results of Gravity Model Specification 2003 (With Tariffs and Volatility)

	Dependent variable: $ln(1+X_{ij})$	**Dependent variable:** $\ln(1+X_{ij}^{PC})$									
	Total	**SITC 0**	**SITC 1**	**SITC 2**	**SITC 3**	**SITC 4**	**SITC 5**	**SITC 6**	**SITC 7**	**SITC 8**	**SITC 9**
lnY_iY_j	1.447*** (12.101)	0.847*** (3.190)	1.080** (2.225)	1.169*** (3.121)	3.200*** (3.109)	0.637 (0.736)	2.012*** (5.622)	0.924*** (5.459)	1.486*** (10.501)	1.424*** (6.793)	0.364 (0.414)
ln Distance	-0.541*** (-3.273)	-0.873*** (-3.302)	-0.031 (-0.035)	-1.611*** (-3.225)	-1.607* (-1.931)	-1.503 (-1.711)	-0.506 (-1.058)	-1.234*** (-5.264)	-0.477** (-2.491)	-0.165 (-0.589)	-0.566 (-0.812)
$Abs(\ln YPC_i - \ln YPC_j)$	0.093 (1.502)	0.359*** (2.910)	-0.114 (-0.442)	0.033 (0.173)	0.331 (0.955)	-0.260 (-0.837)	-0.517*** (-2.827)	0.236** (2.393)	0.078 (1.080)	0.174 (1.634)	-0.073 (-0.244)
Border	-0.188 (-0.617)	0.832 (1.690)	1.507 (1.231)	-0.963 (-1.019)	-0.820 (-0.597)	-3.084* (-1.849)	-0.104 (-0.116)	-0.584 (-1.500)	-0.429 (-1.192)	0.571 (1.086)	-0.154 (-0.116)
$\ln(A_iA_j)$	0.198** (2.596)	-0.073 (-0.639)	-0.379 (-0.501)	0.321 (1.511)	-0.383 (-1.207)	1.317*** (3.870)	-0.075 (-0.354)	0.404* (2.042)	0.340*** (3.760)	0.222* (1.787)	-0.166 (-0.290)
$\ln(N_iN_j)$	-0.714*** (-5.048)	0.419 (1.532)	0.519 (0.385)	-0.434 (-1.033)	0.226 (0.167)	-2.366*** (-3.198)	-0.432 (-1.072)	-0.726* (-2.482)	-1.076*** (-6.123)	-0.867*** (-3.642)	0.218 (0.119)
$\frac{manuf}{X_i}+\frac{manuf}{X_j}$	0.019*** (3.300)	0.024** (2.125)	0.050* (1.920)	0.012 (0.647)	0.044 (0.635)	0.000 (0.006)	-0.008 (-0.450)	0.018* (1.875)	0.044*** (6.098)	0.029*** (2.880)	0.039 (0.721)
ASEAN	3.505*** (6.402)	1.402 (1.369)	4.621* (2.000)	1.337 (0.769)	10.075*** (3.857)	1.397 (0.387)	5.907*** (3.593)	1.090 (1.505)	3.991*** (6.156)	2.481** (2.592)	-0.203 (-0.077)
$Trf_i + Trf_j$	-0.040 (-1.414)	-0.001 (-0.024)	0.014 (0.446)	0.001 (0.012)	0.392 (0.250)	-0.286*** (-3.810)	-0.057 (-0.671)	-0.012 (-0.194)	-0.029 (-1.008)	-0.007 (-0.284)	-0.774 (-0.943)
$Volatility_{ij}$	-0.001 (-0.592)	0.000 (-0.087)	0.004 (0.536)	0.003 (0.481)	-0.008 (-0.947)	0.003 (0.298)	-0.002 (-0.419)	-0.001 (-0.367)	-0.001 (-0.443)	0.007** (2.325)	-0.005 (-0.632)
Constant	-27.369*** (-3.902)	-36.237*** (-3.219)	-57.504 (-1.203)	-21.549 (-0.993)	-126.708*** (-3.77652)	47.633 (0.939)	-54.286** (-2.615)	-5.353 (-0.414)	-25.175*** (-2.970)	-28.735** (-2.395)	-9.174 (-0.243)
R^2	0.928	0.794	0.490	0.597	0.690	0.613	0.739	0.864	0.928	0.908	0.657
Adjusted-R^2	0.898	0.696	0.277	0.429	0.542	0.428	0.631	0.799	0.897	0.869	0.493
Durbin-Watson	2.488	2.208	1.967	2.465	1.845	2.036	2.140	2.082	2.255	2.044	1.726
F-statistics	31.013	8.081	2.302	3.549	4.664	3.311	6.807	13.298	30.721	23.600	4.007

Notes: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Figures in parentheses represent *t*-values.

Table 13:
Model IV(c): Estimation Results of Gravity Model Specification 2005 (With Tariffs and Volatility)

