

Trade Blocks and the Gravity Model: A Study of Economic Integration among Asian Developing Countries

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Abstract

This paper analyzes the trade creation and trade diversion effects of the regional trade agreements (RTAs) in Asia and their effects on intra-regional trade flows using annual trade data for the period 1980-2009. The research will attempt to achieve the following objectives: (a) analyze the major RTAs in Asia and their effects on intra-regional trade flows. (b) use a gravity model to estimate the trade creation and trade diversion effects of various RTAs on trade flows within and across member groups; and (c) measure the effect of RTAs on members' trade with other Asian countries. The findings of this study are, for the most part, consistent with findings of previous studies on the Asian trade flows. The coefficients of real GDP, population, and distance had expected signs and magnitudes in all models estimated.

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I. Introduction

The number of regional trading arrangements (RTAs) or preferential trading agreements (RTAs) have grown dramatically since the early 1990s. By the end of 2009, there were over 220 agreements in force that had been notified to the World Trade Organization (WTO), and an additional 70 are estimated to be operational although not yet notified. According to the WTO, if RTAs reportedly planned or already under negotiation are concluded, the total number of RTAs in force might well approach 300.

Theoretical work on RTAs has always highlighted that while the merchandise trade provisions of RTAs can boost trade among member countries, it is at the expense of trade among non-members. Therefore, whether it benefits a country to join a RTA depends on the cost structures in partner countries, compared with the cost structures in non-members. Viner (1950) recognized that the trade induced by a preferential trading agreement was of two types, which he called trade creation and trade diversion. Trade creation is the substitution in the importing country of a lower cost source of supply within the area for a more costly source and is, therefore, beneficial to the member countries and the world as a whole. In contrast, trade diversion is the substitution of a more costly source of supply within the area for a less costly source outside the area.

Many studies have investigated whether regional trade blocs raise the economic welfare of the integrating partners and the excluded countries. While all of these studies argue that trade creation and diversion are important in understanding which and how RTAs form, the effects of RTA formation are typically ambiguous, since the relative size of trade creation and diversion is in general indeterminate. The welfare effects of RTA formation and the size of trade creation and diversion are an empirical issue. We analyze empirically the trade creation or diversion effects of major RTAs in Asia. The paper uses a gravity model augmented with several sets of dummy variables to estimate the effect of various RTAs on trade flows within and across membership groupings in Asia as well as the effect of RTAs on members' trade with other Asian countries. Some researches have argued that although gravity models have been very frequently used in modeling

Table 1. Regional Trade Agreements in Asia

Agreement	Member Countries	Status
Association of Southeast Asian Nations (ASEAN)	Brunei-Darussalam, Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam	ASEAN was formed in 1967 by Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Brunei-Darussalam joined in 1984, Vietnam in 1995, Myanmar and Lao People's Democratic Republic (PDR) in 1997, Cambodia in 1999, and China in 2004.
Bangkok Agreement (BA)	Bangladesh, China, Laos, India, Republic of Korea, and Sri Lanka	The Bangkok Agreement, signed in 1975, is a preferential tariff arrangement that promotes intra-regional trade through exchange of mutually agreed concessions by member countries. Membership was extended to China in 2002.
Economic Cooperation Organization (ECO)	Afghanistan, Azerbaijan, Iran, Kazakhstan, Kyrgyz Republic, Pakistan, Tajikistan, Turkey, Turkmenistan, and Uzbekistan	ECO was established in 1985 by Iran, Pakistan and Turkey for the purpose of promoting economic, technical and cultural cooperation among the Member States. Membership was extended to the other seven members in 1992.
South Asia Association for Regional Cooperation (SAARC)	Bangladesh, India, Pakistan, Maldives, Nepal and Sri Lanka	SAARC was established in 1985 by Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. The agreement on SAARC Preferential Trading Arrangement (SAPTA) was signed in 1993.

Source: World Trade Organization.

international trade flows, they have not yet been successfully used in capturing the trade creation and diversion effects of liberalization agreements.

