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The Impacts of Free Trade Agreements on Trade Flows: An Application of the Gravity Model Approach

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Abstract

The proliferation of FTAs appears to have affected economic conditions in many countries through foreign trade. We attempt to discern the impacts of FTAs on foreign trade by using two approaches. One approach is to examine the changes in trade patterns before and after an FTA by using indicators of intra-FTA interdependence. The second approach is the estimation of a gravity equation to discern the impacts of FTAs on bilateral trade flows, i.e. trade creation and diversion effects. In the latter approach we extend the previous studies by enlarging the sample size in terms of the time-period, and also undertake an analysis by disaggregating the trade data with a presumption that the impact of FTAs is different for different sectors. The results of the analysis revealed several interesting observations. Our analysis of the total trade indicates that FTAs bring about trade creation effect and that trade diversion effect is limited. Besides, the results of our analysis of disaggregated trade data show different patterns among different products, and they identify trade diversion effect for many products in the case of the EU, the NAFTA, and the MERCOSUR but not for the case of the AFTA.

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I. Introduction

The world has been witnessing a proliferation of regional trade agreements (RTAs), which include free trade agreements (FTAs) and customs unions. The cumulative number of RTAs that had been reported to the GATT (General Agreement on Tariffs and Trade) since its inception in 1948 was 25 in 1990[1]. The number began to increase in the 1990s to a record 91 in 2000, and then accelerated to reach 194 as of March 1, 2007. Several notable developments should be recognized. First, many RTAs are FTAs, under which trade barriers between FTA members are removed but they maintain their own protection vis-à-vis non-FTA members. The number of customs unions, where members not only remove trade barriers between the members but also establish common external tariff vis-à-vis non-members, is small[2]. Second, many FTAs go beyond the tariff removal to include other elements such as liberalization of foreign direct investment (FDI) policies, facilitation of trade and FDI, and economic cooperation. As such, the economic impacts of FTAs on FTA members and non-members are likely to be substantially larger compared to traditional FTAs. Third, FTAs were actively established in Europe, Africa and North and South America through the 1990s, but starting in the 21st century the East Asian region joined other regions in establishing FTAs. In the East Asian region, the Association of Southeast Asian Nations (ASEAN) has been playing a key role in establishing FTAs with other countries in East Asia.

The rapid expansion of FTAs is attributable to various factors. One important reason is the stalemate in the Doha Development Agenda, the on-going multilateral trade negotiation under the World Trade Organization (WTO). Faced with this situation, countries interested in the promotion of trade liberalization have pursued bilateral or plurilateral trade liberalization under FTAs with like-minded countries. Being concerned with possible exclusion from FTAs, an increasing number of countries began showing a strong interest in FTAs.

The proliferation of FTAs appears to have affected economic conditions in

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[1] WTO website, http://www.wto.org/english/tratop_e/region_e/summary_e.xls

[2] As of March 1, 2007, out of 194 RTAs reported to the GATT/WTO, as many as 190 RTAs, or 93 percent of total, are FTAs, while the remaining 14 RTAs, or 7 percent of total, are customs unions. (WTO website). Because of the large number of FTAs among RTAs, we use the term FTAs to indicate RTAs, unless otherwise noted.

many countries, not only FTA members but also non-members, through foreign trade. Two possible impacts, trade creation and trade diversion, may be realized as a result of FTAs. The trade creation effect means that the FTA eliminates trade barriers on trade among FTA members and, therefore, creates trade among them, while the trade diversion effect means that the FTA would replace imports of highly efficient non-member countries by imports from less efficient FTA members. Trade creation results in an improvement in resource allocation and economic welfare, while trade diversion worsens efficiency in resource allocation. Besides, trade diversion has a negative impact on non-members as they lose an exporting opportunity. While consumers in FTA members may increase welfare as the FTA enables them to buy imports at lower prices, an FTA member country in its totality may lose if the loss in government's tariff revenue overwhelms the consumers' gain.

To discern the impacts of FTAs on foreign trade, we undertake the analysis by using two approaches. One approach is to examine the changes in trade patterns before and after an FTA. Specifically, we measure the extent of dependency in foreign trade between and among FTA members. This approach is admittedly simplistic, but it provides useful information on the extent of trade dependency for different FTAs and its changes over time. The second approach is a more vigorous one, namely, the estimation of a gravity model to discern the impact of FTAs on bilateral trade flows, i.e. trade creation and diversion effects. The gravity model, which is built on the assumption that bilateral trade flows depend on the economic size of the two countries and the distance between them, has been used to assess the impacts of FTAs on bilateral trade flows. We extend the previous studies by enlarging the sample size both in terms of the number of countries and in terms of the time-period. We also undertake the analysis by disaggregating the trade data into five sub-sectors with a presumption that the impacts of FTAs would be different among different sectors, mainly because the removal of trade barriers under FTAs is different for different sectors. Specifically, agricultural products are prone to be excluded from the free trade list. Furthermore, we examine explicitly the impacts of trade-diversion of FTAs by taking account of trade between FTA members and non-members.

The structure of the paper is as follows. Section II examines the changing patterns of international trade among FTA member countries over time, in order to see if

any discernable changes such as the increase in intra-FTA member trade can be identified. The analysis in this section, which uses rather crude indicators, also provides some basic information on the international trade for different FTAs. Section III undertakes a rigorous analysis by applying a gravity model to assess the impacts of FTAs on international trade involving FTA members and non-members. In section III a brief survey of the literature is presented before proceeding to the main analysis. Section IV presents some concluding remarks.

II. Intra-FTA Trade Dependency for Selected FTAs

FTAs are expected to promote trade among FTA members, possibly at the expense of trade with non-FTA members. By using a rather crude methodology, this section examines if these expected impacts are observed for a selected number of FTAs, before undertaking a more rigorous approach in the next section. As such, the analysis in this section may be considered to set the stage for a more detailed analysis in the next section.

We use two indicators to examine the extent of intra-FTA interdependence[3]. One is the share of intra-FTA members' trade in FTA members' overall trade (relative share) and the other is trade-intensity. The definitions of these two indicators are shown below.

Relative share: Xii / Xiw

Trade intensity index: $(Xii / Xiw) / (Xiw / Xww)$

where Xii represents intra-region (FTA) trade, Xiw region i's trade with the rest of the world, and Xww world trade.

Let us examine intra-regional dependence in foreign trade for a selected number of FTAs (Table 1). To begin with the relative share indicator, one observes that the relative share has risen in many FTAs with the exceptions of the EU (European Union), Japan-Singapore FTA, Singapore-USA FTA and Mexico-EU FTA after the enactment of

[3] Schiff and Winters (2003) analyzes the impacts of FTAs (they use the term "regional integration agreements) by using various indicators including those used in this paper.

FTAs[4]. For example, for the AFTA (ASEAN Free Trade Area) the relative share increased from around 17 percent in the pre-AFTA years to 22-25 percent in the post-AFTA years. Similar patterns are observed for many other FTAs, although the increase in the relative share is less pronounced compared to the case for the AFTA. This finding indicates the possible trade creation for many FTAs.

The relative shares show the importance of trade with FTA members for a country or a region under study. According to the computed figures for 2005, one finds that intra-FTA trade accounts for a large part of trade for the EU and the NAFTA (North American Free Trade Agreement), as the relative percentage shares of intra-FTA trade in overall trade for these two groups were 58.4 and 43 percent, respectively. Despite the smaller magnitude, the intra-FTA trade is important for the AFTA members, as the relative percentage share was recorded at 25.5 percent. The relative shares for Mercosur and China-ASEAN were of some significance with the figures exceeding 10 percent. Indeed, the relative share for the China-ASEAN FTA increased notably over time. For the remaining FTAs, the relative shares are very small, reflecting the limited importance of intra-FTA trade for the countries involved.

The second indicator we examine is the trade intensity index, which measures the "pure" intensification of trading relationship. An increase in trade with a country may be attributable to two factors. One is the expansion of trade by a trading partner and the other is "pure" intensification of the trade relationship. Specifically, trade relationship of a country with (or trade dependency of a country on) a trading partner country can increase when the trading partner's trade expands faster than other countries. Taking into account this factor, we compute trade intensity index and its changes over time. Trade intensity index captures the "bias" in bilateral trade relationship by considering the trade volume of the trading partner. Trade relationship is more (less) intensive (or biased) than normal if the value of trade intensity is greater (less) than unity.

According to the computed results shown in Table 1, it appears that trade intensity increased after the establishment of FTAs for the NAFTA, the Mercosur, the CER, and the AFTA (recent years). It may be pointed out that trade intensity for Japan-Mexico increased rather noticeably in 2005 after the enactment of the

[4] The figures with the shade indicate that corresponding FTA is in effect.

Japan-Mexico FTA, although its magnitude is very small at 0.217.

An examination of the trade intensity figures reveals wide variations in the intensity of intra-FTA relationships among different FTAs. In 2005 the Mercosur was found to show the strongest intra-FTA trade relationship, as the trade intensity index was recorded at 7.8. The Mercosur was followed by the CER (5.6) and the AFTA (4.5). In addition to these FTAs, the EU and the NAFTA recorded the value greater than unity. These findings indicate that trade relationships among FTA members are quite strong, or above average, for the EU, the NAFTA, the AFTA, the Mercosur and the CER. By contrast, trade relationships among FTA members are rather weak, or below average, for the remaining FTAs, Japan-Singapore, Japan-Mexico, China-ASEAN, Korea-Chile, Singapore-USA, and Mexico-EU.

In this section we examined the impacts of FTAs on trade relationship between and among FTA members. We found that some FTAs including the NAFTA, the AFTA, the MERCOSUR and the CER appeared to have produced trade-creation effect, while for other FTAs such effect was not observed. We further found that intra-FTA trade relationship is important and intense for the EU, the NAFTA, the AFTA, the Mercosur and the CER, while it is not so for other FTAs. The analysis in this section has provided useful information on the impacts of FTAs on international trade for the FTA members, but the analysis was rather crude, as it could not isolate the impacts of FTAs from other factors that influence international trade such as economic size of the countries involved. Furthermore, the analysis in this section was not precise in that no statistical assessment was made. To remedy these problems and to discern the impacts of FTAs on international trade for the FTA members and non-members, we undertake an analysis by applying the gravity model in the next section.

