THE GATT/WTO TRADE EFFECT 20 YEARS LATER: A CRITICAL REVIEW AND NEW INSIGHTS

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ABSTRACT

The failed progress of the Doha Round of trade negotiations, and continued success and interest in establishing preferential trade agreements, have caused many to question the continued relevance of the GATT/WTO. This article offers a holistic and nuanced examination of magnitude and mechanisms through which this organization has potentially facilitated trade. Using a formal econometric model of bilateral trade flows decomposed into destination market and product diversification and specialization margins, we find that membership in the GATT/WTO operates almost exclusively through access to more being able to access more destination markets and shipping and more diversified product mix relative to non-members. This results also held in the case of agricultural trade - although in this sector GATT/WTO membership encourages greater trade through the intensive margin but at a smaller level compared to the extensive margin. For RTAs this effect was reversed. This result suggests that while the GATT/WTO stimulates the development of new and expanding trade relationships, RTAs encourage greater specialization across existing product varieties. The coexistence of RTAs within the multilateral system suggests a complementary relationship exists between these trade facilitation structures.

I. INTRODUCTION

Economists often extol the virtues of more open international markets. Expanding existing markets and opening new ones allows exporters to exploit their comparative advantages and, at the same time, allows firms to increase the scale of their production. Consumers in importing countries gain not only because of the availability of cheaper foreign products but also from having access to a much wider set of product varieties throughout the year. Indeed, the growth in world trade in the post-war era has been nothing short of impressive. Celebrating its 60th anniversary on January 1, 2008, the GATT/WTO published a World Trade Report titled "Six decades of multilateral cooperation: What have we learnt?" Among its many accomplishments, the GATT/WTO notes that: "… since 1950 world trade has grown more than twenty-seven fold in volume terms and this expansion is more than three times as large as the growth in world output which expanded eight-fold during the same period" (WTO 2007, pg. 243). The impressive growth in world trade is often attributed to the GATT/WTO, largely due to its visible role in reducing barriers to trade through successive rounds of negotiation.

Despite the organization's prominence and perceived contributions to fostering international trade, empirical research exploring this issue has generated remarkably ambiguous results. Rose (2004) opened this discussion claiming that membership was not associated with higher trade flows. This finding, which counters much conventional wisdom, was a big shock for trade economists and policy-makers alike. Why would members participate in a multilateral organization if it failed to bolster international trade?

Studies subsequent to Rose's seminar work have offered more nuanced analyses that to varying degrees have overturned or complicated this understanding of WTO's trade facilitation impacts. While many careful analysis have been undertaken, assessment of the success (or not)

of this organization are frequently not robust when examined through the lens of alternative WTO variable construction, model specifications, time periods, or industry disaggregation. The failed progress of the Doha Round of trade negotiations and largely consequential increase in use of preferential trade agreements (PTAs) as a vehicle to foster trade, has as lead many to question the future relevance of GATT/WTO. This unresolved and timely issue is of considerable importance to policymakers. A clear understanding of the historic contributions of this organization and the mechanisms through which it has potentially been facilitated trade, are needed inputs into future multi- or bi-lateral trade negotiations.

This article offers a holistic and nuanced examination of the impacts of the GATT/WTO. This is accomplished through three objectives. First, we provide an assessment of literature in this field to illustrate where we stand after two decades of academic debate over the merits of the multilateral organization. Second, we dissect the growth of United States and world agricultural trade into the intensive (expansion of existing trade flows) and extensive margins (expansion of trade with new countries and/or products). In doing so we begin by providing a graphical decomposition of the growth of US and world agricultural trade along the two margins using a pre-defined base period. The intensive and extensive margins of US exports are then dissected using a novel accounting procedure that defines four possible extensive margin trade expansion paths. The intensive and extensive margins are then estimated using a theoretically founded decomposition method developed by Hummels and Klenow (2005). Finally, we extend the empirical literature using the gravity equation by developing a simple modification of the dependent variable to evaluate extensive and intensive margins and revisit the effects of regional trade agreements on US agricultural trade.

The remainder of this paper is organized as follows. Literature which as estimated trade facilitation impacts of the GATT/WTO is reviewed in section two. Section three introduces the methodological framework to compute the intensive and extensive margins of US and world agri-food trade. Section four discusses the data used in this paper and various summary statistics, and section five presents the results and discussion. This study concludes in section six by considering implications of these findings for future GATT/WTO negotiations and ongoing regional and intra-regional trade liberalization efforts such as the Trans-Pacific Partnership (TPP) and the Transatlantic Trade and Investment Partnership (TTIP).