Table 1 presents the major regional trade agreements in Asia and their current status. Of the four regional trade agreements, ASEAN is the oldest and largest agreement. In addition to these agreements, there are a several bilateral preferential trade agreements.

Table 2 shows the intra-block trade within the major regional trade agreements in Asia between 1970 and 2008. Even though intra-block trade of Asian RTAs increased between 1970 and 2008, they were not significant changes. They are quite low with the exception of ASEAN.

The degree of regional integration through trade in Asia has been rising fast over the last twenty years. However, in 2008, inter-regional trade share in Asia was much lower than the European Union's share of 67.1% and of 49.5% for the North

Table 2. Intra-Block Trade in Asian RTAs, 1970-2008 (%)

Year	ASEAN	Bangkok Agreement	ECO	SAARC
1970	22.4	2.8	2.2	3.2
1971	24.1	2.3	1.7	3.3
1972	21.0	3.0	1.7	5.1
1973	18.8	3.7	2.5	6.3
1974	16.2	1.7	4.5	4.2
1975	16.7	2.1	4.0	4.7
1976	15.0	1.5	3.7	4.0
1977	15.0	1.5	6.4	4.5
1978	15.9	1.7	4.4	4.6
1979	17.1	1.7	3.5	4.8
1980	17.3	1.7	6.3	5.7
1981	17.7	1.8	5.2	5.9
1982	20.2	1.9	7.1	4.9
1983	20.9	2.01	0.1	4.1
1984	18.7	2.71	0.2	5.1
1985	18.5	1.9	9.9	4.9
1986	16.8	1.7	5.2	4.5
1987	17.7	1.3	6.3	4.4
1988	17.6	1.3	4.8	4.2
1989	17.8	1.5	3.7	3.9
1990	18.9	1.6	3.2	3.5
1991	19.7	3.3	3.2	3.7
1992	20.1	4.0	5.2	4.2
1993	21.3	6.1	7.2	3.8
1994	24.3	6.0	7.4	4.1
1995	24.4	6.8	7.9	4.7
1996	24.4	7.6	7.1	4.6
1997	23.9	8.0	7.5	4.5
1998	21.0	7.0	6.8	5.2
1999	21.7	7.3	5.8	4.5
2000	23.0	8.0	5.6	4.7
2001	22.3	8.6	5.5	5.5
2002	22.7	9.3	5.9	5.5
2003	24.71	0.1	6.6	6.6
2004	24.91	1.0	6.6	6.5
2005	25.3	11.1	7.6	6.7
2006	24.9	10.8	8.4	6.4
2007	25.2	11.2	9.0	6.5
2008	25.4	11.0	8.3	6.3

Key:

ASEAN: Association of South-East Asian Nations

ECO: Economic Cooperation Organization

SAARC: South Asian Association for Regional Cooperation
Source: United Nations Conference on Trade and Development (UNCTAD), Handbook of Statistics 2009. Table 2. Intra-Block Trade in Asian RTAs, 1970-2008 (%)

American Free Trade Agreement (NAFTA). It is also interesting to note that there have not been any significant change in the intra-block trade after the given RTA was implemented. For example, when ECO and SAARC were established in 1985, there have not been any significant changes in trade share in the following year or two. Therefore, it is important to analyze the level of trade creation and trade diversion effects of the major RTAs in Asia. The specific objectives of this study are to: (a) analyze the major RTAs in Asia and their effects on intra-regional trade flows; (b) use a gravity model to estimate the trade creation and trade diversion effects of various RTAs on trade flows within and across member groups; and (c) measure the effect of RTAs on members' trade with other Asian countries.

The remainder of the paper is organized as follows: Section II provides a review of the existing literature on this topic. Section III gives a brief description of the methodology used and data sources. Section IV discusses our analysis and findings while Section V offers some conclusions.

II. Survey of Previous Studies

This section summarizes the previous studies that used gravity model to estimate the effects of regional trading agreements on trade flows among member and non-member countries. For a more detailed literature review, the reader is directed to any of a number of surveys of various approaches to the study of RTAs, including Panagariya (1999, 2000), DeRosa (1998), Harrison, Rutherford and Tarr (2003), Robinson and Thierfelder (2002), Scollay and Gilbert (2000), and Lloyd and MacLaren (2004).