III. The Impacts of FTAs on Bilateral Trade Flows: An Application of a Gravity Model

Our analysis is based on estimating a gravity model, which tries to explain the volume of trade between the two countries by their market size and geographical distance. The gravity model has been shown to have theoretical foundations in international trade theory, as discussed in Anderson (1979). We begin our analysis by presenting a brief summary of literature survey of the empirical application of the

gravity model. We then conduct our analysis first by examining the trade creation effect of FTAs and then the trade creation and trade diversion effects jointly.

III.1 A Brief Survey of the Literature

The gravity model has been applied extensively in cross-country analysis of bilateral international trade flows for more than four decades. Tinbergen (1962) and Pöyhönen (1963) are early pioneers in applying the gravity model to study international trade flows, and since then numerous empirical analyses using the model have been conducted to provide various verifications and implications on international trade. Since the mid-1980s theoretical foundations of the gravity model have been provided within the framework of the international trade theory based on imperfect substitutes, increasing return to scale and product differentiation at firm-level. Since the 1990s, the gravity model has attracted a lot of attention in the analysis of international trade as a result of renewed interest in economic geography, which considers geographic and other kinds of 'distance' as an important factor in economic activities.

The gravity equation has been a popular methodology to study the effects on trade of international trading system such as the WTO and regional trading arrangement such as FTAs and currency unions. Timbergen (1962) was the first attempt to examine the effects of FTA on trade, and he found significant positive effects among members of the British Commonwealth but insignificant for the Benelux FTA. In the 1970s and 1980s several studies analyzed the effects of major regional trade agreements and schemes, such as the EEC (European Economic Community), EFTA (European Free Trade Association) and LAFTA (Latin America Free Trade Agreement) (Aitken (1973) and Brada and Mendez (1983), etc.). In order to capture the effects of the FTAs on trade flows, they added a dummy variable, which takes the value of unity if country pairs belong to the same FTA, to the standard gravity model. This dummy variable method has been used for many studies on this subject since then.

In the light of rapid expansion of FTAs since the 1990s, an increasing number of studies have attempted to examine the impacts of various FTAs by applying the gravity model. Frankel, Stein and Wei (1995) and Frankel (1997) examined the effects of major FTAs, such as the EU, the NAFTA, the MECOSUR and the AFTA, and they found significant positive effects in the cases of the MERCOSUR and the AFTA but not

in the cases of the EU or the NAFTA. Solaga and Winters (2000) also attempted to capture the trade creation and two-way trade diversion effects of major multilateral FTAs. They found significantly positive effect on trade creation for the FTAs only in Latin American countries, and they also found significant trade diversion effects for the cases of the EU and the EFTA. Endoh (1999) analyzed the trade creation and trade diversion effects of the EEC, LAFTA and CMEA (Council of Mutual Economic Assistance, COMECON), and he found both effects for these FTAs, and he also observed that the effects were diminishing in the 1990s. As the results of these studies indicate, the estimated results on the effects of FTAs on trade flows by using the gravity model are not uniform but mixed.

Several attempts have been made to discern the effects of FTAs more in detail in recent years. Taking account of the improvement in the estimation method, Baier and Bergstrand (2002) treated FTA dummies as endogenous variables, and they showed that the effect of FTAs on trade flows is quadrupled. Carrere (2003) applied Baier and Bergstrand's specification to panel data analyses, and derived the result showing that FTAs generated a significant increase in trade in contrast to previous results. Chen and Tsai (2005) constructed a modified gravity model and compared the results by using panel data. They found that the estimated values are different among different FTAs.

Although the trade creation effects of FTAs are found in many cases, a lot of studies suggest that the magnitude of the effects depends on the time period and other circumstances. Based on the notion that the impact of FTAs on trade differs depending on the products, several studies have conducted analyses at disaggregated sector levels. Gilbert, Scollay and Bora (2004) attempted to find out the effects of major FTAs and natural trading blocs in East Asia by sector, and they obtained the results that natural trading blocs in East Asia exist in merchandise and manufacturing sectors. Endoh (2005) investigated the effects of GSTP (Generalized System of Trade Preferences) among developing countries on trade of capital goods, and he found that the trade between GSTP countries increased significantly.[5]

In the light of the results from the earlier studies, in this paper we extend the earlier analyses by using a large up-to-date data sample and a disaggregated dataset in

[5] Besides, Fukao, Okubo and Stern (2003) provide an econometric analysis on trade diversion effects of the NAFTA by using HS 2digit level data, in partial equilibrium framework.

order to deepen our understanding of the impacts of FTAs on trade flows.

III.2 The Model and the Estimated Results

We conduct the estimation of the gravity model to assess the impacts of FTAs on international trade flows. We apply the estimation by using two types of datasets, aggregate and disaggregate trade datasets.

III.2.1 The Analysis of ‘‘general FTA’’ effect

The model

We use a standard gravity equation to discern the impacts of FTA on bilateral merchandise trade. First we estimate the following equation (1) to examine “general FTA effects” for total merchandise trade flows between countries i and j.

$$\begin{aligned} ln(Trade_{ijt}) &= \alpha + \beta_1 ln(Y_{it} * Y_{jt}) + \beta_2 ln(y_{it} * y_{jt}) + \beta_3 ln(IncomeGAP) \\ &+ \beta_4 ln(Distance_{ijt}) + \beta_5 Adjacency_{ijt} + \beta_6 Language_{ijt} + \phi\, FTA_{ijt} + \sum_t \gamma_t Timedum_t \end{aligned} \qquad (1)$$

where, $Trade_{jit}$ denotes total export value between country i and j in year t, and it is the sum of the exports of country i to j and the exports of country j to i. *Y* and *y* denote GDP and GDP per capita, respectively. Log of the absolute value of difference of GDP per capita is also included to estimate the effect of the difference of income between a country pair on trade flows. *Distance* indicates the geographical distance in km between the largest cities of countries i and j. *Adjacency* and *Language* are dummy variables, where *Adjacency* is given the value of unity if countries i and j share the common border, and *Language* is given the value of unity if common official languages are shared by countries i and j. *FTA* denotes a “general FTA effects”, and it is binary variable which is unity if country i belongs to the same FTA with country j or otherwise given zero. We construct this variable based on 22 regional trade agreements and 86 bilateral trade agreements which are notified to the GATT and the WTO up to September 2006. *Timedum* is a nested dummy variable which is used to capture external annual time effect during the sample period.

Among the explanatory variables, *Y* and *y* are a proxy for economic scale and

income level, respectively, and their estimated signs are expected to be positive because the larger economic scale and the higher income level promote trade. The difference of income between country pair can have both positive and negative impacts on trade flows. A large income gap may increase vertical (inter-industry) trade, while a small income gap may increase horizontal (intra-industry) trade. The distance variable reflects both tangible and intangible trade costs. The sign is expected to be negative as the longer the distance, the larger the cost. Both dummy variables of *Adjacency* and *Language* also reflect tangible and intangible trade costs such as transportation cost and cultural similarity, so that these estimated coefficients are expected to be positive. The binary variable *FTA* captures a "general FTA effect" on trade flows, and we expect the estimated relation to be positive, if the trade creation effect emerges.

The Data

The sample for the estimation includes 178 countries over the 1950-2005 period (Appendix Table 2). The sample is constructed by expanding the dataset constructed by Rose (2005). We use bilateral trade value, GDP, GDP per capita, distance between pair countries, dummy variables of common language and adjacency during 1950-1999 from his dataset, and expand these variables by using Direction of Trade Statistics and International Financial Statistics of the IMF (International Monetary Fund), World Development Indicators of the World Bank up to the year 2005. Trade data are taken from Direction of Trade Statistics (DOT) of IMF. Since the data from DOT are expressed in nominal US dollars, we deflated the value by consumer price Index of USA (2000=1) in the same way as Rose (2004). The dummy variables of Distance, Adjacency and Common language are set constant during the sample period. Missing values are taken out, and as such the number of samples varies among the estimations.

The Estimation Method

To begin with, we conduct the structural change test because the sample has large time series dimension. We apply the cumulative sum of recursive residual test (CUSUM test) to judge whether the structural change had occurred during the period. CUSUM test for the panel data proposed by Maskus (1983) is applied using weighted

sum of residuals across cross-sectional units. Although the statistic value does not exceed either upper or lower confidence boundaries during the sample periods, the value is found to vary from zero since the year 1984. Therefore we divide the entire sample period into two sub-periods, 1950-1983 and 1984-2005. In addition we produce one sub- group which consists of OECD country pair groups for comparison.

Regarding the estimation method, we have to deal with two problems. The first problem is about heteroskedasticity and auto correlation with disturbance for the large panel data set. We found panel level heteroskedasticity and first order autocorrelation by using LR test and Wooldridge's test for autocorrelation in panel-data models[6]. Based on the results of the tests, we apply the weighted ordinary least square (OLSQ) method with corrected errors to estimate parameters for pooled cross sectional and time series data for the benchmark result. The second problem is the bias arisen from correlation between some of the regressors and country pair-level effects included in the error term. In addition, endogeneity of the regressors gives rise to simultaneous determination such as the relation between GDP and bilateral trade flow. Therefore we apply the system Generalized Method of Moments (GMM) technique. The system GMM technique proposed by Blundell and Bond (1997) is the estimation of a system of two simultaneous equations, one equation in levels and the other in first differences, and these simultaneous equations are estimated with lagged levels and first differences instruments.[7] In the estimation procedure, we regard GDP and GDP per capita are endogenous variables, and use the Robust one-step estimation.

The Results

We apply the ordinary least squares method with corrected disturbance to estimate the equation (1) for all country pairs and OECD groups for the 1950-1983 and 1984-2005 periods for benchmark results. In both cases the estimated coefficients of the standard set of variables, which are generally used in the gravity model estimation, are shown to have expected signs with statistical significance (Table 2). That is to say, the magnitude of bilateral trade is promoted by the economic size, income levels, and cultural similarities of the countries involved, while it is deterred by their geographical

[6] We apply the test written by David Drukker to perform in STATA.
[7] We use STATA's estimator 'xtabond2' provided by David Roodman.

distance. The estimated coefficients of the difference of income levels between country pairs for all samples are shown to have both positive and negative with statistical significance in the case of OLSQ estimations. The estimated coefficients for the GMM estimation are also shown to take both positive and negative signs, but they are not statistically significant.