II. LITERATURE REVIEW

GATT/WTO Trade Facilitation

Efforts to quantify the effects of the GATT/WTO have drawn upon an extensive and growing number of variable and model specifications, and estimation approaches. Tomz et al. (2007) found significant positive trade flow effects by including de jure and de facto membership. Subramanian and Wei (SW, 2007) exploit many asymmetries in the GATT/WTO membership and find large positive trade flow effects for industrialized countries and liberalized manufactured products (but not the case for developing countries and agricultural products). Liu (2009) criticizes the above studies for omitting zero trade flows; in addressing this issue, this author finds a significant positive trade effect of GATT/WTO membership. Mixed results are found by Herz and Wagner (2011) depending on the GATT/WTO negotiating period under consideration, by Chang and Lee (2011) when employing non-parametric matching methods, by Engelbrecht and Pearce (2007) for capital intensive goods (only), and by Balding (2010) using only export data.

Results from Eicher and Henn (2011) put the trade-facilitating impacts of the GATT/WTO squarely in doubt. Incorporating controls for unobserved bilateral-pair heterogeneity (i.e., natural trading partner effects) and individual preferential trade agreements (PTA) – features absent from all previous studies – these authors found an insignificant and sometimes negative trade flow effect of membership. Eicher and Henn (2011), however, omitted zero trade flows and thus could not capture potential GATT/WTO trade facilitation through an important channel – via the creation of new trade relationships. In including both formal and the participation based definition of WTO membership proposed by Tomz et al. (2007), Roy (2011) found a mixed impacted on membership (statistically positive, statistically negative, and insignificant) dependent upon the decade being considered.

Of particular relevance to the current study, Grant and Boys (2012) revisited SW's (2007) result by addressing many of the commonly criticized empirical flaws in this literature - zero trade flows, country-time fixed effects, the decision to export (Helpman et al., 2008) - and included a more complete representation of agricultural trade (as compared to six sectors in SW (2007)). Contrary to SW (2007), these authors found strong evidence that the impact of GATT/WTO on trade varied by aggregated product categories (agriculture, non-agriculture); increases in trade of agricultural products by 161% and non-agricultural goods trade increases of 72% were attributed to membership in this organization. Given the dominance of agricultural products in portfolio products exported by developing and least-developed countries, not surprisingly these nations were found to particularly benefit from membership in this association.

[Insert Table 1 Here.]

Table 1 summarizes characteristics of key studies in this literature. As is more apparent through this data presentation, this literature has largely evolved through iterative refinement of

first the WTO variable specification, then inclusion of additional control variables, alternative estimation approaches, and recently through disaggregating the trade impact on specific industry sectors or the mechanism through which these impacts are achieved (margins).

Intensive and Extensive Margin of Trade

A growing literature has also explored the particular mechanisms through which the WTO has impacted enhanced trade. To date this discussion has largely focused on the evolution of trade at the intensive and extensive margins. At the intensive margin, trade facilitation is reflected by a change in the volume of trade of previously traded products between established trading partners. Changes in trade at the extensive margin reflect increases in trade between new partners or changes in trade (additions, abandonments) of products between established trade partners. As noted by Lin (2009), the establishment of new trading relationships may be due to the lower tariffs or more transparent trade policies afforded to trade between WTO members.

Separate consideration of intensive and extensive trade margins have been included in several studies including those by Feenstra and Rose (1997), Wang and Winters (1992), Evenett and Venables (2002), Haveman and Hummels (2004), and Besedeš and Prusa (2011). The empirical literature examining this issue within the context of the WTO/GATT, however, is relatively limited. Felbermayer and Kohler (2006) used a "corner-solution" approach which the intensive margin was evaluated as the expected value of trade, and the extensive margin as the probability of a given country pair of establishing a trade relationship conditional on gravity model and time covariates. These authors found evidence of WTO membership enhancing trade through the extensive margin. This study has been challenged, however, due to the application of this estimation approach and the time period considered in this analysis (e.g. Lin, 2009). Using a Heckman-type sample selection procedure, Helpman et al., (2006), use a longer a longer

time period to revisit this issue. These authors found that the extensive margin does not contribute in any major way to the growth of world trade.

Given the limitations and conflicting findings of earlier studies, several recent studies have revisited this issue. Including zero trade flows (required to assess the extensive margin), a larger panel dataset, and a more appropriate econometric method, Liu (2009) found that overall the GATT/WTO was successful in facilitating trade at both the intensive and extensive margins. Importantly, however, at the extensive margin was found to dominate during the first five rounds of GATT negotiations, while the intensive margin was found to dominate since 1995 (establishment of the WTO). Between these periods, the GATT was not found to be effective at promoting world trade. Subsequent work by Grant and Boys (2012) similarly found statistically large and positive GATT/WTO trade facilitation impacts across each margins for the trade of both agriculture and non-agriculture products.