The popularity of the gravity model is relatively recent. It was used during the 1960s and 1970s to estimate trade flows but was criticized because it lacks a strong theoretical foundation. Tinbergen (1962), Poyhonen (1963), and Linneman (1966) provided initial specifications and estimates of the determinants of trade flows while Aitken (1973) applied it to RTAs. Anderson (1979) provided a rigorous economic justification, deriving a reduced-form gravity equation from a general equilibrium model incorporating the properties of expenditure systems. Bergstrand (1985) and Deardorff (1997) also provided partial theoretical foundations for the gravity equation, although none of the models generated exactly the same equation generally used in empirical work. Due to a revival of interest among economists in the interconnectedness of economics and geography, the gravity model has again become popular.

Gravity models were first applied to international trade by Tinbergen (1962) and Pöyhönen (1963). Tinbergen developed the model to determine the normal or standard pattern of international trade that would prevail among 42 countries in the absence of trade barriers. Besides the standard GM, Tinbergen also estimated other models including dummy variables for trade agreements and the presence of a common border among trading countries.

Later, Leamer and Stern (1970) derived these relationships from a probability model of transactions, but none relied on standard trade theories. Several authors in search for a theoretical basis came up with models that are based on increasing returns. In particular, Anderson (1979) used Armington preferences in a model of homogenous goods to derive a role for transport costs.

Bergstrand (1985, 1989) developed this analysis further within the increasing returns framework. Later, Helpman (1981) and Helpman and Krugman (1985) integrated monopolistic competition into a Heckscher-Ohlin framework. More recently, Deardorff (1998) derived gravity equation from two cases of the Heckscher-Ohlin theory. These papers now provide the previously missing theoretical underpinnings for the gravity model. Consequently, Evenett and Keller (1998) showed how the data can be used to discriminate between the two alternative trade theories and thus found theoretical support for both in gravity models.

Based on the Helpman and Krugman (1985) model that successfully incorporates monopolistic competition of the increasing returns theory into a Heckscher-Ohlin framework, a number of empirical tests explaining bilateral trade flows have been performed (see for example, Balassa, 1986; Helpman, 1987; Balassa and Bauwens, 1987). Other authors used per capita income to express the level of economic development (Koo and Karamera, 1991; Carrillo and Li, 2002). Models that include population are often referred to as augmented gravity models (Cheng and Wall, 2004). Other variables that are commonly used in gravity models are dummy variables to control for cultural similarity among trade partners, such as language or historical relationships such as colonialism. Growing empirical literature finds that historical linkages are important determinants of international trade flows (see Frankel, Stein and Wei, 1995; Frankel, 1997; and Eichengreen and Irwin, 1998). Lagged bilateral trade flows are significant in determining current trade in a large cross-section of countries, after controlling for income and distance.

Trade statistics confirm that the magnitude of intra-trade within the following three regional groupings, namely, the European Union, Asia-Pacific and North America, has been disproportionately high. One plausible explanation behind this

apparent bias towards intra-regional trade in these three country groups is geographical proximity among the countries. The immediate consequence of geographical proximity is reduction in transport costs, short delivery time, less interest payments on export credits and low spoilage. Both Krugman (1991) and Summers (1991) have opined that the disproportionate intra-trade in above-named three country groups is largely due to proximity, and the other traits associated with proximity. They are wedded to the concept that proximity promotes trade. Krugman (1991) goes further and argues that the three trading blocs are welfare enhancing natural groupings. This naturally means that there are some “unnatural” trade groupings where partners do not have proximity but are far apart. He provided the example of a trading arrangement between the United Kingdom and the members the Commonwealth as an “unnatural” trading arrangement. The argument supporting this hypothesis is that due to less or no distance between trading partners, intra-continental RTAs are likely to be more trade creating than trade diverting.