Concerning the estimated coefficient of 'general FTA effect', the estimated results of the FTA dummy variable show that FTAs promoted bilateral trade in almost all cases. Although the estimated coefficients from the OLSQ estimation tend to have upward bias, the coefficients of system GMM are also found to be significantly positive. The results also suggest that effects of FTA on trade flows are weaker for the second half of sample period than the first half. Although only eight RTAs[8] were formed during the first half sample period, these earlier RTAs including the EC, EFTA and CER tend to be formed with neighbors and major trade partner countries. A large number of bilateral FTAs which were formed during the latter half of the sample period, particularly after the latter half of 1990s, were not formed between major trade partners. Therefore, it is conceivable that the relation between FTA and trade flows became weaker over time. Indeed, the motivation behind the establishment of FTAs in recent years has become diversified as it is not only the trade promotion but also non-economic factors such as political factors that have played important roles in the establishment of FTAs.

Regarding the estimation results by using the system GMM, the estimation needs to be improved because Hansen J statistics test for over-identifying restrictions are not satisfactory in the case of all samples for both periods and OECD for the first half period, and Alleano-Bond test for the serial correlation does not reject the null hypothesis of the absence of autocorrelation in the case of the first half period for the OECD countries. With an improvement of the model specification particularly concerning the problems related to the large T-panel and unbalanced panel data, the results suggest that general impacts of FTA on trade flows are positive and they tended to become weaker over sample periods.

III.2.2 The Analysis of Trade Creation and Trade Diversion Effect

[8] The RTAs are EC, EFTA, CACM, CARICOM, PATCRA, SPARTECA and CER. See Table A.4 for the details on RTAs included in 'general FTA dummy'.

The previous analysis examined the impacts of FTAs in general without considering specific FTAs such as the EU and the NAFTA. We now turn to the analysis of the impacts of specific FTAs on bilateral trade flows. In addition, we analyze not only the trade creation effect but also the trade diversion effect of FTAs. In order to analyze both trade creation and trade diversion effects, we specify the estimation equation by adding a non-FTA member dummy, which takes the value of unity if one country belongs to an FTA but the other country does not, to capture trade diversion effect. In order to examine the impact of FTAs more precisely, our FTA and non-FTA dummies are turned on or given the value of unity when FTAs in question are in effect and we introduce an FTA country pair dummy variable, which takes the value of unity for the entire sample period regardless of the status of FTAs. Such treatment would enable us isolate the impact of FTAs.

As was mentioned in the previous section, our sample is unbalanced panel data, and thus we apply the weighted ordinary least square method for heteroskedasticity and first order autocorrelation at first to obtain the results for a bench mark. In addition we apply the fixed effect and random effect models for the estimation[9]. When the null hypotheses, which states that individual effects are not correlated with the regressors, are rejected by the Hausman test, then we choose the estimation results using the fixed effect model.

The specification of the estimated equation is as follows;

$$\begin{aligned} ln(Trade_{ijt}) &= \alpha + \beta_1 ln(Y_i Y_j) + \beta_2 ln(y_i y_j) + \beta_3 ln(IncomeGAP) \\ &+ \beta_4 ln(Distance_{ijt}) + \beta_5 Adjacency_{ijt} + \beta_6 Language_{ijt} \\ &+ \sum_m \delta_m FTA_{ijt}^m + \sum_m \varepsilon_m FTAtononFTA_{ijt}^m + \sum_m \phi_m FTAmember_{ijt}^m \\ &+ \sum_t \eta_t Timedum_t \qquad (2) \end{aligned}$$

Where, *Trade, Y, y, Distance*, *Adjacency* and *Language* are the same as equation (2). Dummy variables related FTA are *'FTA'*, *'FTAtononFTA' and 'FTA*

[9] We do not apply GMM method for the estimation of equation (2), because of problems of excessive diagonal conditions by large time series and a larger number of independent variables than equation (1).

member'. '*FTA*' dummy is given unity if a country pair belongs to the same FTA, '*FTA to nonFTA*' dummy is given unity if one country is a member of the FTA but the other is not. '*FTAmembe*r' dummy is given unity for an FTA country pair during the entire sample period regardless of the condition of FTAs, i.e. regardless of the fact if the FTA in question is in effect or not in effect.

The results of the estimation are shown in Table 3. The standard variables for the gravity model including GDP, GDP per capita, and distance are generally shown to have expected impacts with statistical significance for the case of ordinary least square method. Although the estimated coefficient of the difference of GDP per capita for the fixed effect model shows the results that are contrary to the result of weighted least squares method. Distance and Adjacency are shown to be inconsistent with the expectation. It is plausible that these results are caused by correlation with individual effect.

The estimated results on the FTA dummies for many FTAs are found to be significantly positive. FTAs, for which positive trade creation are not found, are ASEAN-China FTA, Japan-Singapore FTA, and Singapore-USA FTA. These results are consistent with our previous findings by using crude indicators in section III.1, as they showed the possible presence of trade creation effect for several major FTAs including the NAFTA, the AFTA, and the MERCOSUR. It is interesting to observe that for many FTAs the trade diversion effect is not identified. Specifically, the estimated coefficients on non-FTA dummy are positive and statistically significant for all FTAs except the MECOSUR, EU-Mexico, and Japan-Mexico FTAs.

An examination of the estimates of FTA country-pair dummies reveals interesting observations. The FTAs with positive FTA country-pair dummies can be considered to include natural trading partners, since they exhibit larger trade value compared to "normal" or "average" levels. Specifically, the ASEAN-China, CER, Japan-Singapore, Japan-Mexico, Korea-Chile, and Singapore-USA FTAs may be regarded to consist of natural trading partners. Coupled with these points, one finds that FTAs solidified these relationships in the cases of the CER, Japan-Mexico, and Korea-Chile FTAs.[10].

[10] See Gilber et al (2004) on the discussions of natural trading partners.

III.2.3. Analysis of Selected Industries

We investigate the trade creation and diversion effects further in detail. Specifically, to discern the precise impacts of trade diversion effect on FTA member's trade, we consider the impacts of FTAs on FTA member's exports to non-FTA members and those on FTA non-members' exports to FTA member separately instead of combining these two to analyze trade as we did in the previous section. The specification of the estimated equation is as follows;

$$\begin{aligned} ln(Export_{ijt}) = {} & \alpha + \beta_1 ln(Y_{it}) + \beta_2 ln(Y_{jt}) + \beta_3 ln(y_{it}) + \beta_4 ln(y_{jt}) + \beta_5 ln(IncomeGAP) \\ & + \beta_6 ln(Distance_{ijt}) + \beta_7 Adjacency_{ijt} + \beta_8 Language_{ijt} \\ & + \sum_m \delta_m FTA_{ijt}^m + \sum_m \varepsilon_m FTAtononFTA_{ijt}^m + \sum_m \phi_m NonFTAtoFTA_{ijt}^m \\ & + \sum_t \gamma_t Timedum_t \qquad (3) \end{aligned}$$

Where, $Export_{jit}$ denotes export value from countries i to j in year t, as before, *Y*, and *y*, are GDP and GDP per capita, respectively. *Distance, Adjacency* and *Language* are geographical distance, common border and common official language, respectively.

'FTA' dummy is given the value of unity when both exporter and partner country belong to the same FTA, 'FTAtononFTA' dummy is given unity when exporter belongs to the FTA but partner is not the member, and 'nonFTAtoFTA' dummy is given unity when exporter is a non member but partner country is a member to the FTA. FTA dummy is expected to capture the trade creation effect, while FTAtononFTA dummy and nonFTAtoFTA dummies are to capture the trade diversion effect. For the case of trade creation, the estimated sign of the FTA dummy is positive, while for the case of trade diversion, the signs of the FTAtononFTA and/or nonFTAtoFTA dummies are negative. We call the first type of trade diversion "type 1 trade diversion" and the second type "type 2 trade diversion". In the standard analysis of FTA, type 1 trade diversion is recognized but not type 2 trade diversion. We examine the presence or absence of these two types of trade diversion.

The Data and Estimation Method

Regarding estimation of commodity trade, the sample of 63 countries used in

the empirical analyses is listed in Appendix Table A3. This list is the same as the one used in the previous studies such as in Frankel and Wei (1995), Frankel et al. (1995), Frankel (1997) and Rauch (1999). Export values are taken from Commodity Trade Statistics of the United Nations. We use five types of products for the estimation, namely, food and live animals, apparel, iron and steel, electrical machinery and motor vehicles. Details are described in Appendix Tables A4 - A6. We used the pooled dataset containing the export values for 1990, 1995, 2000 and 2005. Regarding the explanatory variables, we use the same dataset used for the estimation of total trade. As for the estimation of five commodities export, we apply Zellner's seemingly unrelated regression because of the consideration of common external shock during sample periods.

The Results

The results of the estimation are shown in Table 4. The table shows the results for the five different product groups in addition to those for total exports. To begin with the results for total exports, we find the trade creation effect for the AFTA, the CER and Korea-Chile FTA. The trade diversion effect is observed for the NAFTA, the MERCOSUR and the EU-Mexico FTA.

The results for the five different product groups show quite different patterns concerning the trade creation and trade diversion effects for the regional and plurilateral FTAs compared to those for total exports. Contrary to the findings for total exports, for the EU, and the NAFTA, the trade creation effect was found for some products. For the EU, trade creation was found for food and live animals, apparel, iron and steel, and motor vehicles, while for the NAFTA the trade creation effect was found for food and live animals, and motor vehicles. Being consistent with the results for total exports, the AFTA observes trade creation effect for many products. As for the MERCOSUR, trade creation effect was found for total exports, food & live animals and motor vehicles.

As explained above, two types of trade diversion, type 1 and type 2 trade diversion effects, were tested in the analysis. Type 1 trade diversion indicates the decline in FTA members' exports to non-FTA members, while type 2 trade diversion indicates the decline in non-FTA member's exports to FTA members. For the EU, type 1 trade diversion was detected for electrical machinery, while type 2 trade diversion was

found for all commodities except for apparel. It is interesting to note that for apparel non-EU exports to the EU were large and EU's exports to non-EU members in food and animals and iron and steel and motor vehicles are much higher than average. These findings appear to show that consumption, or demand for apparel was substantially large in the EU, while the competitiveness of food and iron and steel was very substantial.

For the NAFTA, type 1 trade diversion was found for all the products except food and live animals, while type 2 trade diversion was found for electrical machinery and motor vehicles Given the these results on trade creation and trade creation, one could argue that the NAFTA market for automobiles is introverted.

