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TRADE BLOCKS AND THE GRAVITY MODEL: EVIDENCE FROM WESTERN HEMISPHERIC COUNTRIES

ABSTRACT

We analyze the major trade blocks in Western Hemisphere and their effects on intra-regional trade flows using data for the period 1980-2006. We use an augmented gravity model to estimate the effect of various trade blocks on trade flows within and across membership groupings as well as the effect of trade blocks on members' trade with other Western Hemispheric countries. The findings of this study are consistent with findings of previous studies on Western Hemisphere trade flows and shed some light on whether the proposed Free Trade Area of the Americas is beneficial or not for Western Hemispheric countries.

Key Words: trade blocks, gravity model, intra-regional trade

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INTRODUCTION

The economic, technological, social and political integration of the world in the twenty first century or the phenomena what we call as globalization includes integration of trade and finance among countries as well. In the backdrop of rapid globalization, if one looks closely one can observe a parallel and sometimes antithetical process of regionalism on the rise. Most studies have focused on a debate between regionalism versus globalization or on how regional trade agreements (RTAs) or preferential trade agreements (PTAs) impact upon the global trading system. However, observing the Western Hemisphere there is a trend from regional or sub-regional groupings towards integration into a much larger regional group, namely, the Free Trade Area of the Americas (FTAA). This larger regional group contains economies with differences in size, outlook and level of development. In this paper we attempt to investigate the rationale for having a larger regional grouping, the FTAA. Especially we investigate whether there is a sub-regional inward bias among themselves or a hemispheric bias, using an augmented gravity model.

The Free Trade Area of the Americas (FTAA) is the most ambitious regional trade agreement proposed to date. Negotiating countries include 34 nations in the Americas, except for Cuba and a few other smaller countries, with a total population of over 800 million and a market of over $14 trillion. Difficulties between Brazil and the U.S., co-chairs of the negotiations, have resulted in a scaled down version of the agreement (dubbed "FTAA á la carte") that allows countries to opt out of certain contentious areas like agriculture subsidies, investment, intellectual property rights, and anti-dumping.

Opponents of this scaled-down agreement, mainly Canada and Chile, criticize the attempt to limit the scope of FTAA, which aims for a continent-wide FTA, arguing that it makes the free trade area meaningless. They argue that the U.S. and Brazil are setting the agenda at the expense of the other participating members who are interested in liberalizing more than just import tariffs. Compared to Europe, RTA dynamics in the Western Hemisphere are more heterogeneous in nature with several major players engaged in multilayered RTA processes and not necessarily sharing similar objectives.

Latin American countries share a tradition of regional integration (Andean Community) (AC); Caribbean Community and Common Market (CARICOM); Central American Common Market (CACM); Central American-Dominican Republic Free Trade Agreement (CAFTA-DR); Latin American Integration Association (LAIA); North

American Free Trade Agreement (NAFTA); Southern Common Market (MERCOSUR), which is quite different from the more recent and market oriented RTAs being pursued by Canada and the U.S. While little progress has been made towards this objective, the same cannot be said for sub-regional and cross-regional RTAs where much has happened in recent years. One of the most noteworthy developments in this respect is the United States' shift from a reluctant to an adamant RTAs player. Having secured RTAs with Singapore, Chile and Jordan in 2003, the United States has signed, in 2004 alone, FTAs with Australia, Morocco and as a part of the Central American-Dominican Republic Free Trade Agreement (CAFTA-DR), with Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and the Dominican Republic; it also has concluded negotiations with Bahrain and is exploring similar agreements with Oman and the United Arab Emirates; it has advanced negotiations with Southern African Customs Union (SACU) opened negotiations with three members of the Andean Community (Columbia, Ecuador and Peru) and Panama; and announced its intentions to open FTA negotiations with Thailand.

Regional trade agreement developments in Western Hemisphere suggest increasing efforts towards consolidation and deepening of the network of RTAs among South and Central American countries (see Table 1). The MERCOSUR members are working towards the objective of a full-fledged Customs Union and have concluded a framework agreement with three members of the Andean Community, which aims toward the gradual establishment of an FTA. Recently, Venezuela has formally joined MERCOSUR while Mexico has signaled its intention to apply for an associate membership. Latin American countries have also been very active in FTA negotiations with partners further away - Mexico has a FTA with Japan; Chile with Republic of Korea; Panama is negotiating with Singapore; MERCOSUR with India and a MERCOSUR -China FTA is being considered.