Frankel and Wei (1997) provide an extensive examination of possible RTAs in Asia-Pacific. They also considered a sequence of “nested country groupings” in Asia, like ASEAN, East Asia, and South Asia and the whole of Asia. In their gravity model exercise, they measured the log of distance between two major cities-usually the capital cities-of the respective countries for their empirical model. They also added a dummy “adjacent” variable to indicate when two countries shared a common border. In another similar study, Frankel, Stein, and Wei (1994) tried to test with a more thorough measure of distance that took into account land and sea routes. The results of both the studies tended to be similar. Frankel and Wei (1997) took GNP in product form because it is empirically well established in bilateral trade regressions and can be justified by the modern theory of trade under imperfect competition. Countries *a priori* choose larger countries to trade with because they offer greater variety of goods to choose from than smaller countries. Also common language tends to facilitate trade by enhancing exporters’ and importers’ understanding of each others’ cultures, commercial and legal systems, which have a great deal of influence on trade. To capture these effects Frankel and Wei (1997) included dummy variables that took the value of one if the country pair in question had a favorable impact on trade due to these effects, and zero if they did not.

The inferences of Frankel and Wei (1997) may be summarized as follows. As posited by the gravity model, geography matters. Distance has an economically

and statistically large effect on trade. As distance increased by 1%, trade declined by 0.5%. The “adjacency” dummy showed that two countries with a common land border have a larger volume of trade than two otherwise identical countries. Another important conclusion was that common language or past colonial connections facilitated trade; it brought in 50% more trade than otherwise.

Thus, using gravity model they reached two vitally important conclusions. First, East and Southeast Asian economies clearly show certain inward bias among themselves. Second, even after controlling for a special Asia effect, East and Southeast Asian economies as a group appear to trade more among themselves than one would expect based on their economic and geographic characteristics. Adding the Hong Kong and Singapore dummies does not change the qualitative feature of the picture.

III. Methodology and Data

This study uses an augmented gravity model to analyze the trade flows in Asia. Gravity models were introduced to economic theory in the 1960s. Linneman’s (1966) seminal study applied a gravity model to analyze the factors that explain trade for a sample of 80 countries. Gravity models have been augmented with variables representing factors that could either facilitate or impede trade.

This article follows numerous authors and specifies the following gravity equation which controls for the basic determinants of international trade. Since the literature on standard gravity models are well known, this study does not discuss the theoretical foundation of gravity models. Following Athukorala and Yamashita (2006) and Kabir and Salim (2010), our specification of the gravity model is:

$$\begin{aligned} \ln X_{ij} = & \beta_0 + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln POP_i + \beta_4 \ln POP_j + \beta_5 \ln Dist_{ij} \\ & + \beta_6 \ln RFE_{ij} + \beta_7 SIM_{ij} + \beta_8 Border_{ij} + \beta_9 Language_{ij} \\ & + \beta_{10} Colony_{ij} + \beta_{11} RTA(I) + \beta_{12} RTA(O) + \beta_{13} BTA + \beta_{14} ASEN \\ & + \beta_{15} BA + \beta_{17} SAARC + \beta_{18} T + u_{ij} \end{aligned} \quad (1)$$

where X_{ij} is the exports from country i to country j ; GDP_i is the real gross domestic product of country i ; GDP_j is the real gross domestic product of country j ; POP_i is the population of country i , POP_j is the population of country j ; $Dist_{ij}$ is the geographical or economic distance between the two countries; RFE_{ij} is the relative factor endowment between country i and country j ; SIM_{ij} is the similarity

