Economic costs and payoffs of bilateral/regional trade agreements

Thomas L. Vollrath
Economic Research Service, USDA
1800 M. Street N.W.
Washington D.C., 20036
(202) 694-5241
thomasv@ers.usda.gov

Charles B. Hallahan
Economic Research Service, USDA
1800 M. Street N.W.
Washington D.C., 20036
(202) 694-5051
hallahan@ers.usda.gov

Selected Paper prepared for presentation at the Agricultural & Applied Economics Association 2009 AAEA & ACCI Joint Annual Meeting, Milwaukee, Wisconsin, July 26-29, 2009.

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Abstract

The rapid increase in the number of bilateral and regional free-trade agreements since 1995 is a striking development. The proliferation of these agreements has raised questions among academicians and policymakers about whether they have, in fact, opened markets, created trade, promoted economic growth, and/or distorted trade. This study uses panel data from the 1975-2005 period and the gravity framework to identify the influence of bilateral/regional free-trade agreements on bilateral trade in merchandise, agriculture, and clothing sectors. A benchmark, Heckman sample-selection, and two generalized models, one of which accounts for reciprocal-free-trade-agreement phase-in effects, are used to gauge the impact on partner trade of mutual as well as asymmetric RTA membership.

Keywords: trade policy; reciprocal trade agreements; bilateral, regional, missing trade; gravity models.

I. Introduction

The rapid increase in the number of bilateral and regional free-trade agreements since 1995 is a striking development. The proliferation of these reciprocal-trade agreements (RTAs) has raised questions among academicians and policymakers about whether they have, in fact, opened markets, created trade, promoted economic growth, and/or distorted trade.[1] These questions are important, especially in the current worldwide economic downturn.

The 2008-09 economic slowdown has increased public anxiety about the virtues of globalization and integrated markets. Falling prices, destruction of economic wealth, and rising unemployment run the risk of increasing domestic protectionism. Indeed, both the World Bank and the World Trade Organization (WTO) recently identified countries adopting measures to restrict trade (Washington Post, 4/23/09). The World Bank found that 17 of the G20 members had adopted measures restricting trade within four months of having signed the Group's November-2008 communiqué pledging to avoid protectionism. In an effort to "name and shame," the WTO recently published a long list of countries that have made counterproductive changes in trade policies.

Whether "creeping protectionism" will lead to a downward spiral in trade restrictive policies is not yet known. We do know, however, that tariffs in the 1930's, sanctioned by the Smoot-

[1] Under Article 24 of GATT/WTO rules, RTAs are GATT/WTO legal, provided that they meet established criteria: 1) as long as preferences are 100 percent, 2) cover substantially all trade, 3) do not raise protection against third countries, and 4) have a definite timetable for implementation.

Hawley Act, turned the U.S. financial crisis into a global economic crisis as one country after another raised tariffs of their own. Collectively, the emergence of trade barriers caused both trade and economic activity worldwide to collapse. Most economists agree that one way for countries to extricate themselves from the current economic downturn is to keep the channels of trade open.

Trade theory does not, however, provide a definitive answer as to whether RTAs enhance economic welfare. Increases in partner trade of RTA members may be beneficial whenever production shifts towards the most efficient producers of specific goods within the trading bloc. Thus, consumers are better off in countries belonging to a bilateral/regional trade agreement because they can substitute lower-priced imported goods for higher-priced domestic goods. But while RTAs often increase trade among partner countries, they may also discriminate--favoring relatively high-cost member-country suppliers at the expense of more efficient non-member suppliers. Overall well-being depends not just upon the trade-creating effects within member blocs but also on the trade-diverting effects that may arise due to the implicit increase in trade barriers which prevents non-partner trade from taking place. According to Viner (1950), "trade creation" takes place when products from low-cost producers in member countries displace high-cost domestic production; while "trade diversion' occurs when bloc partners reorient their trade away from low-cost, nonmember countries towards higher-cost, member countries.

Clearly, many economic forces besides the establishment of bilateral/regional free-trade agreements shape the direction and volume of trade in the global market. When attempting to empirically isolate the *ex-post* impact of any single factor, it is, therefore, important to account for the other determinants affecting trade. This study uses the gravity framework to identify how RTAs shape trade because gravity models can control for the myriad of influences that underlie partner trade. Both conventional and generalized gravity equations are estimated. We use panel rather than cross-sectional data in model estimations because the latter offers a better opportunity to identify the trade impacts of RTAs over a longer period of time and incorporate both within and between effects.

Bilateral/regional trade agreements provide a way for countries to lower/remove tariffs, weaken/eliminate non-tariff barriers and/or negotiate institutional reforms among member states that promote freer trade. The primary objective of this research is to identify economic costs and payoffs of these agreements for trade in total merchandise as well as in agriculture and clothing where restrictive domestic and border policies pose significant impediments to free and open trade. In agriculture, a variety of tools, (e.g., safeguards, special and differential treatment, exemptions for sensitive products) continue to be used by many countries to curtail imports. Until recently, the clothing sector was exempt from GATT/WTO liberalization due to the import-quota system established under the Multifibre Arrangement (MacDonald and Vollrath, 2005).

The study uses panel data and four gravity models to identify the influence of bilateral/regional free-trade agreements on bilateral trade in these three sectors. All empirical models incorporate vectors of both trade-creating and trade-diverting variables.

II. Conceptual framework

According to the gravity framework, the unidirectional trade flow between two countries can be explained by supply conditions at the origin, demand conditions at the destination, and economic forces either assisting or resisting the movement of bilateral trade. The basic gravity model is often expressed as follows:

$$V_{ij} = f(Y_i, Y_{j,} D_{ij}) \qquad (1)$$

where V_{ij}, the value of trade between countries *i* and *j*, is a positive function of Y_i and Y_j, the market size of *i* and *j*, and a negative function of D_{ij}, the distance separating the two trading partners signifying transaction costs of commercial activity.

Basic gravity models, absent a clear link to economic theory, were first estimated by Tinbergen (1962) and Pöyhonen (1963). Since this pioneering research, gravity equations have frequently been used to describe and empirically explain variations in bilateral trade patterns. Problems with traditional models stem not only from the absence of a firm theoretical foundation but also due to statistical issues related to omitted variables, and dropped observations.

Contributions in the contemporary literature have enhanced respectability and sparked a revival in applied gravity research. Developments in the empirical literature have underscored the value of using panel data to mitigate bias arising from failure to fully control for country heterogeneity. This literature has also addressed many other statistical issues, such as endogeneity bias and zero trade flows, which have often led to model misspecification and incorrect interpretation of empirical results. (See, Mátyás, 1997; Egger and Pfaffermayr, 2003; Linders and de Groot, 2006; Westerlund and Wilhelmsson, 2006; Silva and Tenreyro, 2006; and Baier and Bergstrand, 2007).