At a theoretical level regional economic integration is being taken to mean deepening of intra-regional trade, expansion of mutual foreign direct investment (FDI) and harmonization of commercial regulations, standards and practices. Regional economic integration can potentially have many formal shapes and, therefore, names. It could cover a spectrum of arrangements varying from preferential trading areas, to free trade areas, to customs union, to common markets and finally to economic union.

Table 1: Western hemisphere regional trade agreements

Agreement	Member Countries	Status
Andean Common Market (also known as Andean Pact or Andean Community) (AC)	Bolivia, Colombia, Ecuador, Peru, Venezuela	The 1969 Andean Pact founding agreement was a step forward in creating a customs union with a longer term goal of creating a common market. Andean Pact became Andean Community in 1996.
Caribbean Community and Common Market (CARICOM)	Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago	The original treaty was signed in 1973. In 1989, member countries agreed to create a CARICOM Single Market and Economy (CSME).
Central American Common Market (CACM)	Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua	Original treaty signed in 1960 and 1963 but although most intra-regional trade is duty-free, integration process continues.
Central American-Dominican Republic Free Trade Agreement (CAFTA-DR)	Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, United States	The free trade agreement was signed on August 5, 2004. As of September 2005, the agreement had been ratified by six countries. Costa Rica has not ratified.
Latin American Integration Association (LAIA)	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay, Venezuela	The LAIA framework is a preferential trade arrangement consisting of about 40 partial scope agreements involving two or more countries. Most were signed in the 1990s.
North American Free Trade Agreement (NAFTA)	Canada, Mexico, United States	The free trade agreement was signed in December 1992 and entered into force on January 1, 1994.
Southern Common Market (MERCOSUR)	Argentina, Brazil, Paraguay, Uruguay	The treaty was signed in 1991. The goal of the treaty is to form a common market. The program has progressively removed trade barriers and established a common external tariff structure with selected national exceptions.

Source: World Trade Organization

The question is now, does having a continent-wide FTA benefit trade? Table 2 gives a birds-eye view of the scope for such an endeavor. Even though intra-block trade because of RTAS has increased between 1980 and 2006, they were not significant changes. With the exception of NAFTA they are quite low. There has been substantial increase in intra-block trade in the Western Hemisphere, which makes a case for having a continent-wide FTA. The degree of regional integration through trade in Latin America has been rising rapidly over the last twenty years. From 1980 to 2006, inter-regional trade for the Western Hemisphere (all regional blocks) in total has risen from 46.2% to 56.7%. The share of Intra-regional trade within Latin America is still lower than the European Union's share of 62% but higher than the 52% for East Asia (Kawai 2004).

Table 2: Intra-block trade and inter-block trade in western hemisphere

(a) Share of Intra-Block Trade (%)

Year	AC	CACM	CAFTA	CARICOM	LAIA	MERCOSUR	NAFTA	Average
1980	4.1	24.4	2.6	5.4	13.9	11.6	33.6	34.7
1985	3.4	14.6	1.7	6.3	9.2	5.5	43.9	40.7
1990	4.0	15.3	1.7	8.0	11.6	8.9	41.4	39.7
1995	8.6	21.8	2.3	12.1	17.3	20.3	46.2	45.0
2000	7.7	19.1	2.3	14.6	13.2	20.0	55.7	51.7
2006	8.4	16.8	2.2	11.3	14.3	13.5	53.8	47.9

(b) Share of Intra-Western Hemisphere Trade (%)

Year	AC	CACM	CAFTA	CARICOM	LAIA	MERCOSUR	NAFTA	Average
1980	53.5	68.0	32.3	41.1	50.3	37.1	41.4	46.2
1985	57.3	61.9	33.7	59.3	53.8	37.7	44.4	49.7
1990	61.1	64.3	34.3	33.1	53.4	39.0	46.3	47.3
1995	66.2	69.7	35.4	64.3	64.7	47.8	47.0	56.5
2000	70.7	75.7	38.9	76.2	72.3	51.7	51.5	62.4
2006	64.4	74.5	37.5	63.6	61.4	46.2	49.0	56.7

Source: Authors' calculations based on UN Comtrade data.