index; *Border* is a dummy variable which takes the value 1 if the two countries share a contiguous border and zero otherwise; *Language* is a dummy variable which takes the value 1 if the two countries share a common language and zero otherwise; *Colony* is a dummy variable that equals 1 if the exporting country is a former colony of importing country or if the two countries share a common colonial linkage and zero otherwise; *RTA(I)* is a binary variable which is unity if two countries belong to the same regional trade agreement and zero otherwise; *RTA(O)* is a binary variable which is unity if country *i* belong to a regional trade agreement and country *j* does not, or *vice versa* and zero otherwise; *BTA* is a dummy variables that equals 1 if country *i* and country *j* has a bilateral trade agreement and zero otherwise; *ASEAN* is a dummy variable which is unity if the country is a member of the Association of Southeast Asian Nations and zero otherwise; *BA* is a dummy variable which is unity if the country is a member of the Bangkok Agreement and zero otherwise; *ECO* is a dummy variable which is unity if the country is a member of the Economic Cooperation Organization and zero otherwise; *SAARC* is a dummy variable which is unity if the country is a member of the South Asia Association for Regional Cooperation and zero otherwise; *T* is a set of dummy variables to capture year-specific “fixed” effects; and u_{ij} is a normally distributed error term. Thus, the dummy *RTA(I)* measures the degree of trade-creation effects of the regional trade agreement between members, while the dummy *RTA(O)* captures the degree of trade-diverting effects between members and nonmembers, compared to the “normal” bilateral trade flows.

According to Frankel (1993), real *GDP* is included to capture the factors associated with the level of economic development. It also captures the productive capacity of the exporting country and the purchasing power of the importing country. The coefficients of the real *GDP* variables are expected to be positive.

Population variables represent the size of the countries and are expected to have positive signs. According to Venables (1987) and Krugman (1980), the larger countries are better able to absorb imports than smaller countries and are better able to experience economies of scale and thus develop a comparative advantage in their export industries than are smaller countries.

The coefficient of the distance variable ($Dist_{ij}$) is expected to be negative. This is a proxy for transportation costs and time, access to market information, access to markets, and other factors that make it difficult for nations to engage in trade. The anticipated sign on all ten dummy variables is positive, reflecting the idea that proximity, common language, historical links, and regional trading agreements are

trade creating networks. However, the expected sign of the dummy variable $RTA(O)$ can either be positive or negative.

The relative factor endowment variable (RFE_{ij}) is defined as the absolute value of the difference between natural logarithm of per capita GDPs between country i and country j . The choice of this variable as an explanatory variable is based on the standard comparative advantage explanation of trade. This variable aims to capture technology differences between countries in explaining trade patterns. Though this variable is generally measured as the absolute value of the difference between natural logarithm of capital-labor ratio, due to the unavailability of data per capita GDP is used in place of capital-labor ratio. The expected sign of this variable is positive. Recent studies that used this method include Egger (2002), Baltagi et al. (2003), Serlenga and Shin (2007), and Kabir and Salim (2010). Thus, relative factor endowment is defined as:

$$RFE_{ij} = |\ln PGDP_i - \ln PGDP_j| \quad (2)$$

Following Breuss and Egger (1999), Egger (2000, 2002), and Serlenga and Shin (2007), the similarity index is defined as:

$$SIM_{ij} = \ln \left[1 - \left(\frac{GDP_i}{GDP_i + GDP_j} \right)^2 - \left(\frac{GDP_j}{GDP_i + GDP_j} \right)^2 \right] \quad (3)$$

The expected sign of the similarity index variable is positive. This is due to the fact that similarity with respect to GDP per capita implies increased similarity in size of country-specific product diversity in the differentiated goods sector and that leads to an increased trade volume.

This study uses annual data from 1980 to 2009. The dependent variable used in the analysis is exports from country i to country j . The data on exports for the study period of 1980-2009 are from the UN Commodity Trade Statistics (UN Comtrade) database and from International Monetary Fund, *Direction of Trade Statistics* database. Data on population are from International Monetary Fund, *International Financial Statistics Yearbook*. Information on real gross domestic product is from the UNCTAD, *Handbook of Statistics 2009* database and from International Monetary Fund, *World Economic Outlook* database, April 2010. Information on per capita gross domestic product is from the International Monetary Fund, *World Economic Outlook* database, April 2010. The distance variable is obtained from the World Bank, *Trade, Production, and Protection 1976-2004* database.