	Dependent variable: $ln(1+X_{ij})$	**Dependent variable:** $\ln(1+X_{ij}^{PC})$									
	Total	**SITC 0**	**SITC 1**	**SITC 2**	**SITC 3**	**SITC 4**	**SITC 5**	**SITC 6**	**SITC 7**	**SITC 8**	**SITC 9**
lnY_iY_j	1.360*** (10.530)	0.868*** (4.325)	0.959** (2.783)	0.576 (1.232)	3.344*** (3.842)	0.641 (0.994)	2.230*** (4.621)	1.031*** (6.119)	1.653*** (10.899)	1.460*** (6.666)	1.690* (1.752)
ln Distance	-0.567*** (-3.819)	-0.996*** (-4.327)	-0.473 (-0.987)	-1.932*** (-4.327)	-1.764* (-1.750)	-1.927** (-2.731)	-0.521 (-1.019)	-1.361*** (-6.467)	-0.712*** (-3.562)	-0.307 (-1.035)	-1.233 (-1.351)
$Abs(\ln YPC_i - \ln YPC_j)$	0.051 (1.104)	0.320*** (3.286)	-0.307 (-1.439)	-0.179 (-1.184)	0.035 (0.096)	-0.133 (-0.554)	-0.413** (-2.240)	0.180* (2.046)	-0.023 (-0.305)	0.148 (1.341)	-0.308 (-0.893)
Border	-0.070 (-0.284)	0.399 (1.020)	0.711 (0.791)	-1.014 (-1.197)	-0.635 (-0.346)	-2.138 (-1.557)	0.110 (0.117)	-0.559* (-1.752)	-0.591 (-1.552)	0.463 (0.828)	-1.250 (-0.719)
$\ln(A_iA_j)$	0.041 (0.533)	-0.063 (-0.655)	-0.133 (-0.508)	0.283 (1.600)	-0.220 (-0.512)	1.189*** (4.217)	-0.408 (-1.139)	0.294* (1.809)	0.268** (2.716)	0.104 (0.737)	0.229 (0.409)
$\ln(N_iN_j)$	-0.512*** (-4.582)	0.413* (1.990)	0.209 (0.466)	-0.454 (-1.162)	-0.491 (-0.441)	-2.145*** (-3.656)	-0.097 (-0.208)	-0.403 (-1.591)	-0.877*** (-4.792)	-0.717*** (-2.848)	-0.723 (-0.450)
$\frac{manuf}{X_i}+\frac{manuf}{X_j}$	-0.005 (-1.080)	0.019** (2.199)	0.041* (1.947)	-0.018 (-0.806)	-0.028 (-0.728)	-0.006 (-0.198)	-0.018 (-1.154)	0.014* (2.025)	0.030*** (4.272)	0.017* (1.759)	0.062 (1.378)
ASEAN	2.890*** (5.830)	1.180 (1.484)	3.932** (2.484)	-2.021 (-1.019)	8.952*** (2.866)	0.068 (0.026)	5.392*** (3.245)	1.561** (2.217)	4.212*** (6.399)	2.138** (2.216)	4.315 (1.390)
$Trf_i + Trf_j$	0.006 (0.097)	-0.007 (-0.130)	0.002 (0.102)	0.249 (1.557)	0.266 (0.646)	-0.217 (-3.314)	0.237 (0.912)	-0.004 (-0.106)	-0.072 (-1.311)	0.062 (1.077)	-1.342 (-1.410)
$Volatility_{ij}$	-0.003 (-1.914)	0.002 (0.770)	0.007 (1.299)	0.009 (1.614)	-0.003 (-0.275)	0.014 (1.747)	-0.003 (-0.475)	0.000 (-0.193)	-0.001 (-0.331)	0.007* (2.012)	-0.006 (-0.575)
Constant	-22.724 (-3.104)	-35.005*** (-3.875)	-40.704* (-1.969)	14.653 (0.513)	-97.678** (-2.271)	47.036 (1.236)	-67.871** (-2.431)	-17.124 (-1.393)	-33.269*** (-3.527)	-30.066** (-2.298)	-42.855 (-0.983)
R^2	0.942	0.849	0.633	0.656	0.615	0.679	0.719	0.889	0.917	0.888	0.701
Adjusted-R^2	0.914	0.777	0.457	0.491	0.454	0.526	0.602	0.836	0.882	0.842	0.577
Durbin-Watson	2.556	1.682	2.022	2.400	1.866	2.187	2.154	1.799	2.292	1.833	2.267
F-statistics	33.899	11.783	3.604	3.979	3.831	4.428	6.145	16.777	26.524	19.056	5.631

Notes: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Figures in parentheses represent *t*-values.

Table 14:
Model IV(d): Estimation Results of Gravity Model Specification 2006 (With Tariffs and Volatility)