Regarding the AFTA, little evidence is found for the trade diversion. Indeed, only one case of trade diversion with statistical significance was found for the AFTA, that is, type 1 trade diversion in the case of iron and steel. The findings for the MERCOSUR are quite different than those for the AFTA in that many cases of trade diversion were found. Type 1 trade diversion was detected for apparel, electrical machinery, and motor vehicles, while type 2 trade diversion was found for food and live animals, apparel, iron and steel, and motor vehicles.

The findings for other FTAs reveal several interesting patterns. For ASEAN-China, trade between them as well as trade with others countries was substantially large for apparel and electrical machinery, probably reflecting active international trade in parts and components of these products under the regional production and distribution networks, which have been constructed in East Asia by multinational corporations. Indeed, all the trade in electrical machinery involving ASEAN, regardless of their destinations or sources, are higher than average, indicating that ASEAN is a hub for trade in electrical machinery. Bilateral trade between the EU and Mexico is substantially large in iron and steel and electronics while non-members' exports of iron and steel, electronics and motor vehicles to the EU-Mexico are shown to be quite large, probably reflecting large amount of trade in auto parts with the US under the NAFTA. Similarly, EU-Mexico exports to non-FTA members are large for apparel, iron and steel and electronics reflecting substantial Mexican exports to the US.

Trade between Australia and New Zealand under the CER was shown to be higher than the "normal" volume in food and live animals, iron and steel, and electrical

machinery. For the Korea-Chile FTA, trade in apparel and motor vehicles are found to be promoted/created.

IV. Conclusions:

We attempted to examine the impacts of FTAs on trade flows. More specifically, we attempted to discern trade creation and trade diversion effects of FTAs by using two methodologies. One approach is to compute the importance of intra-FTA trade in overall trade of FTA members, and the other is to estimate a gravity equation by introducing FTA dummies.

The results of the analysis revealed several interesting observations. An analysis of the aggregate data, or total trade or total exports, strongly indicates that FTAs bring about trade creation effect and that trade diversion effect is limited. These findings based on aggregate data have to be modified, as the analyses for different product categories show different patterns among different products. Our analysis of trade diversion tends to show such effect for many products in the case of the EU, the NAFTA, and the MERCOSUR but not for the case of the AFTA.

Our overall assessment of the results on trade creation and trade diversion tends to indicate that the MERCOSUR is very closed while the EU and the NAFTA are relatively more closed or introverted than the AFTA, the CER. Some FTAs seem to have too short a history to show substantial impacts yet.

Before ending this paper, we would like to point out the limitations of our study and future research agenda on the impacts of FTA on international trade. To begin with the limitations, we could not include some variables that would have impacts on bilateral international trade. Foreign direct investment (FDI) has been expanding rapidly and FDI is shown to have substantial impacts on foreign trade. Multinational corporations (MNCs), which are major suppliers of FDI, dominate international trade[11]. Indeed, MNCs are actively engaged in intra-firm trade, or trade inside MNCs. These observations attest the importance of FDI in explaining bilateral trade, but a lack of reliable information on bilateral FDI precluded us from including FDI in the analysis. The construction of reliable FDI database is a very important agenda. Another agenda is

[11] Kiyota and Urata (forthcoming) showed MNCs dominate international trade in the case of Japan.

to use a better indicator on the economic cost of bilateral foreign trade. We used geographical distance as a proxy for the economic distance. A better indicator reflecting actual cost such as the cost of transportation is needed. Third, precise contents of FTAs should be explicitly considered. For many FTAs tariff removal/reduction is pursued over time according to the schedule rather than immediately after the enactment of the FTA. Such phasing schedule has to be incorporated in the analysis of the impacts of FTAs on foreign trade.

Table 1: Changes in Intra-FTA Dependency in Foreign Trade for Selected FTAs

		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
EU15	Relative share	0.58	0.558	0.573	0.584	0.58	0.59	0.622	0.637	0.641	0.638	0.646	0.647	0.653
	Trade intensity	1.577	1.739	1.729	1.773	1.842	1.825	1.652	1.639	1.682	1.69	1.603	1.631	1.678
NAFTA	Relative share	0.332	0.348	0.344	0.37	0.379	0.383	0.359	0.361	0.363	0.367	0.372	0.389	0.397
	Trade intensity	1.922	1.952	1.965	2.02	1.852	1.871	1.849	1.954	1.935	1.936	2.092	2.156	2.192
AFTA	Relative share	0.156	0.158	0.182	0.192	0.178	0.179	0.164	0.171	0.165	0.163	0.166	0.175	0.177
	Trade intensity	4.327	4.269	4.525	4.57	4.388	5.067	5.334	5.212	4.468	4.003	3.804	3.631	3.543
MERCOSUR	Relative share	0.089	0.088	0.093	0.076	0.082	0.068	0.091	0.084	0.086	0.099	0.1	0.119	0.141
	Trade intensity	3.279	3.286	3.776	3.542	3.715	3.334	5.391	5.258	5.261	6.492	6.676	7.686	8.986
CER	Relative share	0.064	0.065	0.063	0.068	0.073	0.067	0.065	0.075	0.074	0.072	0.074	0.074	0.075
	Trade intensity	4.321	4.273	3.825	4.57	4.464	4.307	4.49	5.249	4.888	4.41	5.065	5.158	5.427
Japan-Singapore	Relative share	0.036	0.04	0.042	0.04	0.039	0.034	0.034	0.039	0.044	0.046	0.049	0.052	0.051
	Trade intensity	0.427	0.456	0.482	0.439	0.405	0.367	0.367	0.436	0.465	0.484	0.531	0.542	0.55
Japan-Mexico	Relative share	0.012	0.016	0.016	0.014	0.016	0.016	0.012	0.013	0.012	0.011	0.012	0.012	0.013
	Trade intensity	0.153	0.189	0.186	0.165	0.177	0.175	0.136	0.151	0.136	0.125	0.144	0.131	0.149
China-ASEAN	Relative share	0.046	0.048	0.051	0.054	0.054	0.053	0.049	0.05	0.055	0.059	0.061	0.067	0.072
	Trade intensity	0.542	0.492	0.51	0.389	0.538	0.754	0.726	0.769	0.721	0.644	0.582	0.536	0.479
Korea-Chile	Relative share	0.005	0.005	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.007	0.005	0.006	0.007
	Trade intensity	0.383	0.356	0.274	0.236	0.215	0.268	0.257	0.245	0.223	0.312	0.237	0.262	0.278
Singapore-USA	Relative share	0.021	0.021	0.023	0.029	0.027	0.027	0.027	0.03	0.035	0.037	0.038	0.039	0.041
	Trade intensity	0.149	0.145	0.16	0.195	0.168	0.165	0.171	0.201	0.229	0.239	0.258	0.263	0.275
Mexico-EU	Relative share	0.006	0.008	0.008	0.006	0.007	0.006	0.005	0.006	0.005	0.005	0.006	0.007	0.007
	Trade intensity	0.015	0.024	0.023	0.018	0.02	0.019	0.014	0.014	0.014	0.014	0.015	0.016	0.018

Table 1: Changes in Intra-FTA Dependency in Foreign Trade for Selected FTAs (Continued).

		1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
EU15	Relative share	0.604	0.61	0.617	0.609	0.548	0.559	0.62	0.6	0.595	0.599	0.606	0.599	0.584
	Trade intensity	1.733	1.753	1.605	1.615	1.499	1.448	1.626	1.701	1.639	1.639	1.612	1.625	1.665
NAFTA	Relative share	0.41	0.424	0.42	0.434	0.444	0.457	0.468	0.468	0.465	0.459	0.448	0.437	0.43
	Trade intensity	2.081	2.169	2.277	2.297	2.202	2.159	2.148	2.089	2.109	2.186	2.339	2.412	2.387
AFTA	Relative share	0.184	0.201	0.204	0.206	0.212	0.209	0.218	0.227	0.222	0.227	0.251	0.251	0.255
	Trade intensity	3.173	3.226	3.054	3.071	3.226	3.756	3.798	3.711	3.835	3.901	4.536	4.475	4.485
MERCOSUR	Relative share	0.166	0.177	0.185	0.193	0.203	0.209	0.184	0.177	0.16	0.128	0.132	0.134	0.136
	Trade intensity	9.373	9.979	10.514	10.199	9.801	10.34	10.797	9.863	9.003	8.602	9.34	8.363	7.792
CER	Relative share	0.081	0.087	0.087	0.089	0.088	0.077	0.085	0.074	0.075	0.078	0.083	0.082	0.076
	Trade intensity	5.584	5.88	6.204	6.055	6.106	5.722	6.336	5.867	5.992	5.976	6.35	6.255	5.618
Japan-Singapore	Relative share	0.058	0.062	0.064	0.061	0.057	0.05	0.051	0.054	0.046	0.043	0.04	0.04	0.038
	Trade intensity	0.573	0.608	0.64	0.642	0.625	0.616	0.613	0.618	0.582	0.563	0.545	0.549	0.529
Japan-Mexico	Relative share	0.013	0.013	0.011	0.012	0.012	0.012	0.012	0.013	0.014	0.015	0.012	0.014	0.016
	Trade intensity	0.134	0.137	0.115	0.131	0.129	0.145	0.137	0.137	0.161	0.182	0.155	0.184	0.217
China-ASEAN	Relative share	0.084	0.09	0.094	0.094	0.095	0.085	0.089	0.098	0.099	0.106	0.111	0.118	0.124
	Trade intensity	0.432	0.422	0.444	0.452	0.495	0.58	0.581	0.599	0.644	0.709	0.757	0.749	0.746
Korea-Chile	Relative share	0.009	0.009	0.01	0.01	0.01	0.009	0.008	0.008	0.007	0.007	0.008	0.01	0.012
	Trade intensity	0.336	0.338	0.354	0.324	0.351	0.357	0.309	0.267	0.275	0.252	0.279	0.333	0.397
Singapore-USA	Relative share	0.044	0.045	0.047	0.048	0.045	0.041	0.039	0.036	0.033	0.031	0.031	0.03	0.027
	Trade intensity	0.268	0.272	0.299	0.304	0.273	0.243	0.226	0.202	0.192	0.192	0.203	0.204	0.191
Mexico-EU	Relative share	0.007	0.007	0.005	0.005	0.006	0.007	0.007	0.008	0.009	0.008	0.008	0.007	0.008
	Trade intensity	0.02	0.02	0.013	0.013	0.016	0.017	0.018	0.021	0.022	0.021	0.02	0.019	0.022