All countries in the region, except for Cuba, Chile, and Panama, are currently members of one of the six main multilateral RTAs in the region, which are MAFTA, CACM, CARICOM, CAFTA-DR, AC, and MERCOSUR. In addition, there are a number of bilateral agreements. By 2005, almost 20 more RTAs had been concluded, which might at first sight seem to increase the complexity of the network of RTAs in the region. In fact, this busy phase is likely to lead to a partial consolidation, whereby some of the above-mentioned six primary RTAs will have concluded free trade agreements either with

each other or in some cases with other individual countries. For example, the Andean Community's agreements with Argentina and Brazil are likely to have been superseded by its agreement with MERCOSUR and at least some of Chile's bilateral RTAs will have been superseded through its membership in MERCOSUR. Also all CACM members will have concluded separate agreements with Mexico to finalize the CACM-Mexico FTA. Moreover, the number of cross-regional agreements or RTAs from this region have increased significantly. An alternative scenario may occur after the establishment of the Free Trade Area of the Americas (FTAA), which would cover 34 countries. It is yet to be seen what impact such an arrangement might have on the existing six multilateral agreements in the Americas.

Therefore, the objectives of this paper are to (a) analyze the major RTAs in Western Hemisphere and their effects on Intra-regional trade flows; (b) use a gravity model to estimate the effect of various RTAs on trade flows within and across member groups; and (c) measure the effect of RTAs on members' trade with other Western Hemispheric countries.

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. The popularity of the gravity model is relatively recent. Bayoumi and Eichengreen (1995) call the gravity model "the workhorse for empirical studies of the pattern of trade". Its empirical robustness has made it the workhorse for investigations of the geographical pattern of trade. It was used during the 1960s and 1970s to estimate trade flows but was criticized because it lacked a strong theoretical foundation. Tinbergen (1962), Poyhonen (1963), and Linneman (1966) provided initial specifications and estimates of the determinants of trade flows and Aitken (1973) applied it to RTAs. After Anderson (1979) provided a rigorous economic justification, its use expanded again[1]. Due to a revival of interest among economists concerning the relationship between economics and geography, the gravity model has again become popular. Bergstrand (1985) and Deardorff (1998) have provided partial theoretical foundations for the gravity equation,

[1] Other attempts were made to provide a theoretical foundation for the gravity model but they lacked a compelling economic justification. Anderson (1979) derived a reduced-form gravity equation from a general equilibrium model incorporating the properties of expenditure systems.

although none of the models generate exactly the same equation generally used in empirical work.

Indeed, many empirical studies have found such a relationship. For example, Frankel (1997) finds in his study of bilateral trade flows among 63 countries for 1980, 1985, and 1990 that economic size (GNP) and geographic distance have positive and negative effects on bilateral trade flows, respectively. In addition to these two basic variables, Frankel (1997) adds per capita GNP and regional dummies. Per capita GNP is included to capture the factors associated with the level of economic development, thus affecting flows of intra-industry trade. One may argue that industrial countries tend to specialize in production, leading to greater dependence on foreign trade. Furthermore, the residents of high-income economies tend to desire greater variety in their consumption, leading to greater dependence on trade, particularly intra-industry trade. Regional dummies are included to test the existence of a special regional bias in some regions such as East Asia and the European Community—the precursor of the European Union. Frankel finds a positive effect of per capita GNP, as expected, and positive effects for the Western Hemisphere, the European Community, and East Asia dummies, indicating the presence of a regional bias in bilateral trade. He also finds that the regional bias in East Asia declined as the estimated coefficients on the East Asia dummy became smaller over time.

Trade statistics confirm that the magnitude of intra-trade within 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, lower interest payments on export credits, and low spoilage. Both Krugman (1991) and Summers (1991) have opined that the disproportionate intra-trade in the above-named three country groups is largely due to proximity, and that the other traits are 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 rather 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.