Moreover, developments in the theoretical literature have provided a microeconomic foundation to the gravity framework. One of the most noteworthy contributions in this literature is the work of Anderson and van Wincoop (2003, 2004). They developed a generalized framework that establishes clear linkages between gravity-based empirical models and trade theory in which prices play a central equilibrating role.

Anderson and van Wincoop (AvW) manipulate the constant-elasticity-of-substitution (CES) expenditure system to derive an operational model based upon trade costs. Market-clearing conditions are imposed to solve for general-equilibrium prices, prices that embody bilateral resistances confronting both the exporter and the importer with all of their trading partners. In their framework, bilateral trade is expressed as follows:

$$X_{ij} = \left(\frac{Y_i Y_j}{Y_w}\right)\left(\frac{TC_{ij}}{P_i P_j}\right)^{1-\sigma}, \tag{2}$$

where

$$P_i^{1-\sigma} = \sum_j P_j^{\sigma-1} \theta_j TC_{ij}^{1-\sigma}, \forall i, \tag{3}$$

$$P_j^{1-\sigma} = \sum_i P_i^{\sigma-1} \theta_i TC_{ij}^{1-\sigma}, \forall j, \tag{4}$$

and where X_{ij} is value of exports from i to j; Y_i, Y_j, and Y_w are the outputs of country i, j, and the world (w), respectively; σ is the elasticity of substitution between the countries' goods; TC_{ij} denotes bilateral trade costs; P_i captures "outward multilateral resistances" that depict the average trade resistance between origin i and its importing partners ; P_j embodies "inward multilateral resistances" that represent destination j's average trade resistance with is supplying partners; and the θ's denote income shares.

The most important insight obtained from AvW's model is that bilateral trade depends not just on the bilateral drivers characterizing the joint partnership of i and j, but also on multilateral drivers confronting exporter i and importer j in their other markets. An inverse relationship exists between the bilateral and multilateral drivers and partner trade.

The generalized gravity equation that emerges from equations (2-4) is consistent with economic theory:

$$\ln(X_{ij}) = \ln(Y_i) + \ln(Y_j) - \ln Y_w + (1-\sigma)\left[\ln(TC_{ij}) - \ln(P_i) - \ln(P_j)\right] \qquad (5)$$

A major advantage of the gravity models based upon the AvW framework is that they mitigate omitted-variable bias. Errors-in-variable bias arises whenever multilateral resistances, embedded in the error term of conventional specifications, are correlated with right-hand-side variables contained in the estimating equations.

Fixed-effect statistical models can account for omitted variables (Feenstra, 2002). Given that the fixed-effects models are computationally easier to estimate than customized non-linear least squares (NLS) models, most applied researchers have adopted the least squares dummy variables (LSDV) approach to estimating generalized gravity equations. The prototype model of the LSDV-type is as follows: [2]

$$\ln(X_{ij}) = \gamma_i + \gamma_j + \alpha_1 \ln(Y_i) + \alpha_2 \ln(Y_j) + \sum_{m=1}^{M} \beta_m \ln(TC_{ij}^m) + \varepsilon_{ij} \qquad (6)$$

where the fixed effects (γ_i) and (γ_j) control for multilateral prices, each TC_{ijt}^m represents a proxy vector denoting bilateral trade costs and ε_{ij} refers to the disturbance term.[3]

Another significant contribution to the gravity recent literature is the work of Baier and Bergstrand (BB). BB extend the AvW framework to a panel setting by including exporter-time (γ_{it}) and importer-time (γ_{it}) dummies into a generalized model. These fixed effects account for multilateral resistances over time.

In a parsimoniously specified equation, designed to identify the accumulated RTA phase-in impacts on member countries' trade over time, BB also include bilateral pair dummies (γ_{ij}).

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[2] Note: 1) The term $-\ln(Y_w)$ is common across all countries and is, therefore, captured through a constant in the regression model. 2) The term $\ln(Y_i) - \ln(P_i)$ is constant across all exporters for a given importer. It is captured by the exporter dummy, (λi). 3) The term $\ln(Yj) - \ln(P_j)$ is constant across all importers for a given exporter. It is captured through the importer dummy, (λj).

[3] Note: The "trade costs" for exogenous factor *m* is $\rho_m = \beta_m / (1 - \sigma)$.

These partner fixed effects substitute for time-invariant dyadic effects (such as, distance, common borders, language similarity) that are commonly used in conventional gravity equations. More significantly, the pair dummies effectively account for the whole host of domestic regulations, such as antitrust rules, product standards, corporate governance, tax codes, and internal shipping regulations. This is important because some countries are motivated to join FTAs to circumvent internal regulations in importing countries.[4]

In a 2008 article, Grant and Lambert (GL1) adopted the BB framework in an examination of the issue whether RTAs increase members' trade in agriculture. Both the BB and the GL1 applied analyses quantified the impact of RTAs on trade creation. Neither study, however, addressed the issue of RTA-induced trade diversion.

III. Econometric models

The basic gravity model using panel data relates exports by country i to country j in year t to the market size of both countries in year t and economic distance or trade costs separating the two countries. We follow the literature and use GDP to quantify market size in our benchmark gravity model. The time-varying GDP of the exporting country, (Y_{it}), represents the potential supply of goods from that country. The GDP of the importing country, (Y_{jt}), reflects the potential demand of the goods being traded. Since data on trade costs are not readily available, our basic model includes the observable variables to reflect different aspects of bilateral trade costs, namely transportation costs, cultural proximity, and partner trade policies.

[4] Lawrence (1996) underscored the importance of domestic policies as well as international-border policies as factors affecting market integration between and among countries.

Two conventional and two generalized gravity models are estimated. The conventional models include a benchmark equation and Heckman's sample-selection model. The generalized models are structured to conform with AvW's gravity framework. The first generalized model includes dyadic-specific, fixed variables. The second is a dummy-intensive fixed-effects model that includes time, exporter-by-time, importer-by-time, and export-import pair fixed effects as well as RTA phase in variable. To address the issue of heterogeneity of partner trade, the RTA phase-in model was run not only on the global sample of 69 countries trading with each other but also on eight sub-samples, categorized by various combination of high- and low per-capita incomes of the exporting and importing countries.