Table 2: Empirical results of regression on total trade, 1950-2005, pooled data

	1950-1983				1984-2005			
	All sample		OECD countries		All sample		OECD	
	OLS	GMM	OLS	GMM	OLS	GMM	OLS	GMM
general FTA dummy	0.7780	0.2070	0.1343	0.1723	0.2385	0.1065	0.1020	0.1482
	(0.0871) ***	(0.0517) ***	(0.0306) ***	(0.0546) ***	(0.0512) ***	(0.0389) ***	(0.0243) ***	(0.0433) ***
GDP	0.8261	0.3171	0.7681	0.2417	0.9570	0.1056	0.8361	0.3250
	(0.0082) ***	(0.0706) ***	(0.0120) ***	(0.0788) ***	(0.0072) ***	(0.0323) ***	(0.0194) ***	(0.0461) ***
GDP per capita	0.3560	0.1296	0.5262	0.1090	0.5196	0.1477	0.2938	0.1485
	(0.0161) ***	(0.0334) ***	(0.0675) ***	(0.0924)	(0.0130) ***	(0.0324) ***	(0.0839) ***	(0.0795) *
Difference GDP per cap	0.0581	0.0075	-0.0062	0.0245	0.0962	-0.0142	-0.0149	0.0138
	(0.0153) ***	(0.0182)	(0.0060)	(0.0253)	(0.0137) ***	(0.0202)	(0.0058) ***	(0.0142)
Distance	-0.9848	-0.3497	-0.6070	-0.1813	-1.2812	-0.1917	-0.7735	-0.2554
	(0.0260) ***	(0.0691) ***	(0.0300) ***	(0.0614) ***	(0.0240) ***	(0.0434) ***	(0.0445) ***	(0.0374) ***
Adjacency	0.3031	0.0688	0.4799	0.3021	0.9751	0.3361	0.3603	0.0408
	(0.1275) ***	(0.0435)	(0.0457) ***	(0.1093) ***	(0.1262) ***	(0.0853) ***	(0.0559) ***	(0.0671)
Common language	0.5196	0.2023	0.3051	0.1688	0.8856	0.1002	0.3114	0.0861
	(0.0490) ***	(0.0460) ***	(0.0417)	(0.0865) **	(0.0455) ***	(0.0295) ***	(0.0359) ***	(0.0516) *
# of samples	104,199	77,073	5,969	5,791	161,147	118,982	4,277	4,232
Alleano-Bond test AR(2), p-value	R-sq=0.622	0.577	R-sq =0.935	0.015	R-sq=0.664	0.160	R-sq =0.977	0.323
Hansen J statisitcs test, p-value		0.010		0.050		0.000		0.278

Notes: Standard errors are in parentheses. *, ** and *** denotes 1%, 5% and 10% significance level respectively. All variables except dummies are in natural logs. OLS are corrected disturbances for heteroskedasticity and first order autocorrelation for the disturbances.

Table 3: Empirical results of regression on total trade, 1950-2005, pooled data

	OLSQ	Fixed Effect	FE (2000-2005)
EU -FTAdummy	0.8357 (0.0834) ***	0.5436 (0.0848) ***	
EU-non EU FTAdummy	0.7890 (0.0336) ***	0.0628 (0.0259) **	
EU member	-0.0525 (0.1813)		
NAFTA FTAdummy	1.7900 (0.2821) ***	0.8045 (0.4463) *	
NAFTA -non NAFTA FTAdummy	0.3374 (0.0655) ***	0.0425 (0.0465)	
NAFTA member	-0.5313 (0.2134) ***		
AFTA FTAdummy	0.4448 (0.3187)	0.5335 (0.2057) ***	
AFTA - non AFTAdummy	0.5645 (0.0845) ***	0.3358 (0.0556) ***	
AFTA member	-0.0214 (0.6296)		
MERCOSUR FTAdummy	1.6217 (0.2170) ***	0.7103 (0.2362) ***	
MERCOSUR - non FTAdummy	-0.0977 (0.0718)	-0.0277 (0.0452)	
MERCOSUR member	-0.7095 (0.3205) **		
ASEAN-China FTAdummy	-0.2694 (0.3498)	0.3009 (0.3603)	0.2302 (0.3231)
ASEAN China - nonFTAdummy	0.6314 (0.0470) ***	0.1524 (0.0331) ***	0.0541 (0.0296) *
ASEAN-China member	0.8778 (0.3519) ***		
EU Mexico - FTAdummy	0.5253 (0.0779) ***	0.1501 (0.0960)	-0.0688 (0.2380)
EU Mexico - non FTAdummy	0.0284 (0.0337)	-0.0296 (0.0245)	0.1443 (0.0613) **
EU-Mexico member	-0.6068 (0.1529) ***		

	OLSQ	FE	FE (2000-2005)
CER FTAdummy	1.4733 (0.0294) ***	0.5553 (0.7060)	
CER - non FTA dummy	0.4513 (0.1021) ***	0.0132 (0.0519)	
CER member	1.4805 *** (0.0589)		
JapanSingapore FTAdummy	-0.5266 (0.0507) ***	-0.2580 (0.9410)	-0.0399 (1.1124)
JapanSingapore - non FTA dummy	1.1557 (0.0917) ***	-0.1043 (0.0584) *	0.0495 (0.0655)
Japan-Singapore dummy	3.1769 (0.0375) ***		
JapanMexico FTAdummy	0.1617 (0.0909) *	0.3580 (1.0603)	0.1491 (0.8967)
JapanMexico - non FTA dummy	-0.0310 (0.0906)	0.0804 (0.0696)	-0.0033 (0.0578)
JapanMexico dummy	0.9567 (0.0426) ***		
Korea-Chile FTAdummy	1.0350 (0.0298) ***	0.4862 (1.0190)	0.4583 (0.8625)
KoreaChile - non FTA dummy	0.8025 (0.1060) ***	0.2261 (0.0620) ***	0.2076 (0.0525) ***
KoreaChile dummy	2.8301 (0.0391) ***		
Singapore USA FTAdummy	-1.5259 (0.1027) ***	-0.0891 (1.0148)	-0.1565 (0.8626)
SingaporeUSA - non FTA dummy	0.3742 (0.0713) ***	0.0266 (0.0633)	0.0602 (0.0524)
SingaporeUSA dummy	2.3151 (0.0570) ***		
GDP	0.8920 (0.0067) ***	0.4821 (0.0167) ***	0.6091 (0.0722) ***
GDP per capita	0.4379 (0.0128) ***	0.2953 (0.0189) ***	-0.1355 (0.0664) **
Difference GDP per capita	0.0233 (0.0120) **	-0.0237 (0.0059) ***	-0.0095 (0.0144)
Distance	-1.1943 (0.0233) ***		
Adjacency	0.6922 (0.1213) ***		
Common language	0.7510 (0.0412) ***		
# of samples	265,346	253,909	42,738
Adjusted R squared	0.659		

Notes: Standard errors are in parentheses. *, ** and *** denotes 1%, 5% and 10% significance level respectively. All variables except dummies are in natural logs. Additional Fixed effects model estimation for comparison and robustness check is applied for a sub-sample limited time period during 2000-2005 because of bilateral FTAs values are few compared to all samples.

Table 4: Empirical results of disaggregated and aggregated data by Zellner's Seemingly Unrelated Regression.