Using the gravity model, Solonga and Winters (2001) examined the impact of nine RTAs, namely, AC, AFTA, CACM, EU, EFTA, Gulf Co-operation Council (GCC), LAIA[2], MERCOSUR, and MAFTA. Using non-fuel import and export data for 58 countries, they compared the before-and-after scenario of these nine RTAs trade patterns. The central variables of the gravity model—the volume of GDP of countries *i* and *j*, the area of these countries, and the absolute distance between countries *i* and *j* were found to have the expected sign and were all significant at the 1% level. Trade was found to increase with the level of GDP of the importer and exporter and decrease with the size and distance. The variables reflecting population of importer and exporter were positive and almost always significant. The degree of remoteness of the importer country from its suppliers had the expected positive sign and was always significant. The estimated parameters for "common land borders" were not significant in any year of the sample, reflecting probably some collinearity with the parameter for remoteness. Their results show that for all the PTAs involving Latin American countries (CACM, LAIA, and AC) the intra-trade coefficients were positive and statistically significant for the whole sample. However, their results were far from uniformly positive and statistically significant. For NAFTA, it was positive but never significant, while for the GCC it was positive but significant for only a certain number of years. The coefficients for the intra-bloc trade were negative for the EU, EFTA and ASEAN, although they were not statistically significant.

In another study, 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 the 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 (1995) tried to test with a more thorough measure of distance that took into account land, and sea routes. The results of both studies tended to be similar. Frankel and Wei (1997) took GNP in product

[2] Former name of LAIA was LAFTA or the Latin American Free Trade Area. This is a case of dual membership. All the members of the AC group and MERCOSUR are also the members of LAIA or LAFTA.

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. They used ordinary least squares (OLS) regression, which tests the effects of each independent variable while holding constant the effects of the others. They used United Nations trade matrix and the International Monetary Fund's *Direction of Trade Statistics* data and employed a panel regression technique that allows for year-specific intercepts.

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

As regards the degree of integration within Asia, two ASEAN countries, Singapore and Hong Kong, were found to have 600% more trade than two otherwise identical economies. As Singapore is an entrepôt trade center, its imports and exports are usually more than 100% of GDP. It was possible that the apparent intra-ASEAN bias was partly or wholly a reflection of the extreme openness of Singapore. A Singapore dummy was added to examine this. The coefficient of ASEAN dummy was reduced somewhat but remained quantitatively large and statistically significant. This suggested that Singapore's extreme openness did not explain all of the apparent inward bias among the ASEAN countries. It was also found that all East and Southeast Asian countries tended to concentrate their trade with each other, and that the tendencies of the ASEAN economies were not unique in this regard. As expected, two Chinese-speaking countries appeared to trade an estimated four and half times as much as other similarly situated countries. The large magnitude of the Chinese language term raises the possibility that the influence of the Chinese Diaspora was a dominant source of East Asian intraregional trade. A

noteworthy point here is that China-Taiwan trade does not appear in the statistics because official statistics deny it. However, this trade is large, rapidly growing, and routed through Hong Kong. Thus, this trade was counted twice in their data and may have exaggerated the estimate of the influence of the Chinese variable. This double counting in trade was corrected, and the gravity estimates were re-run with trade among the so-called three Chinas. The independent Chinese language effect was no longer found to be significantly stronger than other linguistic links around the globe. The two South Asian economies in the sample, India and Pakistan, were negatively impacted by their historical animosity. Their trade was found to be 70% less than two otherwise identical countries. Overall, the assertion of Krugman (1991) and Summers (1991) is that it stands to reason that proximity promotes trade. The gravity equation estimated convincingly that distance is a very important determinant of trade. South Asia has proved to be an exception, apparently because historical enmity reduced trade between India and Pakistan.

Thus, using the 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 this picture.