	Dependent variable: $ln(1+X_{ij})$	**Dependent variable:** $\ln(1+X_{ij}^{PC})$									
	Total	**SITC 0**	**SITC 1**	**SITC 2**	**SITC 3**	**SITC 4**	**SITC 5**	**SITC 6**	**SITC 7**	**SITC 8**	**SITC 9**
$ln Y_i Y_j$	1.607*** (9.058)	0.935*** (4.968)	1.224*** (4.126)	0.443 (0.938)	3.832*** (4.957)	0.693 (0.925)	1.941*** (4.489)	1.396*** (5.620)	1.710*** (10.488)	1.628*** (7.379)	2.463* (1.726)
ln Distance	-0.734*** (-3.565)	-0.970*** (-4.689)	-0.337 (-0.892)	-1.996*** (-5.046)	-1.496* (-1.721)	-1.786** (-2.503)	-0.725 (-1.468)	-1.208*** (-4.612)	-0.558*** (-3.147)	-0.402 (-1.420)	-1.373 (-1.432)
$Abs(\ln YPC_i - \ln YPC_j)$	0.075 (1.014)	0.298*** (3.485)	-0.219 (-1.170)	-0.281** (-2.115)	0.096 (0.258)	-0.219 (-0.903)	-0.394* (-2.113)	0.235** (2.175)	0.010 (0.184)	0.137 (1.306)	-0.595* (-1.799)
Border	-0.215 (-0.573)	0.425 (1.231)	1.074 (1.466)	-1.215 (-1.632)	-0.112 (-0.069)	-2.340 (-1.689)	0.058 (0.061)	-0.484 (-1.142)	-0.691** (-2.257)	0.246 (0.464)	-0.138 (-0.077)
$\ln(A_i A_j)$	0.108 (0.922)	-0.072 (-0.810)	-0.173 (-0.899)	0.324 (2.096)	-0.464 (-1.184)	1.125*** (3.947)	-0.236 (-0.987)	0.069 (0.343)	0.192*** (2.919)	0.135 (0.917)	0.455 (0.731)
$\ln(N_i N_j)$	-0.437** (-2.534)	0.469** (2.578)	0.214 (0.606)	-0.588** (-1.568)	0.164 (0.168)	-1.980*** (-3.218)	-0.110 (-0.254)	-0.121 (-0.403)	-0.786*** (-5.941)	-0.725*** (-2.935)	-1.667 (-0.867)
$\frac{manuf}{X_i} + \frac{manuf}{X_j}$	0.011 (1.692)	0.026*** (3.344)	0.038** (2.198)	-0.028 (-1.270)	0.023 (0.583)	-0.007 (-0.219)	-0.011 (-0.706)	0.021** (2.353)	0.028*** (4.966)	0.024** (2.573)	0.072 (1.493)
ASEAN	3.746*** (5.534)	1.465* (2.023)	4.837*** (3.568)	-3.031 (-1.540)	11.063*** (3.721)	1.112 (0.376)	4.605** (2.714)	2.724*** (2.843)	4.546*** (7.352)	2.743*** (2.904)	4.933 (1.318)
$Trf_i + Trf_j$	-0.114 (-0.977)	-0.031 (-0.619)	0.005 (0.322)	0.324* (2.013)	0.395 (0.970)	-0.311*** (-4.222)	0.039 (0.223)	0.058 (0.912)	-0.056 (-1.406)	0.036 (0.595)	-0.141 (-0.109)
$Volatility_{ij}$	-0.002 (-0.869)	0.001 (0.593)	0.004 (1.069)	0.007* (2.025)	-0.004 (-0.422)	0.011 (1.686)	-0.002 (-0.445)	-0.001 (-0.236)	-0.002 (-1.602)	0.007** (2.574)	0.002 (0.193)
Constant	-39.074*** (-3.752)	-40.872*** (-4.614)	-53.009*** (-2.973)	26.958 (0.899)	-148.499*** (-3.647)	39.519 (0.878)	-57.009*** (-2.295)	-41.208** (-2.423)	-38.813*** (-4.241)	-38.413*** (-2.860)	-50.573 (-0.986)
R^2	0.904	0.871	0.718	0.719	0.642	0.708	0.692	0.822	0.947	0.899	0.667
Adjusted-R^2	0.863	0.809	0.583	0.585	0.471	0.568	0.564	0.736	0.922	0.857	0.508
Durbin-Watson	2.475	1.769	1.983	2.489	1.912	2.142	2.125	2.104	2.243	1.806	2.034
F-statistics	22.507	14.129	5.321	5.355	3.755	5.066	5.396	9.639	37.313	21.303	4.195

Notes: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Figures in parentheses represent *t*-values.

6. OVERALL FINDINGS AND POLICY RECOMMENDATIONS

As mentioned in the introduction section, ASEAN seeks to speed up regional integration in eleven priority areas in order to establish an ASEAN Economic Community. However, only nine are relevant in this study, namely, agro-based products, automotives, ICT, electronics, fisheries, healthcare, rubber-based products, textiles and apparels, and wood-based products.

In order to identify which SITC classification each of these nine areas falls into, the SITC 2-digit level classifications are matched against these nine sectors[14] as shown in Table 15. The table shows that the priority areas fall mainly in SITC 0, 1, 2 and 4, and to a lesser extent in SITC 5, 6, 7 and 8. There is no match found for SITC 3 and 9 classifications, hence these two sectors will not be the focus in the discussion relating to policies to be formulated for priority areas.

Summary results for all the estimations of the models are provided in Appendixes 1, 2 and 3. For estimations that include tariffs, the important determinants for each sector can also be identified more easily across the four years.

The somewhat irregular results obtained in the different estimations for total trade and each intra-industry trade in the specific sectors makes identifying the determining factors rather problematic. This is true not only across models with and without volatility for estimations with and without tariffs, but also across the different years in the models that include tariffs. Taking the results of one particular model alone may lead to the

[14] The SITC 2-digit level is referred as it provides a further disaggregation of the product classification which is necessary for the matching to be conducted.

elimination of other variables that are found to be significant in the other models, hence understating the number of factors that determine trade. In view of this, the study prefers to adopt a 'non-exclusion' approach and tries to capture all the determining factors found to be dominant in all the four types of models.

In resolving the irregularity problem, for total trade and for each product category, variables that are found to be significant in both Models I and II are first identified as factors that determine trade. Next, variables that are found to be significant in five or more estimations (out of the eight estimations) in Models III and IV are also identified as determining factors and added to those already identified earlier. This method of selecting the dominant results is admittedly rather 'crude' in approach and thus poses as one of the limitations of this study. The outcome of the analysis is shown in Table 16, which is self-explanatory.