1. The benchmark model

Our benchmark gravity equation takes the following form:

$$\ln(X_{ijt}) = \alpha_0 + \gamma_t + \alpha_1 \ln(Y_{it}) + \alpha_2 \ln(Y_{jt}) + \beta_1 \ln(D_{ij}) + \beta_2 (CB_{ij}) + \beta_4 (LL_{ij}) + \beta_5 (LS_{ij}) + \beta_6 (CH_{ij}) + \beta_7 (MA_{ijt}) + \beta_8 (AA_{ijt}) + \varepsilon_{ijt} \quad (7)$$

The indicators for transportation costs include physical distance (D_{ij}), and two dummy variables geographical adjacency (CB_{ij}) which equals 1 when i and j share a contiguous border and 0 otherwise, and landlockedness (LL_{ij}), which equals 1 when either i or j are landlocked and 0 otherwise. The measures for cultural proximity include language similarity (LS_{ij}) a dummy variable which equals 1 whenever nine percent or more of the population in both countries share a common language and 0 otherwise;[5] colonial heritage (CH_{ij}), a dummy variable which equals 1 if two countries have established colonial ties since 1945 and 0 otherwise. We include two dummy variables to represent domestic trade policies--a commonly used measure of mutual membership in RTAs (MA_{ijt}) which equals 1 in year t when two trading partners are mutual members of a bilateral/regional trade agreement and 0 otherwise; and a measure of asymmetric membership in these agreements (AA_{ijt}) which equals 1 in year t when i is not a member of an RTA to which j belongs and 0 otherwise. Time dummies (γ_t) account for factors common to all countries, including worldwide inflation, increases in trade attributable to globalization, and general shocks affecting the world economy.

Most gravity models are specified in log-linear terms because of ease of calculation and interpretation. This specification is not, however, without its problems. Taking logarithms often removes observations from the sample because the log of zero is undefined. Omitting zero-flow or missing observations implies that information is lost on the causes of no or very low trade. Moreover, the practice of dropping observations may produce downwardly biased and inconsistent parameter estimates. Finally, the dependent variable in gravity models estimated using samples where no trade is recorded for some export-to-import partners is no longer bilateral trade; rather it is bilateral trade contingent on the existence of trading relationships.

2. The Heckman model

[5] The 9 percent threshold serves to denote the level at which the ability to communicate is viewed as not imposing substantial transaction costs.

Heckman's (1979) sample-selection model offers a theoretically sound and econometrically elegant solution to include zero flows in models of bilateral trade (Linders and de Groot).[6] The sample selection gravity model allows for the correlation between 1) the joint decision whether *i* chooses to export to *j* and *j* chooses to import from *i* and 2) the amount, if any, of unidirectional trade between *i* and *j*. In other words, the Heckman model accounts for the relationship between *expected profitability* and *conditional expected trade*. A "selection equation" is used to incorporate the binary decision whether or not to trade based upon latent profitability. Then, an "outcome equation" determines the intensity of bilateral trade.

To circumvent problems associated with zero trade flows, we estimate conventional gravity equations using Heckman's sample-selection framework. We chose the maximum likelihood estimator as research has shown that MLE is preferred over the Heckman two-step estimator to jointly estimate the selection and outcome equations (Martin and Pham, 2008).

Formally, the Heckman model distinguishes between the selection and outcome processes:

$$s^*_{ij} = \boldsymbol{z}_{ij}\boldsymbol{\delta} + \boldsymbol{v}_{ij} \text{ (selection mechanism)}$$

$$y^*_{ij} = \boldsymbol{x}_{ij}\boldsymbol{\beta} + \boldsymbol{\mu}_{ij} \text{ (outcome mechanism)}$$

[6] Linders and de Groot investigated other methods for dealing with deal with zero trade flows, including various extensions of Tobit estimation, truncated regression, probit regression, and replacement of zero flows with arbitrary numbers. They found the sample-selection model econometrically preferable to these alternative approaches.

where s^* and y* are the underlying latent variables explaining bilateral trade flows, s is observed to be 1 if trade occurs and 0 otherwise; y is the log of trade when trade occurs ($s = 1$); and the **μ** and **v** vectors are assumed to be jointly normally distributed with correlation ρ.

The expected value of y, given that it is observed, is

$$E[\, y \mid \boldsymbol{s} = 1 \,] = \boldsymbol{x\beta} + \rho\lambda(\boldsymbol{z\delta})$$

where $\lambda(\boldsymbol{z\delta})$ is the Inverse Mills Ratio (IMR).[7]

The first set of covariates in the sample-selection model determine the probability whether the two countries engage in trade. The second set of covariates determines the intensity of bilateral trade, conditional on the existence of a trade relationship. MLE estimation allows for the probability of trade and the size of potential trade to be explained jointly.

Our sample-selection for bilateral trade is specified as follows:

The selection equation

$$s_{ijt}^* = \delta_0 + \delta_t + \delta_1 \ln(Y_{it}) + \delta_2 \ln(Y_{jt}) + \delta_3 \ln(D_{ij}) + \delta_4 \ln(CB_{ij}) + \delta_5 \ln(LL_{ij})$$

[7] OLS parameter estimates are likely to be downwardly biased and inconsistent should incidental truncation arise $(\rho \neq 0)$. In such situations, the OLS regression is misspecified as it excludes the Inverse Mills Ratio as an independent variable. As a result OLS coefficients are attenuated, i.e., biased towards zero and the error variance (σ_u^2) is underestimated.

$$+\delta_6 \ln(LS_{ij}) + \delta_7 (CH_{ij}) + \delta_8 (MA_{ijt}) + \upsilon_{ijt} \qquad (8)$$

where

$s_{ijt} = 1$ if $s^*_{ijt} > 0$

$s_{ijt} = 0$ if $s^*_{ijt} \leq 0$

The outcome equation[8]

$$\ln(X^*_{ijt}) = \beta_0 + \beta_t + \beta_1 \ln(Y_{it}) + \beta_2 \ln(Y_{jt}) + \beta_3 \ln(D_{ij}) + \beta_4 \ln(CB_{ij}) + \beta_5 \ln(LL_{ij})$$

$$+\beta_6 (CH_{ij}) + \beta_7 (MA_{ijt}) + \beta_8 (AA_{ijt}) + \mu_{ijt} \qquad (9)$$

where

$\ln(X^*_{ijt}) = \ln(X_{ijt})$ if $s_{ijt} = 1$

$\ln(X^*_{ijt}) =$ not observed if $s_{ijt} = 0$

(μ_{ijt}, ν_{ijt}) – bivariate normal $\left[0,0,1,\sigma^2_\upsilon, \rho_{\nu\mu}\right]$

3. Generalized-gravity specifications

Many econometricians agree that correctly specified gravity equations must be rich in fixed effects. Mátyás (1997) contends that gravity models that test the significance of trading blocs are misspecified unless they are specified as a triple-index model that account for exporter, importer, and time fixed effects. Egger and Pfaffermayr (2003) maintain that proper specification of the gravity equation includes, in addition to Mátyás' three indexes, bilateral fixed effects. Baier and Bergstrand (2007) present a case for using country-by-time and country-pair fixed effects in a theoretically-motivated gravity equation.

[8] We exclude language similarity in the outcome equation, but include it in the selection equation to circumvent a possible identification problem.