	Food and live animals	Apparels	Iron & Stee	Electrical machine	Motor vehicles	Total Export (FGL
EU	0.7703	0.6662	0.5967	-0.3012	1.0368	0.0207
	(0.12) ***	(0.18) ***	(0.16) ***	(0.11) ***	(0.19) ***	(0.03)
EU to non-EU	0.7217	-0.1029	0.4286	-0.4701	0.2204	0.0651
	(0.09) ***	(0.13)	(0.11) ***	(0.08) ***	(0.13) *	(0.02) ***
non-EU to EU	-0.2849	0.2918	-0.4295	-0.2770	-0.4221	0.0988
	(0.10) ***	(0.15) **	(0.12) ***	(0.09) ***	(0.15) ***	(0.02) ***
NAFTA	1.4850	0.2058	-0.0931	-0.1510	1.7801	0.1771
	(0.37) ***	(0.54)	(0.46)	(0.34)	(0.56) ***	(0.18)
NAFTA to non members	1.5258	-1.4046	-1.2998	-1.3500	-1.8021	-0.3593
	(0.12) ***	(0.18) ***	(0.15) ***	(0.11) ***	(0.18) ***	(0.03) ***
non members to NAFTA	-0.1772	1.3760	0.1335	-0.3344	-1.0255	-0.1085
	(0.13)	(0.20) ***	(0.17)	(0.12) ***	(0.20) ***	(0.03) ***
AFTA	2.1318	0.0524	1.1232	3.4151	1.2319	1.2516
	(0.25) ***	(0.37)	(0.32) ***	(0.23) ***	(0.38) ***	(0.18) ***
AFTA to non members	1.6160	0.9667	-0.2719	2.3635	-0.0109	0.7403
	(0.13) ***	(0.19) ***	(0.16) *	(0.12) ***	(0.20)	(0.04) ***
non members to AFTA	1.1183	0.2186	1.2926	1.3385	0.1700	0.4416
	(0.12) ***	(0.17)	(0.15) ***	(0.11) ***	(0.18)	(0.04) ***
MERCOSUR	1.0356	-0.6756	0.0438	-0.3791	0.9261	0.6316
	(0.27) ***	(0.40) *	(0.34)	(0.25)	(0.42) **	(0.10) ***
MERCOSUR to non members	1.9938	-2.1145	1.3123	-1.4923	-1.0371	-0.1781
	(0.15) ***	(0.22) ***	(0.18) ***	(0.14) ***	(0.22) ***	(0.03) ***
non members to MERCOSUR	-0.4971	-0.5836	-0.6750	-0.3685	-0.8025	0.0416
	(0.14) ***	(0.20) ***	(0.17) ***	(0.13) ***	(0.21) ***	(0.03)
ASEAN-China FTA	-0.0432	2.1472	0.7604	1.3423	0.2067	0.1498
	(0.27)	(0.40) ***	(0.34) **	(0.25) ***	(0.41)	(0.08) *
ASEAN-China FTA to non member	0.0640	2.1038	-0.1525	1.2794	-0.6104	0.2288
	(0.16)	(0.23) ***	(0.19)	(0.14) ***	(0.24) ***	(0.04) ***
non members to ASEAN-China FTA	0.3144	1.0161	0.7167	0.2976	-0.3270	0.0380
	(0.16) **	(0.23) ***	(0.20) ***	(0.14) **	(0.24)	(0.04)
EU-Mexico FTA	0.2638	0.1858	0.8860	0.6179	0.3902	-0.0861
	(0.16) *	(0.23)	(0.20) ***	(0.14) ***	(0.24) *	(0.08)
EU-Mexico FTA to non member	-0.0783	0.6961	0.3844	0.4316	0.0100	-0.0368
	(0.12)	(0.18) ***	(0.15) ***	(0.11) ***	(0.19)	(0.02) *
non members to EU-Mexico FTA	0.2692	-0.2322	0.4255	0.4807	0.4203	-0.0333
	(0.14) **	(0.20)	(0.17) ***	(0.12) ***	(0.21) **	(0.02)
CER	3.3772	1.3430	3.3295	1.9364	2.3646	2.3427
	(0.62) ***	(0.92)	(0.78) ***	(0.58) ***	(0.95) ***	(0.13) ***
CER to non member	3.0161	-0.2359	0.6336	-0.7938	-0.7446	0.6135
	(0.16) ***	(0.23)	(0.20) ***	(0.14) ***	(0.24) ***	(0.05) ***
non members to CER	0.7683	-0.1393	1.3044	0.4753	0.9031	0.4626
	(0.14) ***	(0.21)	(0.18) ***	(0.13) ***	(0.22) ***	(0.04) ***
Japan-Singapore FTA	1.2022	-0.7567	1.4972	0.2868	0.5173	0.1225
	(1.20)	(1.76)	(1.50)	(1.10)	(1.82)	(0.59)
JPN-SGP FTA to non member	-0.2160	-0.8893	0.3838	-1.0362	0.3238	-0.0283
	(0.30) *	(0.44) **	(0.38)	(0.28) ***	(0.46)	(0.08)
non members to JPN-SGP FTA	-0.1294	-0.4016	-0.1870	-0.3780	-0.6197	-0.1467
	(0.33)	(0.49)	(0.42)	(0.31)	(0.51)	(0.08) *
Japan-Mexico FTA	-1.4655	-1.4672	0.4236	1.0155	3.6803	-0.1824
	(1.19)	(1.75)	(1.49)	(1.09)	(1.80) **	(0.27)
JPN-MEX FTA to non member	-2.0416	-1.9406	0.2346	0.1822	1.0244	-0.2020
	(0.28) ***	(0.41) ***	(0.35)	(0.26)	(0.43) **	(0.08) ***
non members to JPN-MEX FTA	-0.2207	0.0029	-0.5253	-0.2546	1.0114	-0.0152
	(0.31)	(0.46)	(0.39)	(0.29)	(0.47) **	(0.07)
Korea-Chile FTA	-0.6473	2.2485	3.6330	2.4756	5.2033	1.1565
	(1.63)	(2.40)	(2.05) *	(1.51) *	(2.48) **	(1.01)
KOR-CHL FTA to non member	-0.7065	0.4424	1.9744	1.1568	2.4585	0.2151
	(0.22) ***	(0.32)	(0.27) ***	(0.20) ***	(0.33) ***	(0.05) ***
non members to KOR-CHL FTA	0.3474	0.6897	1.7014	0.4413	-0.2714	0.0356
	(0.24)	(0.36) **	(0.30) ***	(0.22) **	(0.37)	(0.05)
USA-Singapore FTA	-0.3753	-2.9938	0.3596	1.7650	-0.9796	0.3007
	(1.18)	(1.74) *	(1.49)	(1.09)	(1.80)	(0.74)
US-SGP FTA to non member	-0.0237	0.4350	0.3746	0.0366	-0.3691	-0.2933
	(0.23)	(0.34)	(0.29)	(0.21)	(0.35)	(0.05) ***
non members to US-SGP FTA	0.0995	-3.2893	0.0986	0.6874	0.7500	0.0888
	(0.26)	(0.38) ***	(0.32)	(0.24) ***	(0.39) *	(0.05) *
GDP i	0.6509	0.9979	1.1337	1.1226	1.5668	1.0297
	(0.02) ***	(0.03) ***	(0.03) ***	(0.02) ***	(0.03) ***	(0.01) ***
GDP j	0.7460	0.5025	0.9385	0.7390	0.4776	0.9521
	(0.02) ***	(0.03) ***	(0.03) ***	(0.02) ***	(0.03) ***	(0.01) ***
GDP per capita i	-0.3776	-0.6645	-0.2840	0.5173	0.4153	0.1649
	(0.03) ***	(0.04) ***	(0.03) ***	(0.02) ***	(0.04) ***	(0.01) ***
GDP per capita j	0.1466	0.5737	-0.1671	0.1016	0.2228	0.0019
	(0.02) ***	(0.03) ***	(0.03) ***	(0.02) ***	(0.04) ***	(0.01)
Diff. GDP per capita	0.0001	-0.0676	-0.1092	-0.0591	-0.2624	-0.0159
	(0.02)	(0.03) **	(0.03) ***	(0.02) ***	(0.03) ***	(0.01) ***
Distance	-1.0530	-1.1525	-1.2607	-0.7805	-0.7398	-1.0309
	(0.04) ***	(0.05) ***	(0.04) ***	(0.03) ***	(0.05) ***	(0.01) ***
Adjacency	0.3143	0.4081	0.5448	0.2385	0.6578	0.3291
	(0.12) ***	(0.18) **	(0.15) ***	(0.11) **	(0.18) ***	(0.05) ***
Common language	0.6401	0.1547	0.2536	0.2873	0.5327	0.4950
	(0.08) ***	(0.12)	(0.10) ***	(0.07) ***	(0.12) ***	(0.03) ***
Constant	-9.8376	-15.1344	-23.9805	-30.8073	-37.3431	-29.9456
	(0.83) ***	(1.22)	(1.04) ***	(0.76) ***	(1.26) ***	(0.21) ***
Observations; 4,571	R-sq = 0.559	R-sq = 0.476	R-sq = 0.528	R-sq = 0.641	R-sq = 0.512	# of obs.=13,72

Notes: Standard errors are in parentheses. *, ** and *** denotes 1%, 5% and 10% significance level respectively. All variables except dummies are in natural logs. Sample period is 1990, 1995, 2000 and 2005. Five equations with disaggregated data are applied Zellner's Seemingly Unrelated Regression, and the estimation for Total exports are applied by Cross-sectional time-series Feasible Generalized Squares regression with heteroskedasticity and first order autocorrelations with disturbances.

Table A1: Empirical studies on FTA effects by gravity equation.

Reference	Period	Sector	#countries	Dependant Var.	Explanatory variables and Results
Frankel, Stein & Wei (1995)	1965-1990	Overall	63	Exports + Imports	EastAsia(+,***), EC(+), NAFTA(+) MERCOSUR(+,**), AndeanPact(+,**)
Frankel (1997)	1965-1994	Total merchandise	63	Exports + Imports	EU15(+-), NAFTA(+-), MERCOSUR(+,*), Andean(-,**,+) ASEAN(+**), AUS-NZ(+**)
Endoh (1999)	1960-1994	Overall	80	Exports	EEC1(+,***), EEC2(+,**), EEC3(+,***) LAFTA1(-,**), LAFTA2(-,*), LAFTA3(-,*) CMEA1(-,***), CMEA2(+,***), CMEA3(-,***)
Soloaga & Winters (2000)	1980-1996	Overall	58	Imports	EU(-***), EU-import(+***), EU-Export(+***) EFTA(-), EFTA-import(+***), EFTA-Export(+***) ASEAN(+-), ASEAN-Import(+-), ASEAN-Export(+***) GULFCOOP(+), GULF-Imp(+-), GULF-exp(-***) NAFTA(+), NAFTA-imp(+**), NAFTA-exp(+-*) CACM(+***), CACM-imp(-***), CACM-exp(-***) LAIA(+***), LAIA-imp(-***), LAIA-exp(-***) ANDEAN(+***),ANDEAN-imp(-***),ANDEAN-exp(-***) MERCOSUR(+***),MERCOSUR-imp(-***),
Endoh (2000)	1960-1995	Overall	80	Exports	ASEAN1(+,***), ASEAN2(+,**), ASEAN3(+**,-) APEC89-1(+-), APEC89-2(+,***,-), APEC89-3(+-) EAEC1(+***), EAEC2(+***), EAEC3(+***) APEC951(+**,-), APEC952(+,***), APEC95-3(+,***,-)
Baier & Bergstrand (2002)	1996	Overall	53	Exports + Imports	FTA*GDP(-,**), FTA*Pop(+,**), FTA*Distance(-) FTA*Border(+), FTA*Hazard(-), NFTA*Hazard(-,**)
Carrer (2003)	1962-1996	Overall	130	Imports	EU(+,***), EU-im(+,*), EU-ex(+,***) ANDEAN(+,*), ANDEAN-im(-,***), ANDEAN-ex(-,***) CACM(+,***), CACM-im(-,***), CACM-ex(+-) LAFTA(+,***), LAFTA-im(-,***), LAFTA-ex(-,*) MERCOSUR(-), MERCOS-im(-,***), MERCOS-ex(-) NAFTA(+), NAFTA-im(-,***), NAFTA-ex(+,*) ASEAN(+,***), ASEAN-im(-,***), ASEAN-ex(+,***)
Martinez-Zarzoso & Nowak-Lehmann (2003)	1988-1996	Overall	20	Exports + Imports	EU(+,*), MERCOSUR(+,*)
Elliot & Ikemoto (2004)	1982-1999	Overall	35	Imports	ASEAN(+,***), imASEAN(+,***), exASEAN(+,***) EEC(+,**), imEEC(+,***), exEEC(+,***) NAFTA(+,***), imNAFTA(-,***), exNAFTA(-,***)

Table A1: Empirical studies on FTA effects by gravity equation (continued).