Trade creation is found to be present for total exports, which is found to be mainly contributed by a similar trade creation in beverages & tobacco (SITC 1), minerals & fuels (SITC 3),[15] chemicals & materials (SITC 5), machinery & transport equipment (SITC 7), and miscellaneous manufactures (SITC 8). Intra-trade in these five sectors has caused a shift in the product origin from a domestic producer who faces higher costs to a member producer with lower resource costs, leading to a higher efficiency. Trade diversion is found for the other commodities sector (SITC 9), showing a shift in the product origin from a non-member producer who faces lower costs to a member producer whose resource costs are higher, leading to a fall in efficiency and welfare. However, since this sector comprise of extremely diverse, marginal items that do not fall in any other

[15] Minerals & fuels (SITC 3) is a non-priority sector since it does not contain any of the nine priority areas.

classification,[16] the trade diversion result is not much of a concern. In addition, this sector does not contain any of the nine priority areas listed earlier.

Membership in ASEAN is found to have no effect on the rest of the product classifications, i.e., neither trade creation nor trade diversion is found to be present.[17] This finding is encouraging as it reflects only 'good' intra-regional trade is taking place within ASEAN. On the one hand, this does not come as a surprise since ASEAN adopts an "open regionalism" rather than an inward-looking or a "Fortress ASEAN". On the other hand, in the context of establishing deeper integration in the nine priority areas as one of the measures towards an ASEAN Economic Community (AEC), the insignificant effect of ASEAN on intra-trade activities may imply that trade within ASEAN in food & live animals (SITC 0), crude materials (SITC 2), animal & vegetable fat (SITC 4) and manufactured goods (SITC 6) is inadequate and need to be intensified. ASEAN countries should import goods in these four sectors from member countries that are efficient and low-cost producers so as to generate trade creation rather than trade diversion from the deeper integration sought after.

[16] Other commodities or "commodities and transactions not classified elsewhere" (SITC 9) comprise of UN special code items (SITC 90, 91 & 93), animals, live zoo animals, dogs, cats, etc (SITC 94), arms of war and ammunition (SITC 95), coin (other than gold) not being legal tender (SITC 96), and gold, non-monetary (SITC 97).

[17] Although trade diversion is found in a few sectors in the earlier discussion, the results are not dominant.

Table 15:
ASEAN Priority Sectors with Matching SITC

ASEAN Priority Sectors	Matching SITC							
	SITC 0 (Food & live animals)	**SITC 1 (Beverages & tobacco)**	**SITC 2 (Crude materials, inedible, except fuels)**	**SITC 4 (Animal & vegetable oils, fats, & waxes)**	**SITC 5 (Chemicals & related products)**	**SITC 6 (Manufactured goods classified chiefly by material)**	**SITC 7 (Machinery & transport equipment)**	**SITC 8 (Miscellaneous manufactured articles)**
1.Agro-based products	(00) Live animals chiefly for food (01) Meat & meat preparations 02) Dairy products & bird's eggs (03) Fish, crustaceans, mollucs, preparations thereof (04) Cereals & cereal preparations (05) Vegetables & fruit (06) Sugar, sugar preparations & honey (07) Coffee, tea, cocoa, spices, manufactures thereof (08) Feeding stuff for animals (09)Miscellaneous edible products & preparations	(11) Beverages (12) Tobacco & tobacco manufactures	(21) Hides, skins & fur skins, raw (22) Oil seeds & oleaginous fruit (29) Crude animal & vegetable materials	(41) Animal oils & fats (42) Fixed vegetable oils & fats (43) Animal-vegetable oils-fats, processed, & waxes				
2.Automotives							(78) Road vehicles (79) Other transport equipment	
3.e-ASEAN (ICT)							(75) Office machines & automatic data processing equipment (76) Telecommunications & sound recording apparatus	
4.Electronics							(77) Electrical machinery, apparatus & appliances	(88) Photographic apparatus, optical goods, watches
5.Fisheries	(03) Fish, crustaceans, mollucs,							
6.Healthcare					(54) Medicinal & pharmaceutical products			(87) Professional, scientific & controlling instruments
7.Rubber-based products						(62)Rubber manufactures		
8.Textiles & apparels			(26) Textile fibres & their wastes			(65) Textile yarn, fabrics, made-upart., related products		(83) Travel goods, handbags, & similar containers (84) Articles of apparel & clothing accessories (85) Footwear
9.Wood-based products			(24) Cork & wood (25) Pulp & waste paper			(63) Cork & wood manufactures (excluding furniture) (64) Paper, paperboard, artic. of paper, paper-pulp/board		
Share out of total no. of products of each SITC at 2 digit level	**9/9**	**2/2**	**6/9**	**3/3**	**1/9**	**4/9**	**5/9**	**5/9**

Note: There is no match found for SITC 3 (crude materials) and SITC 9 (other commodities), hence they are not shown.

Table 16:
Consolidation of Determinants of Inter-industry and Intra-industry Trade

Categories		**Total**	**SITC 0**	**SITC 1**	**SITC 2**	**SITC 3**	**SITC 4**	**SITC 5**	**SITC 6**	**SITC 7**	**SITC 8**	**SITC 9**
Core	$\ln Y_i Y_j$	+	+	+	+	+	+	+	+	+	+	-
Core	$\ln Distance$	-	-		-	-	-		-	-		
Relative development	$Abs(\ln YPC_i - \ln YPC_j)$		+		+/-			-	+			
Geographical factors	*Border*			+								
Geographical factors	$\ln(A_i A_j)$						[+]	[+/-]		[+]		[+]
Factor endowment	$\ln(N_i N_j)$	-					-	+/-		-	-	-
Level of development	$\frac{manuf}{X_i} + \frac{manuf}{X_j}$	+	+	+	+/-				+	+	+	[-]
Regional trading arrangement	*ASEAN*	+		+		+		+		+	+	-
Trade policy	$Trf_i + Trf_j$						-					
Exchange rate risk	$Volatility_{ij}$			+		-				-	+	
Number of determinants of trade		5	4	5	5	4	5	5	4	7	5	5

Note: Figures in square parentheses represent results that do not conform to the expected signs.