METHODOLOGY AND DATA

Methodology

This study uses an augmented gravity model to analyze the trade flows in Western Hemisphere. Gravity models were introduced to economic theory in the 1960s. Linneman's (1969) 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. The gravity model has been extensively applied (see for example Frankel, Stein, and Wei (1995), McCallum (1995), Eichengreen and Irwin (1995), Deardorff (1998), Frankel and Romer (1999), Freund (2000), and Frankel and Rose (2002)) and widely accepted as the preferred systematic framework for measuring "natural" trade patterns based on economic size and geographic distance between economies. In a direct and simple application it relates volume of trade between two countries positively to their incomes and negatively to

transaction costs. Thus, economic size (GDP, population, or land area) and transaction costs (geographic distance between the two countries, and cultural dissimilarities) are treated as the two most important factors explaining bilateral trade flows in this model. It is called gravity model because it is analogous to gravitational attraction between two masses in physics (Bergstrand 1985). Lee and Roland-Holst (1998), Blavy (2001) and others specify the basic resulting equation in multiplicative form as follows.

$$T_{ij} = \beta_0 Y_i^{\beta_1} Y_j^{\beta_2} N_i^{\beta_3} N_j^{\beta_4} d_{ij}^{\beta_5} A_{ij}^{\beta_6} e^{\beta_7 D_{ij}} u_{ij} \tag{1}$$

where T_{ij} is the bilateral trade flow from country i to country j, Y_i and Y_j are the exporting and importing countries' gross domestic products, N_i and N_j are the exporting and importing countries' populations, d_{ij} is the geographical or economic distance between the two countries, D_{ij} is an array of dummy variables such as those for preferential trading arrangements, A_{ij} is an array of other factors that could either facilitate or impede trade between country i and country j, and u_{ij} is a log-normally distributed error term with $E(\log(u_{ij})) = 0$. The per capita income variable is generally included in A_{ij}.

Taking the natural logarithms of both sides yields:

$$\begin{aligned} \ln(T_{ij}) = \ln(\beta_0) + \beta_1 \ln(Y_i) + \beta_2 \ln(Y_j) + \beta_3 \ln(N_i) + \beta_4 \ln(N_j) + \beta_5 \ln(d_{ij}) \\ + \beta_6 \ln(A_{ij}) + \beta_7 D_{ij} + u_{ij} \end{aligned} \tag{2}$$

Most studies augment equation (2) with variables to account for geographic, ethno-linguistic, and economic conditions. This article follows numerous authors and specifies the following gravity equation which controls for the basic determinants of international trade:

$$\begin{aligned} \ln(T_{ij}) = \beta_0 + \beta_1 \ln(PCGDP_i) + \beta_2 \ln(PCGDP_j) + \beta_3 \ln(POP_i) + \beta_4 \ln(POP_j) + \beta_5 \ln(Dist_{ij}) \\ + \beta_6 Border + \beta_7 Language + \beta_8 Colony + \beta_9 AC + \beta_{10} CACM + \beta_{11} CAFTA + \beta_{12} LAIA \\ + \beta_{13} MERCOSUR + \beta_{14} NAFTA + u_{ij} \end{aligned} \tag{3}$$

where $PCGDP_i$ is the per capita gross domestic product of country i, $PCGDP_j$ is the per capita 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, *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, *AC, CACM, CAFTA, LAIA, MERCOSUR,* and *NAFTA* are dummy variables for membership in a preference area, and u_{ij} is a normally distributed error term.

According to Frankel (1997), per capita *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 per capita *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 eight dummy variables is positive, reflecting the idea that proximity, common language, historical links, and regional trading agreements are trade creating networks.

Data sources

This study uses annual data from 1980 to 2006. The dependent variable used in the analysis is exports from country *i* to country *j*. The data on exports and imports for the study period of 1980-2006 are from the UN Commodity Trade Statistics (UN Comtrade) database.[3] Additional data on exports and imports are from International Monetary Fund, *Direction of Trade Statistics Yearbook*. Data on population are from International Monetary Fund, *International Financial Statistics Yearbook*. Information on per capita gross domestic product is from International Monetary Fund, *World Economic Outlook Database*, April 2008.