III. EMPIRICAL APPROACH

The purest measure of the EM as advocated by Melitz (2003) and Bernard, Jensen, Redding, and Schott (2007) is at the firm level where one could observe the behavioral dynamics of firms entering into and exiting out of destination markets for each of the products they sell over a certain time period. However, as is widely known such data is difficult to obtain (at least as of this writing). Thus, although we do not observe important dynamics at the firm level, the results of this study, which are at the country level, reflect the underlying behavior of firms. Second, the EM can be measured at different levels of aggregation in the product and destination space. Helpman, Melitz, and Rubinstein (2008) define it at the country level over time, whereas Hummels and Klenow (2005) and Baldwin and Di Nino (2006) work at the country and HS6-digit product level at a point in time. Further, Hillberry and Hummels (2008) investigate

shipment level data and Berthou and Fontagné (2008) evaluate EMs using French firm-level data. While the focus of this article is at the country level, we adopt recent techniques to track and measure the extensive and intensive margins in models of bilateral trade flows to investigate product diversification and specialization channels by which GATT/WTO membership may impact agricultural and non-agricultural trade patterns.

First, following Bernard, Jensen, Redding, and Schott (2007) who decomposed aggregate exports (X_d) to country *d* into two margins: the number of firms exporting to market *d* (N_d) and the average exports per firm (X_d/N_d), we explore the bilateral country-pair analogue of this expression. Letting N_{odt} denote the number of products shipped from origin (*o*) to destination (*d*) in time period (*t*) and X_{odt} the value of exports from *o* to *d* in year *t*, both of which are defined on a country-pair basis, the value of bilateral trade can be expressed as:

$$X_{odt} = \frac{N_{odt} X_{odt}}{N_{odt}} \tag{1}$$

Taking logs, we have the following additive relationship:

$$\ln(X_{odt}) = \ln(N_{odt}) + \ln\left(\frac{X_{odt}}{N_{odt}}\right) \tag{2}$$

The regressand in equation (2) offers over that in a typical gravity equation. First, the logarithmic value of bilateral exports is decomposed into what we will call a "diversification margin" ($\ln(N_{odt})$), which is a simple count of the number of Harmonized System (HS) or Standard Industrial Trade Classification (SITC) products traded between origin *o* and *d* in time period *t*. It is a measure of how "diversified" *o's* (*d*'s) export (import) bundle is when shipping to country *d's* (*o*'s) market. Second, the decomposition of aggregate bilateral exports also includes what we will call a "specialization or intensity margin" ($\ln(X_{odt}/N_{odt})$) defined as average

sales per product. Because of the additive relationship, we can use each of the terms on the right-hand side of (2) as dependent variables in a gravity-like framework to shed light on the question of how bilateral trade expands with GATT/WTO membership. For example does membership promote trade due to a more diversified export basket being sold (the diversification margin) or because countries are trading more intensely (i.e., specializing) in a given product set.

Finally, since OLS is a linear operator and the identity given by equation (2) holds with equality, we can recover the typical gravity equation estimates concerning the level of bilateral trade since the corresponding coefficients in the diversification and specialization margin equations will sum to the overall effect on bilateral exports ($ln(X_{odt})$). The total trade effect of the GATT/WTO will be estimated in this framework by considering agricultural and manufactured (i.e., non-agricultural) trade, denoted by the superscript *k*, in separate regressions:

$$(3) \quad \ln(N_{odt}) = \alpha_{od} + \pi_{ot} + \pi_{dt} + \beta_1 \cdot PTA_{odt} + \beta_2 \cdot GSP_{odt} + \gamma_1 \cdot Bothin_{odt} + \varepsilon_{odt}$$

$$(4) \quad \ln\left(\frac{X_{odt}}{N_{odt}}\right) = \lambda_{od} + \theta_{ot} + \theta_{dt} + \delta_1 \cdot PTA_{odt} + \delta_2 \cdot GSP_{odt} + \varsigma_1 \cdot Bothin_{odt} + \mu_{odt}$$

where α and λ are a comprehensive vectors of country-pair fixed effects as advocated by Eicher and Henn (2011) to obtain unbiased estimates, and π_{ot} (π_{dt}) and θ_{ot} (θ_{dt}) are comprehensive vectors of time-varying origin-specific (destination-specific) fixed effects as advocated by Anderson and van Wincoop (2003), Baier and Bergstrand (2007) and Subramanian and Wei (2007) to control for each country's multilateral resistance with their trading partners in the rest of the world. PTA_{odt} (GSP_{odt}) is an indicator variable equal to one if *o* and *d* belong to a preferential trade agreement (PTA) (*o* extends preferential treatment to *d* under the generalized system of preferences (GSP), and $Bothin_{odt}$ is an indicator equal to one if *o* and *d* are members of the GATT/WTO, and ε_{odt} (μ_{odt}) is a well behaved logarithmic error term for the diversification

(specialization) equation. The remaining variables are vectors of fixed effects. From equation 2, it follows that $\gamma_1 + \zeta_1$ identifies the GATT/WTO trade effect, and from this we can identify the relative contributions of the diversification ($\gamma_1/(\gamma_1+\zeta_1)$) and specialization margins ($\zeta_1/(\gamma_1+\zeta_1)$) in the GATT/WTO trade effect.