The first generalized gravity model we estimate focuses on the impact of various dyadic-specific, fixed variables and incorporates the Mátyás framework in a panel setting as follows:

$$\ln(X_{ijt}) = \alpha_0 + \gamma_{it} + \gamma_{jt} + \beta_1 \ln(D_{ij}) + \beta_2 \ln(CB_{ij}) + \beta_4 \ln(LL_{ij}) + \beta_5 \ln(LS_{ij}) + \beta_6 (CH_{ij}) + \beta_7 (MA_{ijt}) + \beta_8 (AA_{ijt}) + \varepsilon_{ijt} \quad (10)$$

The inclusion of exporter-by-time and importer-by-time fixed effects capture time-varying AvW's multilateral price resistances terms. They also sweep away country-specific time-varying variables such as shifts in domestic policies and macroeconomic shocks.

The second generalized gravity model we estimate is a dummy-intensive, fixed effect model that addresses issues of potential endogeneity in ways similar to Baier and Bergstrand's framework.[9] One source of endogeneity bias that BB identify is measurement error that arises due to the limited ability of the 0-1 RTA dummy variable to account for the phase-in effects as these free trade agreements typically take time to mature. BB contend that most RTAs contain transitional periods of trade liberalization that cannot be captured with binary variables using the date the agreement entered into force. The inclusion of lagged RTA dummies addresses this problem.

BB mitigate a second source of endogeneity bias, namely the omission of "behind-the-border" determinants of trade, by including bilateral pair dummies (γ_{ij}) in their model. The use of country-pair fixed effects provide a means to more thoroughly control for unobservable

[9] Endogeneity bias occurs whenever any right-hand-side variable is correlated with the error term, resulting in OLS possibly yielding biased and inconsistent coefficient estimates.

heterogeneity among country pairs that is constant over time than using distance, contiguity, and other dyadic-specific variables.

Our second gravity model differs from BB's model in that generic time fixed effects as well as contemporaneous and lagged dummy variables that reflect asymmetric-RTA membership are added as explanatory variables:

$$\ln(X_{ijt}) = \alpha_0 + \gamma_{ij} + \gamma_{it} + \gamma_{jt} + \phi_1(MA_{ij,t}) + \phi_2(MA_{ij,t-5}) + \phi_3(MA_{ij,t-10})$$
$$+ \varphi_1(AA_{ij,t}) + \varphi_2(AA_{ij,t-5}) + \varphi_3(AA_{ij,t-10}) + \varepsilon_{ijt} \quad (11)$$

IV. Data

The panel dataset we developed includes bilateral trade flows among 69 countries at five-year intervals beginning in 1975 and ending in 2005.[10] Most, but not all, countries export (import) to every other country. However, eight percent of the cells in our merchandise export-import matrix are missing while 20 and 27 percent of the cells are missing in the agricultural and clothing trade matrices, respectively.[11]

[10] The 69 countries include Algeria, Argentina, Australia, Austria, Bangladesh, Belgium-Luxembourg, Brazil, Cameroon, Canada, Chile, China (mainland), Colombia, Costa Rica, Denmark, Dominican Republic, Egypt, El Salvador, Finland, France, Germany, Ghana, Greece, Guatemala, Honduras, Hong Kong, India, Indonesia, Ireland, Israel, Italy, Ivory Coast, Jamaica, Japan, Jordan, Kenya, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Pakistan, Panama, Paraguay Philippines, Poland, Portugal, Saudi Arabia, Senegal, Singapore, South African Customs Union (Botswana, Lesotho, Namibia, South Africa, and Swaziland), South Korea, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Trinidad-Tobago, Tunisia, Turkey, United Kingdom, United States, Uruguay, Venezuela, and Zambia.

[11] We assume that empty cells are due to no trade actually having taken place.

Bilateral trade data were obtained from the United Nations Commodity Trade Statistics (UN Statistical Office, 2008) database, *UN Comtrade*, the primary international data source for partner- and product-specific trade that includes most countries and products. WTO's definition of total agriculture is used to quantify total agricultural trade. This definition includes all products in harmonized-system (HS) chapters 1-24, except fish and fish products, as well as hides and skins, raw furskins, and fiber wastes.

Distance between capital cities and/or the major commercial center closest to partner countries were calculated using the great circle method obtained from the Agricultural Research Service of USDA. Information about the existence of bilateral and regional free trade agreements were obtained from Oh (2006), see Table 2. Data about colonial heritage and language similarity were obtained from Andrew Rose's (2006) website.

V. Results

Econometric results for the four gravity models are displayed in tables 1-5. Table 1 contains the empirical results for the benchmark and Heckman models. Table 2 shows the results for our first generalized-gravity model, the one with dyadic-specific variables and fixed effects for time and country-by-time. Tables 3-5 exhibit statistics from our dummy-intensive, fixed-effects generalized-gravity model containing both contemporaneous and lagged mutual/asymmetric RTA dummy variables.

The sample-selection models reveal that incidental truncation, given the statistical significance of ρ , characterizes total merchandise and agricultural trade. The null hypothesis that $\rho = 0$ cannot, however, be rejected for clothing trade. These results indicate that estimation of the benchmark models for merchandise and agricultural trade likely produces inconsistent estimates. Unfortunately, it was not possible to draw inferences about possible bias associated with missing observations and zero trade in the generalized gravity equations. When attempting to apply the Heckman framework to these models, the Hessian became unstable precluding convergence.

1. Findings from benchmark, Heckman, and first generalized gravity models

1a. Discussion of the non-policy variables

Coefficients for the independent variables in the benchmark models for merchandise, agricultural and clothing are similar to corresponding parameter estimates in the sample-selection models despite findings of correlation between the output and selection equations. However, the size of the parameter estimates for the dyadic variables are somewhat larger in the sample-selection models. This is to be expected, given that omitting observations from econometric models in the log-linear gravity equations, typically exerts a downward bias on the generated coefficients.

The income elasticities in all the benchmark and sample-selection models are positive and significantly different from zero at the 0.01 level (table 1). The magnitude of these estimates range from 0.72 to 1.21 which fall within commonly found levels. The income elasticities are smaller for agriculture than they are for merchandise. This finding is not unexpected given that raw agricultural are necessities. Consumers typically choose to trade higher valued industrial goods when national income rises.

Distance elasticities with respect to trade are negative and statistically significant at the 0.01 level (table 1 and 2). The distance parameters for trade in agriculture are always smaller than corresponding coefficients for either total merchandise or clothing trade. This suggests that trade of agricultural products is relatively less constrained by physical distance separating exporters and importers than is trade of non-agricultural products.

Parameter estimates for common borders are positively related to the size of trade and statistically significant in 6 of 9 cases in tables 1 and 2.[12] The coefficients on common borders for trade in agriculture are invariably larger than for either total merchandise or clothing trade in table 1. Evidently, sharing a physical boundary is relatively more advantageous to cross-border trade in agriculture. Perishable produce and frequency of cross-border trade in animals may explain this phenomenon.