Higher income levels are found to promote inter-industry as well as intra-industry trade in all sectors, as expected *a priori.* Again, policies that promote growth automatically stimulate trade, and thus such policies should be maintained, particularly during periods of low inflation. In periods of high inflation, however, governments should be aware that contractionary policies may have a negative effect on trade.

Similar to income levels, lower transportation costs promote total trade as well as trade in all sectors except for beverages & tobacco (SITC 1), chemicals & materials (SITC 5) and miscellaneous manufactures (SITC 8). Policies that ensure low transportation costs are, therefore, necessary to stimulate trade in general. In the face of the recent increase in the international oil prices, maintaining low transportation costs poses to be a challenge as many governments are either unable or unwilling to subsidize oil prices continuously. In such a situation, the governments will need to formulate alternative strategies to keep transportation costs related to fuel prices low. In addition, measures should also be taken to upgrade physical infrastructure and improve transportation efficiency to reduce costs related to time.

The theory of comparative advantage is found to hold for food & live animals (SITC 0), crude materials (SITC 2), and manufactured goods (SITC 6) as reflected by the results on relative development. Production of these goods is more intensively undertaken by countries that possess comparative advantage in the specific sectors. Linder's hypothesis, on the other hand, are found for crude materials (SITC 2), as well as chemicals & materials (SITC 5), implying that higher intra-industry trade for these two sectors is also due to similar preferences for the goods.

Geographical factors are found either not to affect trade or affect trade in the opposite direction as shown in Appendix 4. This is found particularly for animal & vegetable fat (SITC 4), chemicals & materials (SITC 5), and machinery & transport equipment (SITC 7) where the variable represented by surface area shows a positive effect on trade. This result is puzzling since countries with larger surface areas are usually assumed to have higher transportation costs that should have a negative effect on trade.

Factor endowments show a negative relationship with total trade as well as with animal & vegetable fat (SITC 4), chemicals & materials (SITC 5), machinery & transport equipment (SITC 7), and miscellaneous manufactures (SITC 8). This may imply that for total trade and the four sectors a large resource endowment creates self-sufficiency and less reliance on international trade.

In general, the level of development shows a positive effect on both inter-industry and intra-industry trade in almost all sectors containing the priority areas, except for only two sectors, namely, animal & vegetable fat (SITC 4) and chemicals & materials (SITC 5). Similar to growth, policies that promote development should be continuously implemented so as to stimulate trade.

Tariffs are found to have no effect on both total trade and intra-industry trade except for animal & vegetable fat (SITC 4). This may imply that tariffs are no longer much of an issue to promote trade, given the tariff reductions that have taken place, both due to tariff reductions in AFTA as well as compliance to WTO agreements. In addition, it also reflects that price competitiveness (including from lower tariffs) is no longer a very important factor for market access. Other factors such as quality of products and other product

characteristics are increasingly becoming more important in determining export demand. Therefore, based on the results, tariff reductions to promote trade is applicable only to the animal & vegetable fat sector. Product development to improve the quality of exports and to meet the preferences of the export demand should perhaps be emphasized instead of continuing to focus on tariff reductions for market access.

Exchange rate risk is found to adversely affect only machinery & transport equipment (SITC 7) among sectors containing the priority areas apart from minerals & fuels (SITC 3). Since these sectors are vulnerable to foreign exchange risks, a close monitoring of these sectors may need to be established in the presence of exchange rate volatility. Similar to tariffs, low exchange rate risk is not a very important determinant of trade in general. However, beverages & tobacco (SITC 1) and miscellaneous manufactures (SITC 8) are found to benefit from exchange rate fluctuations since it is positively related to trade. The policy recommendations are summarized in Table 17 for each product classification.

Table 17:
Summary of Policy Recommendations for Total Trade and by Sector

Product classification	Product description	Policy recommendations
Total	Total exports	Maintain policies that promote growth and development Policies that ensure low transportation costs Measures on product improvements
SITC 0	Food & live animals	Maintain policies that promote growth and development Measures on product improvements
SITC 1	Beverages & tobacco	Maintain policies that promote growth and development Policies that ensure low transportation costs Measures on product improvements
SITC 2	Crude materials	Maintain policies that promote growth and development Measures on product improvements
SITC 3*	Minerals & fuels	Maintain policies that promote growth and development Measures on product improvements Close monitoring in the presence of exchange rate volatility
SITC 4	Animal & vegetable fat	Maintain policies that promote growth Tariff reduction policies Measures on product improvements
SITC 5	Chemicals & materials	Maintain policies that promote growth Policies that ensure low transportation costs Measures on product improvements
SITC 6	Manufactured goods	Maintain policies that promote growth and development Measures on product improvements
SITC 7	Machinery & transport equipment	Maintain policies that promote growth and development Measures on product improvements Close monitoring in the presence of exchange rate volatility
SITC 8	Miscellaneous manufactures	Maintain policies that promote growth and development Policies that ensure low transportation costs Measures on product improvements
SITC 9*	Other commodities	Maintain policies that promote growth and development Measures on product improvements

Note: * Non-priority sectors of ASEAN.

7. CONCLUSION

The ASEAN has established preferential trading arrangements among member countries since as early as 1977. As the global market became more competitive in terms of market access and in attracting foreign direct investment, the ASEAN Free Trade Area (AFTA) was established in 1992 focusing on eliminating tariff and non-tariff barriers. Later in 2003, the Bali Concord II sets the target of establishing an ASEAN Community by 2020 which includes, among others, the creation of the ASEAN Economic Community (AEC).