While equations (3) and (4) are instructive, they do not say anything about the country dimension of GATT/WTO membership. That is, if the GATT/WTO allows firms to serve more destination markets with their products or importing firms to procure product from more source countries then this should be reflected in a more diversified destination mix of countries for all products. Thus, we also consider a slight variation of equations (3) and (4) based on aggregate exports of country o in year t (X_{ot}) decomposed into the number of destination markets served (D_{ot}) and the average exports per destination (X_{ot}/D_{ot}):

$$(5) \quad \ln(D_{ot}) = \beta_1 GDP_{ot} + \beta_2 \ln(\overline{GDP}_{dt}) + \beta_3 \ln(remote_{ot}) + \gamma_1 EXPIN_{ot} + \varepsilon_{ot}$$

$$(6) \quad \ln\left(\frac{X_{ot}}{D_{ot}}\right) = \lambda_1 \ln(GDP_{ot}) + \lambda_2 \ln(\overline{GDP}_{dt}) + \lambda_3 \ln(remote_{ot}) + \varsigma_1 EXPIN_{ot} + \mu_{ot}$$

where, GDP_{ot} ($\overline{GDP}_{dt}$) is the (mean) origin's (destination) gross domestic product, $remote_{ot}$ is a remoteness index of the origin nation defined as the GDP-weighted distance of origin country to all of its destination markets, and $EXPIN_{ot}$ is an indicator variable equal to one if exporter *o* is a member of the GATT/WTO in time period *t*. In similar fashion, it follows that $\gamma_1 + \zeta_1$ identifies the aggregate trade effect of the GATT/WTO, and from this we can identify the relative contributions of the destination diversification margin ($\gamma_1/(\gamma_1+\zeta_1)$) and destination specialization margin ($\zeta_1/(\gamma_1+\zeta_1)$) in the aggregate GATT/WTO trade effect.

While illuminating, the disadvantage of the forgoing analysis is that by simply counting products or destinations, we are implicitly assigning equal weight to all goods and all destination markets. To understand how this may affect the results and implications for the GATT/WTO, we adopt a theoretically motivated index for each of the EM and IM based on the original work of Feenstra (1994) and later expanded across exporters by Hummels and Klenow (HK 2005) and Feenstra and Kee (FK 2008) in a panel data setting. Following HK and FK, the bilateral IM is defined as:

$$(7) \qquad IM_{odt} = \frac{\sum_{k \in K_{odt}} x_{odkt}}{\sum_{k \in K_{odt}} \bar{x}_{wdk}}$$

where *t* represents a particular year, *o* the origin country, *d* the destination country, *w* the rest of the world reference group exclusive of country *o* ($w \neq o$), and *k* a particular HS or SITC product. The summation indices $k \in K_{odt}$ refers to all of the goods categories in which *o* has positive exports (x_{odkt}) to country *d*. The denominator term ($\bar{x}_{wdk}$) is the average value of world exports sent to destination market d (in *o*'s good categories) over all years in the sample period. Thus, the IM is a relative measure of the intensity of *o's* exports to *d* weighted by the average value of the rest of the world's exports to *d* in *o's* goods categories ($k \in K_{odt}$) to take account of the panel nature of the data.

The HK and FK EM similarly uses the rest of the world reference group but is akin to measuring the diversification of *o's* exports in terms of the number of products it sells relative to the number of products sold by the rest of the world (*w*):

(8) $$EM_{odt} = \frac{\sum_{k \in K_{odt}} \bar{x}_{wdk}}{\sum_{k \in K_{wd}} \bar{x}_{wdk}}$$

where, K_{odt} denotes the subset of observable goods categories in which *o* has positive exports to destination *d*, and K_{wd} is the set of all goods exported by the rest of the world over all time periods (FK 2008). For the case when *o's* shipments to *d* are a subset of *w's* shipments to *d*, EM_{odt} measures *o's* extensive margin of trade because it adjusts for the size of *o's* export variety set relative to *w's*. Put differently, *o's* EM is a trade value weighted count of its exportable categories relative to *w's* categories (i.e., the fraction of *o's* categories shipped to *d*). As Hummels and Klenow (2005) note, trade expansion along the EM implies exporting more goods to more markets as an outward shift in demand, rather than a movement along the demand curve for goods as prices fall from increased trade. It should also be noted from equation (8) that the EM is time-varying only in the sense that the set of goods exported by o changes over time, whereas the set of goods exported by the rest of the world (w) over all time periods does not.