However, physical adjacency was found not to bear upon the decision to trade in the selection equations for either agriculture or clothing. These results may be due to the importance of factor endowments motivating trade in both of these subsectors. Elsewhere, the exporter land-to-labor ratio relative to the importer land-to-labor ratio was found to be positively related to bilateral

[12] Curiously, sharing a common border is negatively related to the decision to trade for total merchandise in the generalized gravity model (table 2).

export-to-import trade flows in agriculture and negatively related to corresponding trade flows in clothing. See, (Vollrath, *el al.,* 2009).

Empirical results from the benchmark and Heckman models indicate that landlockedness lowers trade in agriculture and clothing, but not in the case of total merchandise. Given the parameter estimates in table 1, the cost to agricultural trade of a country being landlocked appears particularly high. By contrast, the results from the generalized model, which controls for country-time varying effects, indicate that landlockedness does not pose a barrier to trade anywhere, including in agriculture or clothing.

Language similarity and colonial heritage, have the expected positive sign and are significant at the one percent level in both conventional-gravity models as well as in the generalized gravity model. These results suggest that cultural distances matter. The ability of a significant proportion of the population in both countries to communicate in the same language and/or possession of a common colonial heritage evidently convey trade advantages among nations.

1b. <u>Discussion of the policy variables</u>

The empirical results from the conventional gravity models in table 1 do not provide any evidence of trade creation, ascertained via a positive and statistically significant MA coefficient, for either total merchandise or clothing. However, this is not the case for agriculture where the MA coefficients (signifying mutual RTA membership) are virtually identical in magnitude in both the benchmark and Heckman models. Applying an elasticity of substitution of 5 to a simple average of the MA coefficients in the OLS and the MLE output equations generates an implied tariff equivalent of 117 percent for the pre-RTA border cost for agricultural goods. This statistic is very close to previous research showing a 127 percent pre-RTA tariff equivalent for total agriculture (Grant and Lambert, 2001).

The conventional gravity model results in table 1 show no evidence of trade diversion, defined by a negative and statistically significant AA coefficient. The AA coefficients (denoting asymmetrical-RTA membership) are positive for merchandise and agriculture, but negative for clothing. But since none of these parameter estimates are statistically significant, these findings suggest that RTA-member imports from extra-bloc supplying countries were not lower than they would have been if both the exporting and the importing countries either belonged to or did not belong to the same RTA.

The generalized model does not detect trade diversion in any of the three sectors, just as was the case with the two conventional models (table 2). Moreover, the results from equation 10 do not provide evidence of trade creation in total merchandise. However, the findings in table 2 point to trade creation in clothing, but not in agriculture. The MA parameter for clothing indicates that clothing imports from fellow bloc suppliers increased 63 percent [exp(.49) – 1 = .63]. Corresponding parameter estimates for agriculture in table 1 depict a 124 to 127 percent increase in trade between partners belonging to the same RTA.

2. Findings from the RTA phase-in models

Tables 3-5 show the parameter estimates from running the dummy-intensive, fixed-effects gravity model for total merchandise and the agriculture and clothing, respectively. To account for the cumulative impact of RTAs on partner trade, we added the corresponding individual MA and AA coefficients over time. When the accumulated MA and AA coefficients were determined to be significantly different than zero using Wald test statistics, the percentage change in trade creation and trade diversion were calculated. These calculations are labeled as "total TC effect" and "total TD effect" in tables 3-5.

To examine whether RTAs may have had an impact on various partner combinations, we divided our global sample of observed trade flows into high-income (HIC), low-income (LIC), and all (ALL) exporter/importer groupings. We then ran our dummy-intensive gravity model on the following eight sub-samples: ALL imports from ALL, HIC imports from ALL, ALL imports from HIC, HIC imports from HIC, LIC imports from HIC, LIC imports from ALL, ALL imports from LIC, LIC imports from LIC, and HIC imports from LIC.

2a. Total merchandise trade

The accumulated MA and AA coefficients, in our global sample of 21,852 observed trade flows for merchandise trade (table 3, column 1) are not statistically different than zero based upon F-tests results. These findings, similar to what was found in the benchmark and Heckman models, are not altogether surprising given that tariffs on manufactured goods, goods that make up the highest percentage of items in total merchandise trade, were substantially reduced after World War II via multilateral trade negotiations in the GATT/WTO (Gibson, *et al*, 2001).

The absence of trade creation, detected for the global sample, applies elsewhere. Note, that the hypothesis that $\sum_t MA_{ij} = 0$ could not be rejected in any of the eight sub-samples. There is, however, some evidence of trade diversion. The hypothesis that $\sum_t AA_{ij} = 0$ was rejected in the case of HICs trading with each other (column 4). Model results show that trade declines at a 4 percent annual compound rate for HIC exporting to HICs that do not belong to RTAs to which the importers belong.

2b. Agricultural trade

An important empirical result from our global sample for agriculture shows that the impact of mutual membership in RTAs increased, on average, bilateral trade 2.7 fold over a 10-year period, beyond what would have occurred in the absence of these agreements (table 4, column 1). This development occurred in the sample of 19,225 observations without statistical evidence of trade being diverted.

Inspection of the empirical results from the various sub-samples reveals that much of the agricultural trade creation identified in the global sample stemmed from RTA-member exports to RTA partners in the low income countries. Trade liberalization induced by mutual membership in RTAs increased exports to LIC partners 6.5 fold, on average, over 10 years beyond what would have occurred in the absence of these agreements (column 6). The payoff to LIC exporters belonging to the same RTA as their LIC partner was particularly pronounced, increasing 10.5 fold (column 8). In addition, exports from HIC suppliers to their RTA partners in the low income countries was more pronounced, increasing 2.4 fold (column 5), than to their typical RTA partner, which increased, on average, 1.4 fold (column 3).

The increase in RTA-member exports to LIC partners did not come at the expense of trade having been diverted from non-member suppliers. In fact, the empirical results show that countries belonging to RTAs but not having an agreement with LIC importers also increased their exports to these markets, although at a lower level (column 6). This finding suggests that RTAs may serve as a catalyst to more open agricultural markets in the developing world.

2c. Clothing trade

The generalized model with RTA phase-in effects does not reject the F-test hypothesis of no trade creation for clothing in either the global or any of the sub-samples (table 5, columns 1-9). These results are not surprising given that quotas, sanctioned by the Multifiber Arrangement, was the dominate trade policy instrument affecting clothing trade until it was replaced by the Agreement on Textiles and Clothing in 2005.

The model does provide evidence, however, that RTAs adversely affect trade in some clothing markets. Asymmetric RTA membership resulted in bilateral trade falling 6.5 percent per year for HICs exporting clothing to importers belonging to RTAs to which the supplying countries were not affiliated (column 3). This trade loss can be attributable to HICs belonging to RTAs importing less clothing from HIC exporters with whom they did not share a common RTA membership (see, column 4), but to non-member-LIC exporters of clothing (see, columns 8).