Reference	Period	Sector	countries	Dependant Var	Explanatory variables and Results
Nguyen & Hashimoto (2005)	1988-2002	Overall	39	Exports	AFTA(+***), imAFTA(+***), exAFTA(+***) EU(-***), imEU(-***), exEU(-***), MERCO(+***),imMERCO(+***),exMERCO(-***) NAFTA(+**), imNAFTA(+***), exNAFTA(-***)
Cheng & Tsai (2005)	1981-1997	Overall	44 + 57	Exports	EEC(+-,**), EFTA(+,**), EU(+,**), CUSFTA(+,**), NAFTA(+***) EEC-exp & imp (+-,**), EFTA-exp & imp (+-,**), EU-exp & imp (-**), CUSFTA-exp & imp(-, **), NAFTA-exp & imp(+-,**), LAFTA-exp & imp(+-,**) MERCOSUR-exp & imp(+-,**)
Rose (2005)	1948-1999	Overall	175	Exports + Imports	FTA(+,***), GSP(+,***) WTO1(-,*), WTO2(-,*) IMF1(-,***), IMF2(-,**) OECD1(+,***), OECD2(+,***)
Gilbert, Scollay & Bora (2004)	1984-1998	4 sectors	38	Exports + Imports	EU(-, agriculture+**),NAFTA(-), AFTA(+**), CER(+), MERCOSUR(+-),Andean Pact(+**, agriculture+-) APEC(+***) EU(+-), NAFTA(-***), AFTA(+**), CER(-***, agri+**), MERCOSURopen(-*, agri+***), Andean Pact open (-***, agri+-), APEC open(+)
Jayasinghe & Sarker (2004)	1985-2000	6 agrifood sectors	59	Exports + Imports	NAFTA bloc effects are significant on vegetable and meat. NAFTA trade diversion are on meat, vegetable, fruits, sugar, but diminishing over time.
Endoh (2005)	1970-1995	3 sectors;	63	Exports + Imports	GATT(+,***), GSTPbase(-,***), GSTP859095(+,***) GSTP9095(+,***), GSTP95(+) Africa(-,***), Americas(+,***), Asia(+,***) Europe(-,*), Oceania(+,*)

Table A2: Sample economies; Estimation 1

ALBANIA	CHAD	GAMBIA, THE	LAO PEOPLE S DEM.REP	NORWAY	SUDAN
ALGERIA	CHILE	GEORGIA	LATVIA	OMAN	SURINAME
ANGOLA	CHINA,P.R.: MAINLAND	GERMANY	LEBANON	PAKISTAN	SWAZILAND
ANTIGUA AND BARBUDA	CHINA,P.R.:HONG KONG	GHANA	LESOTHO	PANAMA	SWEDEN
ARGENTINA	COLOMBIA	GREECE	LIBERIA	PAPUA NEW GUINEA	SWITZERLAND
ARMENIA	COMOROS	GRENADA	LIBYA	PARAGUAY	SYRIAN ARAB REPUBLIC
AUSTRALIA	CONGO, DEM. REP. OF	GUATEMALA	LITHUANIA	PERU	TAJIKISTAN
AUSTRIA	CONGO, REPUBLIC OF	GUINEA	LUXEMBURG	PHILIPPINES	TANZANIA
AZERBAIJAN, REP. OF	COSTA RICA	GUINEA-BISSAU	MACEDONIA, FYR	POLAND	THAILAND
BAHAMAS, THE	COTE D IVOIRE	GUYANA	MADAGASCAR	PORTUGAL	TOGO
BAHRAIN, KINGDOM OF	CROATIA	HAITI	MALAWI	ROMANIA	TONGA
BANGLADESH	CUBA	HONDURAS	MALAYSIA	RUSSIA	TRINIDAD AND TOBAGO
BELARUS	CYPRUS	HUNGARY	MALDIVES	RWANDA	TUNISIA
BELGIUM	CZECH REPUBLIC	ICELAND	MALI	SAMOA	TURKEY
BELGIUM-LUXEMBOURG	DENMARK	INDIA	MALTA	SAO TOME & PRINCIPE	TURKMENISTAN
BELIZE	DJIBOUTI	INDONESIA	MAURITANIA	SAUDI ARABIA	UGANDA
BENIN	DOMINICA	IRAN, I.R. OF	MAURITIUS	SENEGAL	UKRAINE
BHUTAN	DOMINICAN REPUBLIC	IRAQ	MEXICO	SERBIA & MONTENEGRO	UNITED ARAB EMIRATES
BOLIVIA	ECUADOR	IRELAND	MOLDOVA	SEYCHELLES	UNITED KINGDOM
BOSNIA & HERZEGOVINA	EGYPT	ISRAEL	MONGOLIA	SIERRA LEONE	UNITED STATES
BOTSWANA	EL SALVADOR	ITALY	MOROCCO	SINGAPORE	URUGUAY
BRAZIL	EQUATORIAL GUINEA	JAMAICA	MOZAMBIQUE	SLOVAK REPUBLIC	UZBEKISTAN
BULGARIA	ERITREA	JAPAN	NAMIBIA	SLOVENIA	VANUATU
BURKINA FASO	ESTONIA	JORDAN	NEPAL	SOLOMON ISLANDS	VENEZUELA, REP. BOL.
BURUNDI	ETHIOPIA	KAZAKHSTAN	NETHERLANDS	SOUTH AFRICA	VIETNAM
CAMBODIA	FIJI	KENYA	NEW CALEDONIA	SPAIN	YEMEN ARAB REP.
CAMEROON	FINLAND	KIRIBATI	NEW ZEALAND	SRI LANKA	ZAMBIA
CANADA	FRANCE	KOREA	NICARAGUA	ST. KITTS AND NEVIS	ZIMBABWE
CAPE VERDE	FRENCH POLYNESIA	KUWAIT	NIGER	ST. LUCIA	
CENTRAL AFRICAN REP.	GABON	KYRGYZ REPUBLIC	NIGERIA	ST. VINCENT & GRENS.	

Table A3: Sample economies and the largest city; Estimation 2

ALGERIA	CHINA,Hong Kong	HUNGARY	KUWAIT	PARAGUAY	SWEDEN
ARGENTINA	COLOMBIA	ICELAND	LIBYA	PERU	SWITZERLAND
AUSTRALIA	DENMARK	INDIA	LUXEMBURG	PHILIPPINES	THAILAND
AUSTRIA	ECUADOR	INDONESIA	MALAYSIA	PORTUGAL	TUNISIA
BELGIUM	EGYPT	IRAN, I.R. OF	MEXICO	ROMANIA	TURKEY
BOLIVIA	ETHIOPIA	IRELAND	MOROCCO	SAUDI ARABIA	UAE
BRAZIL	FINLAND	ISRAEL	NETHERLANDS	SINGAPORE	UNITED KINGDOM
BULGARIA	FRANCE	ITALY	NEW ZEALAND	SOUTH AFRICA	UNITED STATES
CANADA	GERMANY	JAPAN	NIGERIA	SPAIN	URUGUAY
CHILE	GHANA	KENYA	NORWAY	SUDAN	VENEZUELA
CHINA,Mainland	GREECE	KOREA	PAKISTAN		

Table A4: FTAs included in 'general FTA' dummy

Agreement	Member countris and accession	enforced year
EC	Belgium, Germany, France. Italy, Luxcemburg, Netherland Denmark, Ireland, United Kingdom, Switzerland, Iceland, Norway Algeria(1976), Syria(1977), Greece(1981), Portugal, Spain(1986), Romania(1993), Bulgaria(1993), Austria, Finland, Sweden(1995), Turkey(1996), Tunisia(1998), South Africa, Morocco, Israel, Mexico(2000), Croatia, Jordan(2002), Chile, Lebanon(2003), Egypt(2004)	1958
EFTA	United Kingdom, Austria, Sweden, Switzerland, Denmark, Norway, Portugal Iceland(1970), Turkey(1992), Israel, Romania, Bulgaria(1993), Morocco(1999), Yugoslavia. FR, Mexico(2001), Jordan, Croatia(2002), Singapore(2003), Chile(2004), Tunisia(2005)	1960 1970
CACM	Guatemala, El Salvador, Honduras, Nicaragua	1961
CARICOM	Antigua and Barbuda, Bahamas, Barbados,Belize,Dominica,Grenada,Guyana,Haiti,Jamaica,Montserrat,Saint Lucia St. Kitts and Nevis St. Vincent and the Grenadines Suriname Trinidad and	1973
PATCRA	Australia, Papua New Guinea,	1977
SPARTECA	Australia, New Zealand, Cuc Island	1981
LAIA	Argentine, Bolivia, Brasil, Chile, Colombia, Ecuador, Chile, Mexico, Paraguay, Peru, Uruguay, Venezuela, Cuba	1981
CER	Australia, New Zealand	1983
CAN	Colombia, Ecuador, Peru, Bolivia, Venezuela	1988
GSTP	Algeria(1990), Argentina(1990), Bangladesh(1989), Benin(1989), Bolivia(1989), Brazil(1991), Cameroon(1992), Chile(1989), Colombia(1997), Cuba(1989), DPR.Korea(1989), Ecuador(1990), Egypt(1989), Ghana(1990), Guinea(1990), Guyana(1989), India(1989), Indonesia(1989), Iran(1992), Iraq(1989), Libya(1989), Malaysia(1989), Mexico(1989), Morocco (1997), Mozambique (1990), Myanmar(1997), Nicaragua(1989), Nigeria (1989), Pakistan(1989), Peru(1989), Philippines(1992), Rep. Korea(1989), Romania(1989), Singapore(1989), Sri Lanka(1989), Sudan(1991), Thailand(1990), Trinidad and Tobago(1989)	1989
MERCOSUR	Argentina, Brasil, Paraguay, Uruguay, Venezuela	1991
AFTA	Brunei, Indonesia, Malaysia, Philippines, Singapore, Thaikand	1992
	Vietnam(1995), Laos, Myanmar(1997), Cambodia(1999)	
NAFTA	Canada, Mexico, USA	1994
COMESA	Angola, Burundi, Comoros, Djibouti, DR.Congo, Egypt, Eritrea, Ethiopia, Kenya, Lesotho, Libya, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Rwanda, Seychelles, Sudan, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe	1994
CIS	Armenia, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Ukraine, Uzbekistan, Azerbaijan (1993), Georgia(1993)	1994
SAPTA	Bangladesh, Nepal, Bhutan, Pakistan, India, Sri Lanka, Maldives	1995
CEFTA	Hungary, Poland, Czech, Slovak, Slovenia, Romania, Bulgaria	1992
CEFTA accession	Romania(1997), Bulgaria (1999), Croatia(2003)	
CEMAC	Cameroon, Central African R.Chad, R.Congo, Equatorial Guinea, Gabon	1999
WAEMU/UEMO	Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal	2000
EAC	Kenya, Uganda, Tanzania	2000
SADC	Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia, Zimbabwe, Namibia, South Africa, Mauritius, DR.Congo, Madagascar, Seychelles	2000
ASEAN - China		2003
Laos — Thailand		1991
United States — Israel		1985
Armenia - Russian Federation		1993
Kyrgyz Republic — Russian Federation		1993
Georgia — Russian Federation		1994
Romania — Moldova		1995
Costa Rica - Mexico		1995
Faroe Islands — Switzerland		1995
Kyrgyz Republic — Armenia		1995
Kyrgyz Republic — Kazakhstan		1995
Armenia - Moldova		1995
Georgia — Ukraine		1996
Georgia — Azerbaijan		1996
Kyrgyz Republic — Moldova		1996
Armenia - Ukraine		1996
Canada — Israel		1997
Turkey - Israel		1997
Canada — Chile		1997
Kyrgyz Republic — Ukraine		1998
Romania — Turkey		1998
Kyrgyz Republic — Uzbekistan		1998
Mexico - Nicaragua		1998
Georgia — Armenia		1998
Bulgaria — Turkey		1999
Georgia — Kazakhstan		1999
Chile — Mexico		1999
Georgia — Turkmenistan		2000
Bulgaria — Former Yugoslav Republic of Macedonia		2000
Israel - Mexico		2000