[3] http://unstats.un.org/unsd/comtrade/default.aspx

The distance variable is obtained from the World Bank, *Trade, Production, and Protection 1976-2004* database.[4]

EMPIRICAL RESULTS

We estimated two sets of regression models, each set consisting of models estimated for five-year time periods 1980-84, 1985-89, 1990-94, 1995-99, and 2000-06 (seven-year period). First set of models were estimated using all 67 countries selected for the study. Second set of models were estimated using only countries in the Western Hemisphere. The estimated results of the models analyzing intra-trade flows are presented in Tables 3 and 4. Let us first discuss the results of the first set of regression models presented 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^2s range from a low of 0.617 to a high of 0.730. This value is acceptable for a cross-sectional study and is comparable to those obtained in other studies employing the gravity model to examine intra-regional trade flows in the Western Hemisphere.

The coefficients of the per capita income variables are positive and highly statistically significant, indicating that size of the economies play an important role in intra-trade flows. The coefficients for the exporter is greater in magnitude than that for the importer indicating that the income elasticity of intra-regional trade is more elastic with respect to the exporting country's income than it is to the importing country's income. This finding confirms the results of the study by Garman, Petersen, and Gillard (1998) in their study of Latin American trade.

The population coefficients are positive and statistically significant in all cases. This result is also similar to the results of previous studies on Western Hemisphere intra-regional trade. The distance variable also has the expected negative sign and is highly significant. All the coefficients are statistically significant at the 1% level of significance.

The Border dummy variable has the expected positive sign and is statistically significant. However, the border effect in the case of trade flows is relatively low. Generally the border effect is estimated by the border dummy coefficient in a regression equation. Since all variables in the model, except the dummy variables, are in logarithm, the border effect is calculated as the anti-log of the border dummy coefficient. In the estimated model, border dummy coefficient is 1.563 for the 1980-84 period. Therefore,

[4] http://web.worldbank.org/Home/Topics/Data and Statistics/Trade/

the border effect is [exp(1.563)=] 3.9. This value indicates that countries sharing a common border in the region, on average, tend to have about 4 times more trade compared with countries with no common borders. This result is similar to the finding of the study by Söderling (2005) on trade flows in region. However, Helliwell (1996, 1998) and McCallum (1995) estimate the border effect to be around 20 in Canada-US trade, indicating that there will be 20 times more trade among states/provinces that share a common border.

Table 3: Estimates for the augmented gravity model specification (all trading partners)

Variable	1980-1984	1985-1989	1990-1994	1995-1999	2000-2006
C	-13.048	-16.447	-15.128	-17.547	-16.94
	(-7.51)	(-9.74)	(-20.0)	(-19.14)	(-23.97)
$ln(PCGDP_i)$	1.456*	1.987*	1.839*	2.060*	2.002*
	(28.18)	(18.86)	(27.28)	(26.01)	(28.35)
$ln(PCGDP_j)$	1.044*	1.101*	1.103*	1.114*	0.970*
	(3.82)	(6.14)	(13.79)	(18.08)	(36.30)
$ln(POP_i)$	1.575*	1.400*	1.355*	1.235*	1.262*
	(23.97)	(32.94)	(68.76)	(43.94)	(38.77)
$ln(POP_j)$	0.894*	0.875*	0.901*	0.951*	0.926*
	(16.11)	(18.31)	(17.17)	(19.58)	(25.09)
$ln(Dist_{ij})$	-1.325*	-1.498*	-1.567*	-1.618*	-1.846*
	(-11.59)	(-12.18)	(-14.91)	(-13.32)	(-21.44)
Border	1.365*	1.067*	1.001*	0.961*	0.992*
	(5.25)	(3.76)	(5.08)	(4.17)	(3.39)
Colony	0.748***	0.525	-0.132	0.033	0.066
	(1.71)	(0.83)	(-0.27)	(0.06)	(0.14)
Language	0.291	0.382**	0.677*	0.761*	0.704*
	(1.43)	(2.16)	(4.15)	(6.17)	(4.41)
AC	-0.293	-1.281*	-0.344*	-0.448*	0.081
	(-1.34)	(-7.60)	(-3.08)	(-3.73)	(0.62)
CACM	2.104*	1.816*	1.787*	2.514*	2.899*
	(8.62)	(9.22)	(18.14)	(33.51)	(43.15)
CAFTA	-1.362*	-0.632***	-0.661*	-0.625*	-1.386*
	(-4.22)	(-1.87)	(-3.85)	(-3.00)	(-5.72)
LAIA	0.412	1.589*	1.058*	1.841*	1.634*
	(2.65)	(7.51)	(5.44)	(15.45)	(14.52)
MERCOSUR	0.542**	-0.477**	-0.360*	-0.816*	0.461*
	(2.50)	(-2.45)	(-2.66)	(-4.77)	(3.79)
NAFTA	0.350*	-1.347*	1.219*	0.543*	0.783**
	(3.49)	(-14.56)	(35.40)	(4.44)	(6.72)
Adjusted R^2	0.617	0.654	0.704	0.730	0.714
Observations	7,020	7,020	7,020	7,020	9,828
F-statistics	751.94	879.63	1107.05	1256.43	1165.05
Pr(F-statistics)	0.0000	0.0000	0.0000	0.0000	0.0000
Border Effect	3.9	2.9	2.7	2.6	2.7