However, despite the progress made in terms of tariff reductions over the years, studies have suggested that only negligible increases in regional trade have been achieved. This is mainly due to the fact that ASEAN trades more with the rest of the World (about 80% share of total). Hence, integration efforts within ASEAN had to be geared toward "open regionalism", rather than inward-looking or a "Fortress ASEAN". This is most appropriate since the ASEAN markets are relatively small. Integration efforts are not for the purpose of gaining access to each other's markets per se, but rather as a means to plug into the international marketplace.

Since the AEC seeks to establish ASEAN as a single market place and production base, it needs to ensure that member countries develop their capacities and enhance production efficiency as a means to create comparative advantage in the various sectors. Hence, intra-ASEAN trade has to be trade creating (higher trade with efficient members) and not trade diverting (higher trade with inefficient members). This should also be the case at the sectoral level.

Thus, this study aims at investigating whether intra-trade in general and at the sectoral level has caused a shift in the product origin from a domestic producer who faces higher costs to a member producer with lower resource costs, leading to a higher efficiency (trade creation) or whether it has caused the product origin to shift from a non-member producer who faces lower costs to a member producer whose resource costs are higher, leading to a fall in efficiency and welfare (trade diversion). In doing so, the study will also identify which sectors benefit from intra-regional trade within ASEAN in terms of promoting trade in efficient sectors. Factors that affect trade, both inter-industry as well as intra-industry trade at the sectoral level are also later identified.

The study adopts the extended gravity model at the total as well as the disaggregated level at the one-digit Standard International Trade Classification (SITC) Revision 2. The basic gravity model is extended by including additional factors that are found to be robust in the sensitivity analysis of gravity models by Yamarik and Ghosh (2005). These factors include level of development as represented by the sum of manufacturing exports as a percentage of merchandise exports, factor endowment as represented by population, geographical factors as represented by adjacency of one country to another and surface area, regional trading arrangement represented by membership in the ASEAN, as well as trade policy as represented by tariff rates. However, two additional variables are also included in the extended gravity model, namely relative development as represented by the log difference of real GDP per capita and exchange rate risk as represented by exchange rate volatility. This is for the purpose of investigating whether member countries' similarities or dissimilarities matter in determining trade, as well as whether there is a need to establish exchange rate policy coordination within ASEAN in order to ensure stable exchange rates in promoting trade.

Four main models are estimated in this study: (i) Model I: Extended gravity model without tariff and volatility (1989-2006); (ii) Model II: Extended gravity model without tariff and with volatility (1992-2006); (iii) Model III: Extended gravity model with tariff and without volatility (2001, 2003, 2005, 2006); and (iv) Model IV: Extended gravity model with tariff and volatility (2001, 2003, 2005, 2006). For each of the model, estimations are performed for total bilateral exports as well as exports at the one-digit Standard International Trade Classification (SITC) disaggregated level, i.e., from SITC 0 to SITC 9, using the Panel Data procedure for the five founding members of ASEAN, namely Indonesia, Malaysia, the Philippines, Singapore, and Thailand and their three major trading partners, namely Japan, the UK, and the US.

Trade creation is found to be present for total exports, for beverages & tobacco (SITC 1), chemicals & materials (SITC 5), machinery & transport equipment (SITC 7), and miscellaneous manufactures (SITC 8). This implies that the increased inter-industry and intra-industry trade in the four sectors within ASEAN involves trade in efficient sectors of fellow member countries. Neither trade creation nor trade diversion is found in any of the other sectors. Thus, only 'good' intra-regional trade is taking place within ASEAN.

Income levels, transportation costs as well as level of development are shown to have a significant effect on total trade as well as most sectors. Relative development affects only food & live animals (SITC 0), crude materials (SITC 2), chemicals & materials (SITC 5), and manufactured goods (SITC 6). Factor endowments are important determinants of total trade as well as trade in animal & vegetable fat (SITC 4), chemicals & materials (SITC 5), machinery & transport equipment (SITC 7), and miscellaneous manufactures (SITC 8).

Tariffs do not seem to have any effect on trade except for the animal & vegetable fat sector (SITC 4), while exchange rate risk affects only beverages & tobacco (SITC 1), minerals & fuels (SITC 3), machinery & transport equipment (SITC 7), and miscellaneous manufactures (SITC 8).

Based on the findings, in general, policies that promote growth and development in the region should be maintained. This is in line with Hanoi Plan of Action and the ASEAN Vision 2020 that emphasize on sustainable and equitable growth to promote economic integration in ASEAN. In addition, measures need to be undertaken to ensure low transportation costs that include improving both the physical infrastructure and the efficiency of transportation systems as well as considering policies that ensure low fuel prices. Since tariffs are no longer much of an issue to promote trade, emphasis should be placed on other factors that affect export demand such as product development to improve the quality of exports and to meet the preferences of importing countries.