Table A5: List of Variables

Variables	Definition	Expected signs	Source
Trade	Average of bilateral trade flows((Exportij+Exportji+Importij+importji)/4), deflated by US CPI		Rose(2005), IMF, Direction of Trade Statisti
Export	Export value of country i to j		UN, COMTRADE
	-Food and Live animals		- SITC code 0
	-Apparels		- HS code 61
	-Iron and steel		- HS code 72
	-Electrical machinery		- HS code 85
	-Motor vehicles for transport of persons		- HS code 8703
GDP	log og real GDP	+	World Bank, WDI, IFS, IMF
per capita GDP	log of per capita GDP, real GDP divided by total population	+	World Bank, WDI, IFS, IMF
Distance	log of distance in kn between the largest city of country i and j	-	
Adjacency	Dummy variable if a country pair has the same common languages.	+	
Language	Dummy variable if a country pair shares a land border	+	
FTA	Dummy variable if a country pair belongs to the same FTA.		
EU1	Dummy variable if a country pair both belongs to EU		
EU2	Dummy variable if country i is a member of EU and country j is not a member.		
EU3	Dummy variable if country i is not a member of EU and country j is a member.		
NAFTA1	Dummy variable if a country pair both belongs to NAFTA		
NAFTA2	Dummy variable if country i is a member of NAFTA and country j is not a member.		
NAFTA3	Dummy variable if country i is not a member of NAFTA and country j is a member.		
AFTA1	Dummy variable if a country pair both belongs to AFTA		
AFTA2	Dummy variable if country i is a member of AFTA and country j is not a member.		
AFTA3	Dummy variable if country i is not a member of AFTA and country j is a member.		
MERCOSUR1	Dummy variable if a country pair both belongs to MERCOSUR		
MERCOSUR2	Dummy variable if country i is a member of MERCOSUR and country j is not a member.		
MERCOSUR3	Dummy variable if country i is not a member of MERCOSUR and country j is a member.		
ASEAN-China 1	Dummy variable if a country pair both belongs to ASEAN-China FTA		
ASEAN-China 2	Dummy variable if country i is a member of ASEAN-China FTA and country j is not a member.		
ASEAN-China 3	Dummy variable if country i is not a member of ASEAN-China FTA and country j is a member.		
EU-Mexico 1	Dummy variable if a country pair both belongs to EU-Mexico FTA		
EU-Mexico 2	Dummy variable if country i is a member of EU-Mexico FTA and country j is not a member.		
EU-Mexico 3	Dummy variable if country i is not a member of EU-Mexico FTA and country j is a member.		
CER	Dummy variable if a country pair both belongs to CER		
Japan-Singapore FTA	Dummy variable if a country pair both belongs to Japan-Singapore FTA		
Japan-Mexico FTA	Dummy variable if a country pair both belongs to Japan-Mexico FTA		
Korea-Chile FTA	Dummy variable if a country pair both belongs to Korea-Chile FTA		
Singapore-USA FTA	Dummy variable if a country pair both belongs to Singapore-USA FTA		

Table A6: Basic statistics of variable of equation 1

Variable	Obs	Mean	Std. Dev.
ln Trade	265,522	10.01241	3.43835
ln GDP	265,414	49.14773	2.63304
ln GDP percap	265,414	17.15873	1.54378
ln (dif. GDP pp)	265,414	8.53369	1.37245
ln Distance	265,522	8.17534	0.80596
Adjacency	265,454	0.02828	0.16578
Common language	265,454	0.21627	0.41170
General FTA	265,522	0.08790	0.28315
EU 15	265,522	0.00681	0.08224
NAFTA	265,522	0.00014	0.01164
AFTA	265,522	0.00101	0.03181
MERCOSUR	265,522	0.00056	0.02376
CER	265,522	0.00009	0.00931
ASEAN-China	265,522	0.00009	0.00951
EU-Mexico	265,522	0.00198	0.04442
Japan-Singapore	265,522	0.00017	0.01287
Japan-Mexico	265,522	0.000004	0.00194
Korea-Chile	265,522	0.000008	0.00274
US-Singapore	265,522	0.000008	0.00274

Table A7: Basic statistics of variable of equation 2

Variables	*N*	Mean	Std. Dev.
ln Export			
-Food and Live animals	11,686	15.3921	2.9395
-Apparels	7,879	12.8962	3.4430
-Iron and steel	7,345	14.5908	3.2123
-Electrical machinery	9,450	15.5264	3.5669
-Motor vehicles	5,737	14.1710	3.6134
ln GDPi	15,689	25.4445	1.5942
ln GDPj	15,689	25.4445	1.5942
ln GDP per capita	15,689	8.5393	1.5164
ln GDP per capita	15,689	8.5393	1.5164
ln (dif. GDP pp)	15,689	8.7674	1.4551
ln Distance	15,876	8.6719	0.8778
Adjacency	15,876	0.0340	0.1813
Language	15,876	0.1051	0.3066
EU	15,876	0.0453	0.2079
NAFTA	15,876	0.0015	0.0389
AFTA	15,876	0.0050	0.0708
MERCOSUR	15,876	0.0050	0.0708
ASEAN-China	15,876	0.0053	0.0725
EU-Mexico	15,876	0.0265	0.1607
CER	15,876	2.5E-04	1.6E-02
Japan-Singapore	15,876	2.5E-04	1.6E-02
Japan-Mexico	15,876	2.5E-04	1.6E-02
Korea-Chile	15,876	2.5E-04	1.6E-02
Singapore-USA	15,876	2.5E-04	1.6E-02

Table A8: Correlation matrix of explanatory variables of equation 1, pooled data

	ln GDP	ln GDP per cap	ln Distance	Adjacency	Language	FTA	EU	NAFTA	AFTA	MERCOSUR	ASEAN-China	EU-MEX	CER	JPN-SGP	JPN-MEX	KOR-CHL	SGP-USA
ln GDP	1																
ln GDP per capita	0.5281	1															
ln Distance	0.1273	0.0407	1														
Adjacency	-0.023	-0.089	-0.383	1													
Language	-0.201	-0.134	-0.174	0.1484	1												
FTA	0.1085	-0.008	-0.182	0.1134	0.0731	1											
EU	0.1731	0.1826	-0.207	0.0816	-0.017	0.2646	1										
NAFTA	0.0419	0.0241	-0.019	0.0586	0.0076	0.0411	-0.002	1									
AFTA	0.0145	-0.025	-0.072	0.0634	-0.012	0.1164	-0.004	-6E-04	1								
MERCOSUR	0.0218	0.0106	-0.04	0.0885	0.0379	0.084	-0.003	-4E-04	-0.001	1							
ASEAN-China	0.0218	0.0125	-0.004	-0.007	-0.016	0.0514	0.0036	0.0036	0.004	0.0033	1						
EU-Mexico	0.1027	0.1123	-0.095	0.0339	-0.009	0.1555	0.4906	-9E-04	-0.002	-0.002	0.0717	1					
CER	0.0123	0.0185	-0.013	-0.002	0.0279	0.0329	-0.001	-2E-04	-5E-04	-3E-04	-9E-04	-7E-04	1				
Japan-Singapore	0.0113	0.0109	-3E-04	-8E-04	-0.002	0.0137	-5E-04	-1E-04	-2E-04	-1E-04	0.0078	-3E-04	-1E-04	1			
Japan-Mexico	0.0073	0.004	0.002	-4E-04	-0.001	0.0069	-2E-04	0	-1E-04	-1E-04	0.0056	-1E-04	0	0	1		
Korea-Chile	0.0053	0.0037	0.0049	-6E-04	-0.001	0.0097	-4E-04	0	-1E-04	-1E-04	0.0079	-2E-04	0	0	0	1	
Singapore-USA	0.0091	0.0077	0.0041	-6E-04	0.0082	0.0097	-4E-04	0	-1E-04	-1E-04	0.0079	-2E-04	0	0	0	0	1

Appendix: The Description of the data

Trade values at aggregated level are expanded dataset provided by Rose (2005) up to the year 2005, by using Direction of Trade Statistics (DOT) of IMF. These values denote nominal US$, thus we deflated by consumer price index (CPI) of USA (2000=1).

Export values at commodity level are from the UN's Commodity Trade Statistics database (COMTRADE, available from http://comtrade.un.org/db/). We used five commodity data, namely 'food and live animals' of SITC code 0, 'articles of apparel, accessories, knit or crochet' of HS code 61, 'iron and steel' of HS code 72, 'electrical, electronic equipment' of HS code 85 and 'Motor vehicles for transport of persons' of HS code 8703. We also deflated these export value by CPI of USA.

Real GDP and population data are taken from the World Bank's World Development Indicators (WDI). Real GDP are deflated by GDP deflator (2000=1) and denote US$. Real per capita GDP is real GDP divided by population. We define 'Adjacency' as a case where countries share common land border, and 'common language' as a case where two countries have the same official language. The information on these two variables is obtained from 'regional basic data' provided by website of Ministry of Foreign Affairs of Japan.

'Comprehensive FTA' dummy variable is based on the date in force of the notified RTAs to WTO. Regarding the EU and the AFTA, the number of signatory countries has increased during the sample periods, thus EU dummy and AFTA dummy reflects this enlargement.

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