IV. Empirical Results

We estimate the model with annual data for 19 Asian countries for the period 1980 to 2009. They include Bangladesh, Brunei Darussalam, Cambodia, China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Maldives, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand and Vietnam. We analyze the trade flows of these 19 countries to a sample of 64 countries. The list of the countries in the full sample is given in the Appendix. We estimated four sets of regression models to measure the effects of regional trade agreements in Asia during the four periods: 1980-2009, 1980-1989, 1990-1999, and 2000-2009. The model was estimated using ordinary least squares (OLS) with country dummies to capture country-specific fixed effects. Since there was strong evidence of heteroskedasticity, we derived consistent variance-covariance standard errors of the regression coefficients using the Huber-White consistent variance-covariance estimator. The results are reported in Table 3. The conventional variables behave very much the same way as the model predicts, and the estimated coefficients are statistically significant. The adjusted R^2 values range from a low of 0.544 to a high of 0.604. These values are acceptable for a cross-sectional study and are comparable to those obtained in other studies employing the gravity model to examine intra-regional trade flows.

The coefficients of the real GDP variables for both countries are positive in all models estimated. They are also statistically significant at the 1% level of significance. The population coefficients are negative and statistically significant in all models. The distance variable has the expected negative sign and is highly significant in all models estimated. The results for the distance variable provide strong support for the hypothesis that transportation and other distance-related costs are an important determinant of trade flows.

The Border variable has the expected positive sign in all models. However, this variable is not statistically significant in any of the four models. The common language dummy is statistically significant, with the expected positive sign in all cases. The common colony dummy is statistically significant, with the expected positive sign in all cases. The coefficient on relative factor endowment variable is statistically significant in three of the four cases and has the expected sign in three time periods. Its positive sign suggests that bilateral trade flows are related positively to inter-country differences in the level of technological advancement. The coefficient on similarity index variable is statistically significant in three of the

Table 3. Effects of RTAs on Trade Flows in Asia

Variable	1980-2009	1980-1989	1990-1999	2000-2009
<i>Constant</i>	-37.418*** (0.56)	-44.702*** (1.05)	-34.655*** (0.92)	-32.807 (0.79)
$\ln(GDP_i)$	2.618*** (0.02)	3.219*** (0.05)	2.365*** (0.40)	2.256*** (0.04)
$\ln(GDP_j)$	1.614*** (0.02)	1.824*** (0.06)	1.557*** (0.42)	1.513*** (0.04)
$\ln(POP_i)$	-0.372*** (0.02)	-0.812*** (0.04)	-0.080** (0.03)	-0.205*** (0.03)
$\ln(POP_j)$	-0.597*** (0.03)	-0.864*** (0.06)	-0.583*** (0.05)	-0.406*** (0.03)
RFE_{ij}	0.001 (0.01)	-0.001*** (0.00)	0.001*** (0.00)	0.001*** (0.00)
SIM_{ij}	0.221*** (0.05)	0.525*** (0.10)	-0.183** (0.08)	0.057 (0.07)
$\ln(Distance)$	-0.689*** (0.05)	-0.629*** (0.09)	-0.703*** (0.08)	-0.775*** (0.06)
<i>Border</i>	0.110 (0.17)	0.339 (0.34)	0.076 (0.29)	0.096 (0.24)
<i>Language</i>	1.999*** (0.11)	2.166*** (0.21)	2.164*** (0.19)	1.088*** (0.16)
<i>Colony</i>	1.040*** (0.23)	1.148** (0.45)	0.762* (0.39)	1.685*** (0.33)
<i>RTA(I)</i>	2.347*** (0.11)	2.375*** (0.22)	2.401*** (0.19)	2.274*** (0.16)
<i>RTA(O)</i>	-0.803*** (0.13)	-1.342*** (0.26)	-0.852*** (0.22)	-0.096 (0.53)
<i>BTA</i>	-0.174 (0.19)	0.050 (0.39)	-0.157 (0.34)	-0.243 (0.26)
<i>ASEAN</i>	1.517*** (0.09)	1.989*** (0.18)	1.260*** (0.15)	1.346*** (0.13)
<i>BA</i>	1.453*** (0.07)	2.055*** (0.13)	1.431*** (0.12)	1.014*** (0.11)
<i>ECO</i>	-0.293* (0.15)	-0.593* (0.30)	-0.163 (0.26)	-0.082 (0.22)
<i>SAARC</i>	1.564*** (0.09)	3.395*** (0.19)	0.977*** (0.17)	0.243* (0.14)
<i>Adjusted R²</i>	0.578	0.544	0.566	0.608
<i>Observations</i>	36.570	12.190	12.190	12.190
<i>F</i>	1.091.7	558.7	609.3	725.7
<i>RMSE</i>	1.12	1.08	1.04	1.20