Finally, note that the product of the two margins yields *o's* overall trade share in *d's* market:

(9) $$IM_{odt} EM_{odt} = \frac{\sum_{k \in K_{odt}} x_{odkt}}{\sum_{k \in K_{wd}} \bar{x}_{wdk}} = \frac{x_{odt}}{\bar{x}_d}$$

where, x_{odt} is *o*'s total export value sent to *d* at time *t* and $\bar{x}_d$ is the average value of *d*'s imports from the world.

The advantage of Hummels and Klenow's (2005) margins is that the IM and EM are judged relative to the products that the rest of the world countries are serving. To implement the

HK and FK empirically, we again make use of the linearly additive property of OLS to decompose *the GATT/WTO trade effect* into the relative contributions of the Hummels-Klenow and Feenstra-Kee intensive and extensive margins:

$$(10) \quad \ln(IM_{odt}) = \alpha_{od} + \pi_{ot} + \pi_{dt} + \beta_1 \cdot PTA_{odt} + \beta_2 \cdot GSP_{odt} + \gamma_1 \cdot Bothin_{odt} + \varepsilon_{odt}$$

$$(11) \quad \ln(EM_{odt}) = \lambda_{od} + \theta_{ot} + \theta_{dt} + \delta_1 \cdot PTA_{odt} + \delta_2 \cdot GSP_{odt} + \varsigma_1 \cdot Bothin_{odt} + \mu_{odt}$$

where, in addition to controlling for the time-varying nature of importer d's (inward) multilateral resistance, π_{dt} also absorbs *o*'s import share in destination market *d*.

Econometric Issues

Recent advances in the specification and estimation in the empirical trade literature have challenged the traditional assumptions of the gravity equation. First, both Anderson and van Wincoop (AvW 2003) and Feenstra (2004) demonstrate that trade depends not only on the bilateral barriers separating *o* and *d* (distance, shared borders and common language), but also on each countries' "multilateral resistance" they face with their partners in the rest of the world. Because multilateral price data are difficult to measure, much less observe, Baier and Bergstrand (2007), Subramanian and Wei (2007), Grant and Boys (2012), Grant (2013) and many others suggests the inclusion of time-varying importer and exporter fixed effects in a panel setting as a consistent method to control for multilateral prices. We follow this approach by including a comprehensive set of time-varying origin and destination specific fixed effects in each specification.

Second, many of the studies of the GATT/WTO following Rose's (2004) influential paper include time-varying country-specific fixed effects but failed to control for unobserved heterogeneity and trade costs and "natural trading partner" effects specific to country-pairs. The

"natural trading partner" bias arises when country-pairs are more likely to select into the GATT/WTO for trade cost reasons other than those observed on the right-hand side of the typical gravity equation (Baldwin and Taglioni 2006; Magee 2008). For example, the U.S. and Canada are often considered "natural trading partners", even absent the fact that both countries are party to the GATT/WTO and belong to the North American Free Trade Agreement (NAFTA), because both countries share a land border, speak the same language and have a similar set of tastes and preferences. If these residual trade costs factors do not change a lot over time, Baldwin and Taglioni (2006) suggest the use of country-pair (*ij*) fixed effects which allows for a time-invariant U.S.-Canada (and Canada-U.S.) specific intercept to control for "naturally" higher (and also lower) levels of trade, irrespective of membership in the GATT/WTO. Eicher and Henn (2011) revisited the GATT/WTO trade effect with country-pair specific fixed effects and found that the benefits of membership largely vanished when explicit controls for unobserved country-pair heterogeneity and natural trading partner effects were factored in. However, as noted previously, Eicher and Henn (2011) did not consider alternative channels by which the membership may expand trade vis à vis the extensive and intensive margins nor did they address zero trade flow records.