V. Summary

Econometric models designed to determine whether partner trade expands as a result of reciprocal trade agreements often include a summary, non-specific RTA index variable that identifies whether two countries are members of the same agreement. When assessing the economic impacts of regional/bilateral trade agreements it is also important to identify the impact on partner trade of asymmetric RTA membership. For this reason we innovate by including a generic dummy variable in all models that recognizes whether or not the exporting country is a member of RTA to which the importing country belongs.

The study uses panel data and the gravity framework to gauge the influence of bilateral/regional free-trade agreements on partner trade in merchandise, agriculture, and clothing sectors. Two conventional and two generalized gravity models were estimated. The benchmark gravity equation generated statistical regularities that conform with established stylized facts. The sample-selection model provided a way to account for zero trade flows. The generalized model that includes selected dyadic-specific variables and country-by-time fixed effects allowed for time-varying multilateral prices. The dummy-intensive generalized gravity that includes exporter-by-time, importer-by-time, and export-import-pair fixed effects incorporated RTA phase-in effects. To address the issue of heterogeneity of partner trade, the RTA phase-in model was run not only on the global sample of 69 countries trading with each other but also on eight sub-samples, categorized by various combination of high- and low per-capita incomes of the exporting and importing countries.

Model results provide strong empirical evidence that RTAs create trade in agriculture countries belonging to a common reciprocal agreement without diverting trade from non-member suppliers. The empirical finding of RTA-induced trade creation that characterizes the agricultural sector in the benchmark, Heckman, and phase-in models could not be generalized. These models did not detect evidence supporting the view that trade expanded in either the merchandise or clothing sector between countries sharing a common RTA membership.[13]

Sub-sample estimations using the generalized gravity model with RTA phase-in effects identified particularly large expansion in agricultural trade when countries export goods to LICs that belong to RTAs. The increase in LIC agricultural imports from LIC suppliers, when both the exporter and the importer were members of the same RTA, was particularly impressive, rising almost 10.5-fold over 10 years beyond what would have occurred in the absence of mutual agreements.

The empirical results show that RTAs may serve as a catalyst to more open agricultural markets in the developing world. Agricultural exporters that expanded trade with importers in LICs that were members of a bilateral/regional trade agreement included not only exporters sharing a

[13] However, the null hypothesis of no increase in intra-bloc trade was rejected for clothing but not rejected for agriculture in the generalized gravity model with dyadic-specific variables.

common RTA membership with their LIC trading partner but also HIC exporters not sharing a mutual RTA membership with their LIC partner.[14]

No evidence of trade diversion was discerned for merchandise, agriculture, or clothing in the benchmark, Heckman, or either of the generalized models that included all country pairs in our data sample. The null hypothesis of no trade diversion could not, however, be rejected in all sub-samples. HICs exporting goods from in all three sectors to HIC importers belonging to RTAs to which the supplying countries were not affiliated were adversely affected by asymmetric RTA membership (see column 4 in tables 3-5).

[14] The only group of agricultural suppliers identified as not benefiting from exporting to LIC importers that belong to RTAs were LIC exporters not sharing a common RTA membership with their LIC trading partner.

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Table 1: Benchmark and sample-selection gravity equations

Variables	Symbols	Merchandise Benchmark (*OLS*)	Merchandise Heckman (*MLE*) Outcome	Merchandise Heckman (*MLE*) Selection	Agriculture Benchmark (OLS)	Agriculture Heckman (*MLE*) Outcome	Agriculture Heckman (*MLE*) Selection	Clothing Benchmark (OLS)	Clothing Heckman (*MLE*) Outcome	Clothing Heckman (*MLE*) Selection
Exporter's income	Y_i	1.12***	1.10***	0.39***	0.72***	0.72***	0.42***	1.07***	1.06***	0.54***
		(181.49)	(181.40)	(42.28)	(85.11)	(83.71)	(66.08)	(127.71)	(111.03)	(81.46)
Importer's income	Y_j	0.94***	0.93***	0.32***	0.79***	0.79***	0.31***	0.78***	0.77***	0.30***
		(156.46)	(155.28)	(37.97)	(93.62)	(93.36)	(49.89)	(85.83)	(83.71)	(49.67)
Distance	DT_{ij}	-1.05***	-1.08***	-0.26***	-0.79***	-0.85***	-0.38***	-1.03***	-1.08***	-0.44***
		(-66.54)	(-67.61)	(-11.92)	(-39.31)	(-41.98)	(-23.51)	(-46.91)	(-48.54)	(-27.48)
Common Border	CB_{ij}	0.10	0.25***	-0.33**	0.57***	0.76***	-0.08	0.32***	0.51***	0.02
		(1.48)	(3.79)	(-2.30)	(6.97)	(9.32)	(-0.66)	(3.78)	(6.19)	(0.18)
Landlockedness	LL_{ij}	-0.04	-0.04	0.05*	-0.41***	-0.42***	0.05***	-0.10**	-0.12***	0.13***
		(-1.20)	(-1.24)	(1.65)	(-9.35)	(-9.71)	(2.09)	(-2.44)	(-2.72)	(5.39)
Language similarity	LS_{ij}	0.47***		0.20***	0.63***		0.13***	0.62***		0.20***
		(16.04)		(6.12)	(16.73)		(5.18)	(15.89)		(7.75)
Colonial heritage	CH_{ij}	1.07***	1.34***	7.68***	1.42***	1.79***	5.91***	1.15***	1.50***	1.72***
		(18.27)	(23.39)	(117.65)	(15.16)	(19.22)	(98.42)	(9.56)	(13.02)	(4.74)
Mutual RTA membership	MAij	0.12	0.11	0.46***	0.82***	0.80***	0.52***	0.12	0.10	0.21
		(0.81)	(-0.72)	(2.96)	(3.42)	(3.30)	(5.13)	(0.55)	(0.48)	(2.52)
Asymmetrical RTA membership	AAij	0.08	0.10		0.18	0.21		-0.33	-0.30	
		(.055)	(0.67)		(0.74)	(0.86)		(-1.55)	(-1.39)	
Constant	C	18.37***	18.87***	1.77***	15.53***	18.87***	2.10***	15.71***	16.28***	1.90***
		(94.68)	(95.30)	(9.19)	(53.66)	(55.00)	(14.29)	(55.98)	(57.34)	(13.16)
Adjusted R^2		0.68			0.43			0.51		
F-statistic		4,676***			1,781***			2,238***		
Root MSE		1.89			2.37			2.36		
No. of obs.		29,954	32,572		25,931	32,572		23,810	32,572	
Censored obs.			2,618			6,641			8,762	
Log likelihood			-68,438			-71101			-66,569	
Wald-statistic			73,431			28,742			26,226	
rho	ρ_{μ}		-0.07**			-0.07**			0.03	
sigma	σ_{ε}		1.90**			2.38**			2.37**	
lambda	λ		-0.13**			0.16**			0.07	

Notes: Dependent variable: log of exports from I to j. Robust t-statistics in parentheses. Coefficient estimates for the fixed time effects are not reported for brevity. The * denotes the null hypothesis is rejected at the 0.10 significance level,**at the 0.5 level, and ***at the 0.01 level. Inverse Mills ratio computed at the mean value of the regressor variables.