Note: * significant at the 1 percent level; ** significant at the 5 percent level; *** significant at the 10 percent level.

Table 4: Estimates for the augmented gravity model specification (WH trading partners)

Variable	1980-1984	1985-1989	1990-1994	1995-1999	2000-2006
C	-12.962	-16.160	-14.308	-14.279	-11.466
	(-5.17)	(-6.72)	(-7.41)	(-7.76)	(-6.08)
$ln(PCGDP_i)$	1.608*	2.217*	1.988*	1.962*	1.704*
	(7.87)	(9.81)	(11.99)	(13.67)	(11.60)
$ln(PCGDP_j)$	1.403*	1.279*	1.147*	1.032*	0.988*
	(13.41)	(12.43)	(12.81)	(12.96)	(13.49)
$ln(POP_i)$	1.449*	1.219*	1.138*	1.089*	1.021*
	(18.13)	(15.04)	(16.24)	(16.95)	(15.89)
$ln(POP_j)$	0.840*	0.842*	0.931*	0.977*	0.944*
	(18.46)	(19.76)	(24.86)	(25.19)	(27.38)
$ln(Dist_{ij})$	-1.721*	-1.862*	-1.746*	-1.721*	-1.764*
	(-9.22)	(-10.65)	(-10.79)	(-11.23)	(-11.59)
Border	1.132*	0.636**	0.699*	0.619*	0.558**
	(3.50)	(2.30)	(2.95)	(2.84)	(2.47)
Language	0.264	0.303	0.489*	0.468*	0.251***
	(1.38)	(1.48)	(2.73)	(2.99)	(1.66)
AC	-0.051	-0.416	0.411	-0.093	0.078
	(-0.15)	(-1.36)	(1.40)	(-0.36)	(0.29)
CACM	1.096**	0.981***	1.209*	1.552*	2.059*
	(2.44)	(1.94)	(2.88)	(4.37)	(6.02)
CAFTA	-0.588	0.517	0.076	0.162	-1.582
	(-1.08)	(0.80)	(0.14)	(0.33)	(-1.21)
LAIA	-0.728	1.124**	0.281*	1.413*	1.748*
	(-1.48)	(2.19)	(0.62)	(3.25)	(3.94)
MERCOSUR	0.263	0.138	0.229	-0.674*	0.427**
	(0.95)	(0.50)	(0.99)	(-3.30)	(2.03)
NAFTA	0.797	1.643*	1.492*	0.801*	1.101*
	(1.36)	(2.74)	(7.26)	(3.33)	(4.37)
Adjusted R^2	0.683	0.693	0.736	0.764	0.748
Observations	3,672	3,672	3,672	3,672	5,140
F-statistics	566.15	295.58	731.81	849.07	781.15
Pr(F-statistics)	0.0000	0.0000	0.0000	0.0000	0.0000
Border Effect	5.2	3.0	2.7	2.6	2.5

Note: * significant at the 1 percent level; ** significant at the 5 percent level; *** significant at the 10 percent level.