Finally, Rose's (2004) model and many subsequent studies suffers from a nontrivial selection bias (Liu 2009; Grant and Boys 2012). Because the log of zero is undefined, the dependent variable in typical gravity equations is limited to country-pairs where trade is strictly positive. The bias created by the omission of zero trade flows from the gravity model has recently been documented in Santos-Silva and Tenreryo (2006) and Helpman, Melitz and Rubinstein (HMR 2008) and Grant and Boys (2012) (see also Liu 2009; Felbemeyer and Kohler 2010 for other applications). If there are large unobservable trade barriers then countries may

not select into exporting. This explains why zeros exist in the trade data, but not for random reasons. Further, the omission of zero trade flows ignores the possibility that GATT/WTO membership may not only induce existing country-pairs to trade more (the "intensive margin" of trade), but also provides incentives for countries to create new trading relationships (the "extensive margin" of trade). This paper addresses explicitly the margins by which GATT/WTO membership affects members' agricultural and non-agricultural trade but does not tackle the zeros issue in this preliminary work.

IV. DATA

Bilateral trade values at the four-digit level of the Standard Industrial Trade Classification (revision one) and six-digit level of Harmonized System of trade classification (HS1996) were retrieved from the United Nations COMTRADE database. Two datasets were assembled to compare how the level of disaggregation of product definitions may affect the number of goods traded and the intensity of trade conditional on membership in the GATT/WTO. First, we use HS1996 six-digit product codes for 185 countries over the period 1998-2010 (annually), to compute the range of goods traded and average trade per product.[1] The HS database contains 5,036 products in total, of which 617 are agricultural goods, defined as chapters 01-24, excluding chapter 03 (fish and seafood products).[2] In the second database, we use the Standard Industrial Trade Classification revision one (SITCR1) product codes for the same 185 countries (Appendix 1) but over a much longer timeframe, 1965-2010, at five year intervals. The advantage of the SITCR1 is that we have a longer time series to investigate the channels by which the multilateral organization influences members' trade. However, the disadvantage is that the data are more

[1] Because HS revisions can take up to two or three years for countries to fully adopt the new product classification system, we begin our analysis in the year 1998.
[2] Cotton and related products in HS chapter 52 are excluded from the agricultural sector.

aggregated containing 1,133 product codes, or roughly 22 percent (1,133/5,036) of the product codes available in the HS1996 system.[3]

Mirrored trade flows are used to construct both datasets whereby export statistics reported by the partner country are used if the reporting country's imports are missing.[4] The data two datasets assembled ensure a considerable amount of variation in GATT/WTO membership status of country pairs as we move through time. For example, 67 percent (186,076) of the total number of observations (277,087) in the HS1996 database (1998-2010) represent cases where both importing and exporting countries are members of the GATT/WTO, compared to 33 percent of observations where only one country (82,383 observations), either the importer or the exporter, is a member of the GATT/WTO or neither of the two countries are members. In the SITCR1 we use the same number of countries (185) but the sample period is much longer (1965-2010). Because of this, the member-nonmember ratio is roughly equal with 50 percent, or 95,876 bilateral trade observations taking place between two members of the GATT/WTO compared to 94,971 observations (50 percent) taking place between a member and a nonmember or two nonmember countries. Membership is coded based on the GATT/WTO's notifications of members' official dates of accession which are available from the WTO's website.[5] Table X displays summary statistics of the range of goods traded and average sales or trade per variety.

[3] Note there is some turnover in the HS and SITC codes over time as products get re-classified under trade agreements, new tariff lines or for other political or economic reasons. While much of this can be mitigated by using a common HS or SITC classification throughout the sample (i.e., HS1996 or SITC revision 1), as is done here, some reclassification still exists. Thus, when comparing the intensive and extensive product margins over time such as 1998-2010, product reclassification may impart some bias on the extensive margin. Although we did not attempt to develop a stable product classification in this study, readers should be aware of this.

[4] Feenstra *et al*. (2005) also employ mirrored trade flows when trade flow statistics of the reporting country are incomplete or missing.

[5] Our definition of GATT/WTO membership is akin to Rose (2004a). We do not control for *de facto* or provisional membership as in TGR (2007) in the current version of this paper. A list of members prior to and after the formation of the WTO can be found at: http://www.wto.org/English/thewto_e/gattmem_e.htm.

Gross Domestic Product (GDP) data (in US dollars) are obtained from the World Bank (WB) Development Indicators and the United Nations (UN) National Accounts. GDP data are far more complete than corresponding production values from the Food and Agricultural Organization (FAO) and are available for almost all countries and time periods.[6] Data for other standard covariates - distance, contiguity, common language, colonial ties, landlocked countries, island nations, and land areas - are taken from the *Centre d'Etudes Prospectives et d'Informations Internationales* (CEPII) geo-distance dataset (Mayer and Zignago 2006).[7] Information regarding membership regional trade agreements (RTAs) are taken from the WTO's Regional Trade Agreements Gateway.[8]