Table 2: Generalized gravity equations with dyadic-specific variables

Variables	Symbols	Merchandise	Agriculture	Clothing
Distance	DT_{ij}	-1.25*** (-74.14)	-1.09*** (-55.23)	-1.37*** (-69.01)
Common Border	CB_{ij}	-0.27*** (-3.99)	0.13 (1.66)	-0.08 (-1.02)
Landlockedness	LL_{ij}	-0.18 (-1.16)	0.05 (0.25)	0.14 (0.07)
Language similarity	LS_{ij}	0.59*** (18.50)	0.67*** (18.23)	0.72*** (20.60)
Colonial heritage	CH_{ij}	1.04*** (15.25)	1.29*** (17.25)	1.24*** (15.91)
Mutual RTA membership	MA_{ij}	-0.13*** (-1.17)	0.05 (0.31)	0.49*** (3.20)
Asymmetrical RTA membership	AA_{ij}	0.12 (1.02)	0.16 (0.10)	0.16 (1.05)
Adjusted R^2		0.77	0.69	0.77
F-statistic		122.77**	75.26**	95.29**
Root MSE		1.61	1.76	1.61
No. Obs.		30,187	26,114	23,975

Notes: The dependent variable is the natural log of uni-directional trade flows from i to j in year t. Coefficient estimates for time and country-by-time dummies are not reported for brevity. Parentheses denote t-statistics based upon White's standard errors which are consistent and robust to heteroskedasticity. The * denotes statistics hypothesis is rejected at the 0.10 signficance level, ** at the 0.5 level, and *** at the 0.01 level.

Table 3. Merchandise trade creation and trade diversion effects derived from generalized gravity equations controlling for RTA phase-in impacts

	1 ALL imports from ALL	2 HIC imports from ALL	3 ALL imports from HIC	4 HIC imports from HIC	5 LIC imports from HIC	6 LIC imports from ALL	7 ALL imports from LIC	8 LIC imports from LIC	9 HIC imports from LIC
MAijt	-0.16	-0.26	-0.10	-0.12	-0.19	-0.11	-0.39	-0.27	-0.44
	(-1.25)	(-1.33)	(-0.77)	(-0.91)	(-0.87)	(-0.70)	(-1.34)	(-0.85)	(-1.22)
MAijt-5	0.12	-0.03	0.01	-0.16	0.03	0.21	0.22	0.23	-0.22
	(0.95)	(-0.18)	(0.12)	(-1.51)	(0.10)	(0.81)	(0.60)	(0.49)	(-0.38)
MAijt-10	0.21	0.34	0.13	-0.13	0.32	-0.44	-0.17	-1.10	0.93*
	(1.16)	(1.40)	(1.29)	(-1.16)	(1.32)	(-1.10)	(-0.41)	(-1.67)	(1.64)
AAijt	-0.19	-0.31	-0.20	-0.27**	-0.22	-0.15	-0.21	-0.23	-0.26
	(-1.48)	(-1.50)	(-1.56)	(-2.01)	(-1.01)	(-0.92)	(-0.73)	(-0.70)	(-0.70)
AAijt-5	-0.02	-0.13	-0.09	-0.28**	0.08	0.17	0.32	0.20	0.01
	(-0.13)	(-0.83)	(-0.94)	(-2.39)	(0.32)	(0.64)	(0.86)	(0.41)	(0.01)
AAijt-10	0.17	0.29	0.19*	-0.11	0.49***	-0.26	0.04	-0.88	1.34***
	(0.93)	(1.14)	(1.79)	(-0.88)	(2.58)	(-0.67)	(0.09)	(-1.38)	(2.69)
MAijt sum	0.18	0.06	0.05	-0.41	0.16	-0.34	-0.34	-1.13	0.27
	(0.72)	(0.15)	(0.25)	(-1.53)	(0.53)	(-0.80)	(-0.66)	(-1.39)	(0.73)
Total TC effect									
AAijt sum	-0.04	-0.14	-0.10	-0.66**	0.35	-0.24	0.14	-0.91	1.09
	(-0.15)	(-0.37)	(-0.50)	(-2.37)	(1.30)	(-0.57)	(0.28)	(-1.12)	(1.50)
Total TD effect				-0.48					
Adjusted R^2	0.91	0.93	0.96	0.97	0.93	0.88	0.87	0.83	0.90
F-statistic	38.45**	45.89**	53.50**	100.35**	34.24**	26.48**	23.97**	17.92**	27.79**
Root MSE	1.01	0.76	0.55	0.32	0.63	1.12	1.21	1.37	0.90
No. obs.	21,852	8,433	8,471	2,998	5,473	13,419	13,381	7,946	5,435

Notes: The dependent variable is the natural log of clothing bilateral trade (lnXijt) from country i to country j in year t. All regressions are estimated using a five-year panel from 1975-2005 and include exporter-by-time, importer-by-time, and exporter-to-importer bilateral fixed effects omitted in table for brevity.
The "total TC effect" measures the percentage change in bilateral trade attributable to mutual membership in an RTA. It is calculated when the MAijt sum is significantly different than zero. The "total TD effect" measures the percentage change in bilateral trade attributable to j not belonging to any RTA to which i is a member.
It is calculated when the AAijt sum is significantly different from zero. Standard errors are calculated using White's heteroskedastic robust standard errors. Asymptotic F- and t-statistics are in parentheses. The * denotes the null hypothesis is rejected at the 0.10 significance level, ** at the 0.5 , and *** at the 0.1 level.