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Appendix 1:

Summary Results of Extended Gravity Model Without Tariffs

		Expected	Total		SITC 0		SITC 1	
Categories	**Variables**	**sign**	**Model I**	**Model II**	**Model I**	**Model II**	**Model I**	**Model II**
Core	$\ln(Y_iY_j)$	+	+	+	+	+	+	+
Core	ln *Distance*	-			-			
Relative development	$Abs(\ln YPC_i - \ln YPC_j)$	+ or -						
Geographical factors	*Border*	+					+	+
Geographical factors	$\ln(A_iA_j)$	-						
Factor endowment	$\ln(NiNj)$	+ or -						
Level of development	$\frac{manuf}{X_i} + \frac{manuf}{X_j}$	+			[-]			
Regional trading arrangement	*ASEAN*	+ or -					+	+
Exchange rate risk	$Volatility_{ij}$	+ or -						+

		Expected	SITC 2		SITC 3		SITC 4	
Categories	**Variables**	**sign**	**Model I**	**Model II**	**Model I**	**Model II**	**Model I**	**Model II**
Core	$\ln(Y_iY_j)$	+	+	+	+	+	+	+
Core	ln *Distance*	-	-	-				
Relative development	$Abs(\ln YPC_i - \ln YPC_j)$	+ or -	+	-				
Geographical factors	*Border*	+						
Geographical factors	$\ln(A_iA_j)$	-						[+]
Factor endowment	$\ln(NiNj)$	+ or -'						
Level of development	$\frac{manuf}{X_i} + \frac{manuf}{X_j}$	+	+	-				
Regional trading arrangement	*ASEAN*	+ or -						
Exchange rate risk	$Volatility_{ij}$	+ or -		+		-		

Categories	Variables	Expected sign	SITC 5		SITC 6		SITC 7	
			Model I	Model II	Model I	Model II	Model I	Model II
Core	$\ln(Y_iY_j)$	+	+	+	+	+	+	+
Core	ln *Distance*	-			-	-	-	-
Relative development	$Abs(\ln YPC_i - \ln YPC_j)$	+ or -						
Geographical factors	*Border*	+						
Geographical factors	$\ln(A_iA_j)$	-	-	[+]				
Factor endowment	$\ln(NiNj)$	+ or -	+	-				
Level of development	$\frac{manuf}{X_i} + \frac{manuf}{X_j}$	+	+			+	+	+
Regional trading arrangement	*ASEAN*	+ or -	+				-	
Exchange rate risk	$Volatility_{ij}$	+ or -						-

Categories	Variables	Expected sign	SITC 8		SITC 9	
			Model I	Model II	Model I	Model II
Core	$\ln(Y_iY_j)$	+	+	+	[-]	[-]
Core	ln *Distance*	-				-
Relative development	$Abs(\ln YPC_i - \ln YPC_j)$	+ or -				
Geographical factors	*Border*	+				[-]
Geographical factors	$\ln(A_iA_j)$	-			[+]	[+]
Factor endowment	$\ln(NiNj)$	+ or -			-	-
Level of development	$\frac{manuf}{X_i} + \frac{manuf}{X_j}$	+	+	+	[-]	[-]
Regional trading arrangement	*ASEAN*	+ or -	-		-	-
Exchange rate risk	$Volatility_{ij}$	+ or -				

Notes: Model I = Without volatility; Model II = With volatility. Figures in square parentheses represent results that do not conform to the expected signs.

Appendix 2:
Summary Results of Extended Gravity Model With Tariffs and Without Volatility

		Expected	Total				SITC 0				SITC 1			
Categories	**Variables**	**sign**	**2001**	**2003**	**2005**	**2006**	**2001**	**2003**	**2005**	**2006**	**2001**	**2003**	**2005**	**2006**
Core	$\ln(Y_iY_j)$	+	+	+	+	+	+	+	+	+	+	+	+	+
Core	ln *Distance*	-	-	-	-	-	-	-	-	-				
Relative development	$Abs(\ln YPC_i - \ln YPC_j)$	+ or -	+	+			+	+	+	+				
Geographical factors	*Border*	+						+			+			
Geographical factors	$\ln(A_iA_j)$	-		[+]										
Factor endowment	$\ln(NiNj)$	+ or -	-	-	-	-			+	+				
	$\frac{manuf}{X_i} + \frac{manuf}{X_j}$													
Level of development		+	+	+		+		+	+	+		+		+
Regional trading arrangement	*ASEAN*	+ or -	+	+	+	+	+			+	+	+	+	+
Trade policy	$Trf_i + Trf_j$	-					[+]							

		Expected	SITC 2				SITC 3				SITC 4			
Categories	**Variables**	**sign**	**2001**	**2003**	**2005**	**2006**	**2001**	**2003**	**2005**	**2006**	**2001**	**2003**	**2005**	**2006**
Core	$\ln(Y_iY_j)$	+	+	+			+	+	+	+				
Core	ln *Distance*	-	-	-	-	-	-	-	-	-		-	-	-
Relative development	$Abs(\ln YPC_i - \ln YPC_j)$	+ or -												
Geographical factors	*Border*	+										[-]		
Geographical factors	$\ln(A_iA_j)$	-									[+]	[+]		[+]
Factor endowment	$\ln(NiNj)$	+ or -										-	+	-
Level of development														
	$\frac{manuf}{X_i} + \frac{manuf}{X_j}$													
		+				[-]							-	
Regional trading arrangement	*ASEAN*	+ or -					+	+	+	+				
Trade policy	$Trf_i + Trf_j$	-				[+]					-	-	-	-

		Expected	SITC 5				SITC 6				SITC 7			
Categories	**Variables**	**sign**	**2001**	**2003**	**2005**	**2006**	**2001**	**2003**	**2005**	**2006**	**2001**	**2003**	**2005**	**2006**
Core	$\ln(Y_i Y_j)$	+	+	+	+	+	+	+	+	+	+	+	+	+
Core	ln *Distance*	-	-				-	-	-	-	-	-	-	-
Relative development	$Abs(\ln YPC_i - \ln YPC_j)$	+ or -	-	-	-	-	+	+	+	+	+			
Geographical factors	*Border*	+							[-]					[-]
Geographical factors	$\ln(A_i A_j)$	-						[+]	[+]		[+]	[+]	[+]	[+]
Factor endowment	$\ln(NiNj)$	+ or -						-			-	-	-	-
Level of development	$\frac{manuf}{X_i} + \frac{manuf}{X_j}$	+						+	+	+	+	+	+	+
Regional trading arrangement	*ASEAN*	+ or -	+	+	+	+			+	+	+	+	+	+
Trade policy	$Trf_i + Trf_j$	-												