The completed datasets at the HS1996 and SITCR1 product classifications cover 185 countries listed in the appendix table 1. There are 56 industrialized countries, 87 developing economies, and 42 least-developed countries. The delineation between the development statuses of countries was taken from the World Bank's low, middle and high income classification. In total we construct two significant datasets each with an agricultural and non-agricultural dimension. The first of these datasets is based on a longer timeframe of SITCR1 from 1965-2010 at five year intervals (1965, 1970, 1975, … , 2010). Starting at the four digit level of the SITCR1 product disaggregation which contains a total of 625 products, 151 of which are agricultural products and 474 non-agricultural products. Using this product definition we then compute the

[6] In some cases (i.e., Taiwan), we use GDP data from the Penn World Tables (6.3) to supplement WB and UN data when it is incomplete or missing. WB Development Indicators Data can be accessed (with subscription) at: http://ddp-ext.worldbank.org/ext/DDPQQ/member.do?method=getMembers&userid=1&queryId=135, and UN GDP data can be retrieved at: http://unstats.un.org/unsd/snaama/dnllist.asp. Penn World Tables can be accessed at the Center for International Comparisons at the University of Pennsylvania's website: http://pwt.econ.upenn.edu/

[7] CEPII is an independent European research institute on the international economy stationed in Paris, France. CEPII's research program and datasets can be accessed at www.cepii.com. CEPII uses the great circle formula to calculate the geographic distance between countries, referenced by latitudes and longitudes of the largest urban agglomerations in terms of population.

[8] Available at: https://www.wto.org/english/tratop_e/region_e/region_e.htm

number of products traded (N_{odt}), exports per product (average sales or *Xodt*/*Nodt*) and the HK and FK margins, bilaterally, as measures of the diversification and specialization and intensive and extensive margins specified in equations (3) and (4) and (8) and (9), respectively. In the final step we aggregate the bilateral data to the multilateral or total exports level for each exporter and year identifying the number of destination markets (D_{ot}) served and exports per destination (X_{ot}/D_{ot}) as in equations (5) and (6).

We then repeat this exercise to construct a second dataset based on the HS 1996 six-digit classification and every year from 1998-2010. This database is based on a total of 5,036 goods and the same 185 countries. Here, 619 (4,417) products are defined as agricultural goods (Chapters 01-24) (non-agricultural goods). In total there are 190,847 bilateral trade observations in the SITCR1 database 263,631 observations in the HS 1996 database.[9] Fifty percent in the SITCR1 database correspond to observations where both countries belong to the GATT/WTO. This share increases to 67 percent in the HS 1996 database because of the later timeframe on which it is based.

V. RESULTS (PRELIMINARY AND INCOMPLETE)

The results are organized in two sections. In section one we take a casual look at the relationship between the HK and FK intensive and extensive margins and the number of years in which countries were members of the GATT/WTO. Section two presents the econometric results investigating more formally the channels by which membership in the multilateral organization increases trade.

[9] In the aggregate trade datasets based on the number of destination markets and exports per destination, there are 1,687 (2,322) exporter-year observations in the SITCR1 (HS 1996) database.

Graphical Evidence of the Intensive and Extensive Margins

We begin with a qualitative decomposition of the growth of world manufacturing and agricultural trade by defining a base-period reference year and investigate the growth of trade in product and partner markets that did and did not exist in the base period. Two benchmark periods are used. First, we use a 1980-1985 base period and tabulate all possible country-product pairs in the data for which the world exhibited positive trade flows. Because the HS system did not come into existence until 1989, and wasn't officially adopted well into the mid-1990s for many countries, we use the SITC which is available as far back as 1962. Recall, the benefit of the SITCR1 is that we can cover a much longer time series to decompose the growth of trade. The disadvantage is that it contains approximately one-fifth the number of product varieties available in the HS system.

Because each classification of international trade codes may give different results about the relative contributions of the intensive and extensive margins, we present results using both classifications. For the SITCR1 system, the reference period is all country-product observations that existed in the 1980-1985 period. For the HS system, the reference year is a single year and is set at the initial year of our data, 1998.[10] The set of triadic importer-exporter-product observations that existed in the two base years 1980-1985 and 1998, defines the existing country-pair and product market space. In the graphical method, we simply trace out the growth rates of world merchandise and agricultural trade from 1985-2010 using the SITC classification and from 1998-2010 using the HS system, conditional on whether the observation was traded in the

[10] We use the 1996 HS system which provided a revision and some reclassification of the trade codes compared to its predecessor in 1992. However, some countries did not transition fully to the HS1996 system until 1998. This is important because if we defined the reference period as 1996 and many countries did not transition to this system until several years later, the country-product variety space would appear relatively thin in the base year even if trade was occurring under the HS1992 classification. In this case, we would tend to overstate the importance of new products and destinations and the extensive margin of trade.

reference period (existing products) or whether trade is occurring between new partner countries and/or in new product varieties (new goods).