Table 4. Agricultural trade creation and trade diversion effects derived from generalized gravity equations controlling for RTA phase-in impacts

	1 ALL imports from ALL	2 HIC imports from ALL	3 ALL imports from HIC	4 HIC imports from HIC	5 LIC imports from HIC	6 LIC imports from ALL	7 ALL imports from LIC	8 LIC imports from LIC	9 HIC imports from LIC
MAijt	0.39***	0.22	0.27	0.13	0.37	0.55**	0.60**	0.90*	0.42
	(2.85)	(1.42)	(1.57)	(0.76)	(1.24)	(2.34)	(2.44)	(1.66)	(1.48)
MAijt-5	0.28	0.16	0.02	0.04	-0.72	0.20	0.24	0.31	0.16
	(1.29)	(1.07)	(0.12)	(0.23)	(-1.57)	(0.42)	(0.48)	(0.39)	(0.39)
MAijt-10	0.63**	0.01	0.58*	-0.10	1.57***	1.27***	0.24	1.24**	0.93*
	(2.14)	(0.04)	(1.71)	(-0.42)	(2.70)	(2.55)	(0.50)	(1.97)	(-1.12)
AAijt	0.23	0.17	0.28	-0.27**	0.49	0.29	0.28	0.28	0.41
	(1.61)	(1.06)	(1.55)	(-0.20)	(1.57)	(1.19)	(1.12)	(0.51)	(1.50)
AAijt-5	0.03	-0.08	-0.23	-0.28*	-0.78*	0.00	0.17	0.32	0.24
	(0.12)	(-0.50)	(-1.36)	(-1.86)	(-1.73)	(0.01)	(0.35)	(0.39)	(0.62)
AAijt-10	0.34	-0.13	0.19*	-0.13	0.49***	1.13**	0.02	0.97*	1.34***
	(1.16)	(-0.52)	(1.46)	(-0.55)	(3.30)	(2.38)	(0.05)	(1.64)	(-1.15)
MAijt sum	1.30***	0.39	0.87**	0.07	1.22*	2.02***	1.08	2.45**	-0.25
	(3.19)	(1.11)	(2.03)	(0.18)	(1.89)	(3.01)	(1.59)	(2.21)	(-0.35)
Total TC effect			1.39		2.39	6.54		10.59	
AAijt sum	0.60	-0.04	0.56	-0.66*	1.46**	1.42**	0.47	1.57	-0.11
	(1.46)	(-0.13)	(1.28)	(-1.20)	(2.35)	(2.16)	(0.71)	(1.41)	(-0.17)
Total TD effect				-0.38	3.31	3.16			
Adjusted R^2	0.86	0.90	0.90	0.94	0.85	0.81	0.82	0.76	0.86
F-statistic	14.43**	16.43**	19.43**	19.12**	10.97**	9.39**	7.64**	5.92**	7.31**
Root MSE	1.18	0.94	0.91	0.91	1.05	1.32	1.35	1.53	1.10
No. obs.	19,225	8,076	8,263	2,994	5,269	11,149	10,962	5,880	5,082

Notes: The dependent variable is the natural log of clothing bilateral trade (lnXijt) from country i to country j in year t. All regressions are estimated using a five-year panel from 1975-2005 and include exporter-by-time, importer-by-time, and exporter-to-importer bilateral fixed effects omitted in table for brevity. The "total TC effect" measures the percentage change in bilateral trade attributable to mutual membership in an RTA. It is calculated when the MAijt sum is significantly different than zero. The "total TD effect" measures the percentage change in bilateral trade attributable to j not belonging to any RTA to which i is a member. It is calculated when the AAijt sum is significantly different from zero. Standard errors are calculated using White's heteroskedastic robust standard errors. Asymptotic F- and t-statistics are in parentheses. The * denotes the null hypothesis is rejected at the 0.10 significance level, ** at the 0.5 , and *** at the 0.1 level.

Table 5. Clothing trade creation and trade diversion effects derived from generalized gravity equations controlling for RTA phase-in impacts

	1	2	3	4	5	6	7	8	9
	ALL imports from ALL	HIC imports from ALL	ALL imports from HIC	HIC imports from HIC	LIC imports from HIC	LIC imports from ALL	ALL imports from LIC	LIC imports from LIC	HIC imports from LIC
MAijt	0.02	0.02	-0.08	-0.06	-0.16	0.01	0.04	0.49	-0.09
	(0.14)	(0.08)	(-0.53)	(-0.36)	(-0.61)	(0.05)	(0.14)	(0.91)	(-0.23)
MAijt-5	-0.23	-0.24	-0.35**	-0.32**	-0.64	-0.08	-0.24	0.12	-0.62
	(-1.38)	(-1.54)	(-2.04)	(-1.98)	(-1.07)	(-0.21)	(-0.60)	(0.19)	(-1.11)
MAijt-10	0.34	0.29	-0.02	-0.07	0.33	0.25	0.36	0.04	0.93*
	(-1.49)	(0.78)	(-0.12)	(-0.40)	(0.62)	(0.57)	(0.72)	(0.06)	(1.30)
AAijt	0.19	0.03	-0.08	-0.27**	0.10	0.46*	0.42	1.02*	0.17
	(1.18)	(0.14)	(-0.46)	(-0.69)	(0.37)	(1.71)	(1.27)	(1.89)	(0.40)
AAijt-5	-0.32*	-0.30*	-0.57***	-0.28***	-0.69	-0.13	-0.09	0.18	-0.46
	(-1.82)	(-1.72)	(-3.04)	(-3.09)	(-1.20)	(-0.32)	(-0.21)	(0.29)	(-0.83)
AAijt-10	0.12	0.10	0.19*	-0.05	0.49***	0.05	0.00	-0.12	1.34***
	(0.54)	(0.25)	(-0.12)	(-0.27)	(0.56)	(0.12)	(0.00)	(-0.18)	(0.30)
MAijt sum	0.13	0.06	-0.45	-0.45	-0.47	0.18	0.16	0.65	0.75
	(0.38)	(0.12)	(-1.41)	(-1.23)	(-0.64)	(0.30)	(0.25)	(0.65)	(0.75)
Total TC effect									
AAijt sum	-0.01	-0.17	-0.67**	-0.66***	-0.36	0.38	0.34	1.09	0.04
	(-0.01)	(-0.34)	(-2.01)	(-1.98)	(-0.53)	(0.65)	(0.53)	(1.10)	(0.05)
Total TD effect			-0.49	-0.53					
Adjusted R^2	0.89	0.93	0.92	0.95	0.86	0.85	0.87	0.83	0.90
F-statistic	19.38**	21.85**	15.06**	24.35**	9.82**		14.95**		16.89**
Root MSE	1.13	0.96	0.90	0.54	1.05	1.21	1.28	1.34	1.15
No. obs.	18,050	7,570	8,041	2,989	5,052	10,480	10,009	5,428	4,581

Notes: The dependent variable is the natural log of clothing bilateral trade (lnXijt) from country i to country j in year t. All regressions are estimated using a five-year panel from 1975-2005 and include exporter-by-time, importer-by-time, and exporter-to-importer bilateral fixed effects omitted in table for brevity.
The "total TC effect" measures the percentage change in bilateral trade attributable to mutual membership in an RTA. It is calculated when the MAijt sum is significa
different than zero. The "total TD effect" measures the percentage change in bilateral trade attributable to j not belonging to any RTA to which i is a member.
It is calculated when the AAijt sum is significantly different from zero. Standard errors are calculated using White's heteroskedastic robust standard errors. Asymptoti
F- and t-statistics are in parentheses. The * denotes the null hypothesis is rejected at the 0.10 significance level, ** at the 0.5 , and *** at the 0.1 level.