		Expected	SITC 8				SITC 9			
Categories	**Variables**	**sign**	**2001**	**2003**	**2005**	**2006**	**2001**	**2003**	**2005**	**2006**
Core	$\ln(Y_i Y_j)$	+	+	+	+	+				+
Core	ln *Distance*	-								
Relative development	$Abs(\ln YPC_i - \ln YPC_j)$	+ or -	+	+	+	+				-
Geographical factors	*Border*	+								
Geographical factors	$\ln(A_i A_j)$	-			[+]					
Factor endowment	$\ln(NiNj)$	+ or -	-	-		-				
Level of development	$\frac{manuf}{X_i} + \frac{manuf}{X_j}$	+		+					+	
Regional trading arrangement	*ASEAN*	+ or -		+	+	+				
Trade policy	$Trf_i + Trf_j$	-								

Note: Figures in square parentheses represent results that do not conform to the expected signs.

Appendix 3:
Summary Results of Extended Gravity Model With Tariffs and Volatility

		Expected	Total				SITC 0				SITC 1			
Categories	**Variables**	**sign**	**2001**	**2003**	**2005**	**2006**	**2001**	**2003**	**2005**	**2006**	**2001**	**2003**	**2005**	**2006**
Core	$\ln(Y_iY_j)$	+	+	+	+	+	+	+	+	+	+	+	+	+
Core	ln *Distance*	-	-	-	-	-	-	-	-	-				
Relative development	$Abs(\ln YPC_i - \ln YPC_j)$	+ or -	+					+	+	+				
Geographical factors	*Border*	+												
Geographical factors	$\ln(A_iA_j)$	-		[+]										
Factor endowment	$\ln(NiNj)$	+ or -	-	-	-	-			+	+				
	$\frac{manuf}{X_i} + \frac{manuf}{X_j}$													
Level of development		+	+	+				+	+	+		+	+	+
Regional trading arrangement	*ASEAN*	+ or -	+	+	+	+	+			+	+	+	+	+
Trade policy	$Trf_i + Trf_j$	-					[+]							
Exchange rate risk	$Volatility_{ij}$	+ or -												
		Expected	**SITC 2**				**SITC 3**				**SITC 4**			
Categories	**Variables**	**sign**	**2001**	**2003**	**2005**	**2006**	**2001**	**2003**	**2005**	**2006**	**2001**	**2003**	**2005**	**2006**
Core	$\ln(Y_iY_j)$	+	+	+			+	+	+	+				
Core	ln *Distance*	-	-	-	-	-	-	-	-				-	-
Relative development	$Abs(\ln YPC_i - \ln YPC_j)$	+ or -				-								
Geographical factors	*Border*	+										[-]		
Geographical factors	$\ln(A_iA_j)$	-									[+]	[+]	[+]	[+]
Factor endowment	$\ln(NiNj)$	+ or -'				-						-	-	-
Level of development	$\frac{manuf}{X_i} + \frac{manuf}{X_j}$	+												
Regional trading arrangement	*ASEAN*	+ or -					+	+	+	+				
Trade policy	$Trf_i + Trf_j$	-				[+]					-	-		-
Exchange rate risk	$Volatility_{ij}$	+ or -				+								

Categories	Variables	Expected sign	SITC 5				SITC 6				SITC 7			
			2001	2003	2005	2006	2001	2003	2005	2006	2001	2003	2005	2006
Core	$\ln(Y_iY_j)$	+	+	+	+	+	+	+	+	+	+	+	+	+
Core	ln *Distance*	-					-	-	-	-	-	-	-	-
Relative development	$Abs(\ln YPC_i - \ln YPC_j)$	+ or -	-	+	-	-		+	+	+	+			
Geographical factors	*Border*	+							[-]					[-]
Geographical factors	$\ln(A_iA_j)$	-						[+]	[+]		[+]	[+]	[+]	[+]
Factor endowment	$\ln(NiNj)$	+ or -						-			-	-	-	-
Level of development	$\frac{manuf}{X_i}+\frac{manuf}{X_j}$	+						+	+	+	+	+	+	+
Regional trading arrangement	*ASEAN*	+ or -	+	+	+	+			+	+	+	+	+	+
Trade policy	$Trf_i + Trf_j$	-												
Exchange rate risk	$Volatility_{ij}$	+ or -												

Categories	Variables	Expected sign	SITC 8				SITC 9			
			2001	2003	2005	2006	2001	2003	2005	2006
Core	$\ln(Y_iY_j)$	+	+	+	+	+			+	+
Core	ln *Distance*	-								
Relative development	$Abs(\ln YPC_i - \ln YPC_j)$	+ or -								-
Geographical factors	*Border*	+								
Geographical factors	$\ln(A_iA_j)$	-		[+]						
Factor endowment	$\ln(NiNj)$	+ or -	-	-	-	-				
Level of development	$\frac{manuf}{X_i}+\frac{manuf}{X_j}$	+	+	+	+	+				
Regional trading arrangement	*ASEAN*	+ or -		+	+	+				
Trade policy	$Trf_i + Trf_j$	-								
Exchange rate risk	$Volatility_{ij}$	+ or -	+	+	+	+	-			

Note: Figures in square parentheses represent results that do not conform to the expected signs.