The language dummy has the expected positive sign in all five cases, however, it is significant in only four of the five models estimated. The common language variable has less effect on trade than the amount of trade when two countries share a common border. Common language in the region tends to facilitate trade by enhancing exporters' and importers' understanding of each others' cultures, commercial and legal systems. Similarly, colonial past also tends to have mostly a positive effect on trade flows. The dummy variables for membership in a trade preference scheme give mixed results. This finding is also consistent with the finding of Garman, Petersen, and Gillard (1998) in their study of

Latin American trade. CACM and LAIA are the only trading blocks with the expected positive sign.

Let us now discuss the results of the second set of regression models presented in Table 4. When the models were estimated using only the countries in the Western Hemisphere, the overall results did not change significantly. One of the changes is the improvement of the adjusted R^2s now ranging from a low of 0.683 to a high of 0.784. Another noticeable change is that the border effects increased somewhat ranging from 2.5 to 5.2.

The coefficients of the per capita income variables are still positive and highly statistically significant, indicating that size of the economies play an important role in intra-trade flows. The coefficients for the exporter is greater in magnitude than that for the importer indicating that the income elasticity of intra-regional trade is more elastic with respect to the exporting country's income than it is to the importing country's income. The population coefficients are positive and statistically significant in all cases. The distance variable also has the expected negative sign and is highly significant. The Border dummy variable has the expected positive sign and is statistically significant. The language dummy has the expected positive sign in all five cases. The dummy variables for membership in a trade preference scheme also give mixed results.

SUMMARY AND CONCLUSIONS

This paper analyzes the intra-regional trade flows in the Western Hemisphere region using an augmented gravity model applied to panel data. The study uses annual trade data for the period 1980-2006. Employing the gravity model in the analysis of intra-regional trade in the Western Hemisphere region reveals some interesting observations concerning the Western Hemispheric trade and integration arrangements, such as the importance of language and culture as determinants of trade. The findings of this study are, for the most part, are consistent with findings of previous studies on the Western Hemisphere region 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 border effect is relatively smaller in the Western Hemisphere region, relative to the regions such as North America and Europe. For example, Helliwell (1996, 1998) and McCallum (1995) estimate the border effect to be around 20 in Canada-US trade,

indicating that there will be 20 times more trade among states/provinces that share a common border while this study finds border effects to be only about 4.

The growth of intra-Western Hemisphere trade will help countries in Western Hemisphere to form larger regional trading agreements, such as the Free Trade Area of the Americas (FTAA). The rapidly evolving economic and political climates provide many opportunities for the investigation of the success of economic integration in Western Hemisphere. At a time when information and communication technology is becoming the as important as trade routes prior to the 21st century, the volume of services trade seem to have gone up between countries that are not geographically contiguous.

Also, the FTAA is more than a region. It is a concentric circle of several sub-regional blocks with disparities in income, size and distance as wide as any other part of the world. Therefore, despite the results, expecting economic integration may be quite far fetched. The analogy that comes close is all of Asia forming into a trade block. Gravity model could explain regional backward and forward linkages, however, when thinks of FTAA, more than economics, the political implications and linkages may play a predominant role.

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APPENDIX

Table 1: Countries included in the gravity model sample

Antigua and Barbuda	France	Nicaragua
Argentina	Germany	Norway
Australia	Greece	Panama
Austria	Grenada	Paraguay
Bahamas	Guatemala	Peru
Barbados	Guyana	Portugal
Belgium	Haiti	Russia
Belize	Honduras	Saint Kitts and Nevis
Bolivia	Hong Kong	Saint Lucia
Brazil	Hungary	Saint Vincent and the Grenadines
Canada	India	Singapore
Chile	Indonesia	South Africa
China	Ireland	Spain
Colombia	Italy	Suriname
Costa Rica	Jamaica	Sweden
Denmark	Japan	Switzerland
Dominica	Korea	Thailand
Dominican Republic	Malaysia	Trinidad and Tobago
Ecuador	Mexico	United Kingdom
Egypt	Netherlands	Uruguay
El Salvador	Netherlands Antilles	United States
Finland	New Zealand	Venezuela