Note: The standard errors of the regression coefficients have been derived using the Huber-White consistent variance-covariance estimator. RMSE is the Root Mean Square Errors. Statistical significance is denoted as *** for 1 % level, ** for 5 % level, and * for 10 % level.

four cases and has the expected sign in three time periods.

The estimated coefficient of the dummy variable, $RTA(I)$, has the expected positive sign and statistically significant in all four cases. This variable is expected to measure the degree of trade-creation effects of the regional trade agreement between members. The export enhancement effect of Asian regional trade agreements, calculated by $[\exp(\beta_{11}) - 1] \times 100$, turns out to be 945.4%. The estimated coefficient of the dummy variable, $RTA(O)$, has a negative sign in all four cases. This variable is expected to capture the degree of trade-diverting effects between members and nonmembers, compared to the “normal” bilateral trade flows.

The coefficient of the bilateral trade agreements dummy is statistically insignificant in all four cases. It also has the unexpected negative sign in three of the four cases. Three of the four dummy variables for membership in regional trade agreements, namely ASEAN, BA, and SAARC, have the expected positive signs and all are statistically significant. The dummy variable representing the fourth regional trade agreement, ECO, has the unexpected negative sign. This may be due to the fact that only 2 of the 19 Asian countries are members of this agreement. In sum, all coefficients of regional dummy variables are mostly positive and significant, indicating that multilateral trade agreements tend to enhance more trade than bilateral trade agreements.

V. Summary and Conclusions

Employing the gravity model in the analysis of intra-regional trade flows in Asia reveals some interesting observations concerning Asian trade and integration arrangements, such as the importance of language and culture as determinants of trade resistance. The regression results provide interesting results that mostly support the gravity estimates conducted on other economic blocs.

The main purpose of this paper was to understand the effects of regional trade agreements on trade flows among Asian countries. The analytical procedure includes an augmented gravity model to estimate export equations using combined time-series/cross-country data for the period 1980 to 2009. A sample of 19 Asian countries was chosen for the empirical analysis. The results are meaningful in terms of explaining the pattern of Asian trade, which support the theoretical model. The real GDP of both importers and exporters positively influence the bilateral trade. The population of both importers and exporters negatively influence the

bilateral trade. Consistent with other studies using the gravity model, distance is found to be negative and statistically significantly correlated with Asian exports.

The findings of this study are, for the most part, consistent with findings of previous studies on Asian trade flows. The coefficients of per capita GDP, population, and distance had expected signs and magnitudes in all models estimated. This confirms the results of other studies. The rapidly evolving economic and political climates provide many opportunities for the investigation of the success of economic integration in Asia.

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Appendix

Table 1. Countries Included in the Gravity Model Sample

Argentina	Indonesia	Poland
Australia	Iran	Portugal
Austria	Ireland	Qatar
Bahrain	Italy	Romania
Bangladesh	Japan	Russia
Belgium	Jordan	Saudi Arabia
Brazil	Kenya	Singapore
Brunei Darussalam	Korea, Republic of	South Africa
Cambodia	Kuwait	Spain
Canada	Malaysia	Sri Lanka
Chile	Maldives	Sweden
China, Hong Kong SAR	Mexico	Switzerland
China, P. R. of	Morocco	Syria
Czech Republic	Myanmar	Thailand
Denmark	NepalT	unisia
Egypt	Netherlands	Turkey
Finland	New Zealand	United Arab Emirates
France	Nigeria	United Kingdom
Germany	Norway	United States
Ghana	Pakistan	Uruguay
Greece	Panama	Viet Nam
Hungary	Peru	Yemen, Republic of
India	Philippines	