Figure 1 illustrates the growth in the value of global trade for total merchandise products (panel 1) and the subset of agricultural products (panel 2) at five year intervals starting in the reference period 1980-1985. In both panels, the growth of world and agricultural trade is decomposed into the existing partner and/or product trade and new partner or product trade. Existing trade is defined as observations that had nonzero trade in the reference period and all subsequent years through 2010. New trade is defined as observations for which trade was zero or did not exist in the reference period but became nonzero in some later period. For comparison, and to illustrate that the EM is sensitive to the two time periods chosen, we also plot the growth of new trade starting from a 1995 reference period. Also plotted are the shares of new partner/product trade in world trade.

In 2010, total merchandise trade topped $16 trillion and agricultural trade exceeded $1.1 trillion. Dissecting the growth of total merchandise and agricultural trade showcases some important findings. First, the IM accounts for the vast majority of world trade growth. In 2000, for example, 90 (86) percent of the increase in total merchandise (agricultural) trade occurred between partners and products that traded in the reference period. Second, an increasing share of world trade is occurring at the EM, in new markets either through establishing new partners or the introduction of new products. In 2000, the EM accounted for 10 percent ($659 billion) of total merchandise trade and 14 percent ($79 billion) of agricultural trade. By 2010, the share of world trade that was due to the formation of new partners and/or products was 18 percent, or $2.9 trillion, and 21 percent of the total, or $242 billion in agriculture.

Finally, the purple-colored line beginning in 2000 traces out the growth of the EM using 1995 as the reference year, and clearly illustrates that this margin is a much smaller share of the growth of world trade compared to the reference year 1980-1985. Thus, the shorter is the time period between the reference year and the end year, the lower will be the contribution of the EM to overall trade growth.

Figure 2 plots the relationship between the HK intensive and extensive margin of agricultural trade and the number of years in the GATT/WTO at a single point in time (2005).[11] Six scatterplots are illustrated. The top three figures plot country level extensive margins and years in the GATT/WTO for developed, developing and least developed countries while the bottom three figures do the same for each country's intensive margin. Both margins are aggregated to the country level by taking the geometric average of country *o's* intensive, extensive, and overall margin based on the HS1996 database across all destination markets ($d \neq o$).

For developed countries there is a significant positive and reasonably tight relationship between the number of years in the WTO and the weighted count of the number of products exported relative to the rest of the world reference group (the HK extensive margin) and the intensity of by which developed nations export products compared to the rest of the world in the same goods categories (the HK intensive margin). Developing countries also showcase a positive relationship between their IM and EM and years in the GATT/WTO. However, the relationship is more dispersed and the slope if the fitted line is not nearly as steep, particularly for developing countries' extensive margin. For LDCs, there appears to be no relationship

[11] We experimented with other years such as 2000, 2010, and 1995 and the results are almost identical.

between membership and the EM and IM of agricultural trade. This latter result could be indicative of the fact that LDCs have been largely exempt from market access commitments in the GATT/WTO under the umbrella of special and differential treatment.

The GATT/WTO Effects and the Margins of Trade

While the previous graphical analysis was instructive, it did not control for a number of other factors influencing the extent of countries' extensive and intensive product margins. This section presents the econometric results contained in tables 3 and 4. Table 3 presents the results based on the SITC data and a longer time series (1965-2010) and table 4 presents the results based on the HS 1996 data using a much shorter time period (1998-2010) but a much larger product set (5,036). Three scenarios are depicted. In scenario one, we look at aggregate trade and the country (i.e., destination) margin of trade conditional on membership (equations 5 and 6). Scenario two considers the specialization and diversification margins as described in equations 3 and 4, and the final scenario considers HK and FK's weighted IM and EM indices.

We begin by looking at the effect of membership in the GATT/WTO on the number of destinations markets served (D_{ot}) and average exports per destination (X_{ot}/D_{ot}) at the county level. By summing the coefficients in the Dot and X_{ot}/D_{ot} equations we can recover the aggregate impact of membership which is 0.25 for manufacturing (i.e., non-agricultural) and agricultural trade. Exponentiation of this effect suggests that membership increases a countries' aggregate exports to all markets by 28 percent ((exp(0.25)-1)*100). More illuminating, however, is the fact that this trade effect is the result of membership allowing countries to serve more destination markets compared to trading more per destination. The GATT/WTO coefficient of 0.18 in the D_{ot} equation suggests that almost three-quarters of the total trade effect is from serving more destination countries in both agricultural and manufacturing exports. In HS regressions (table 4),

which considers a much later timeframe, the GATT/WTO effect is insignificant for manufacturing trade but significant in agriculture. However, the 34 percent aggregate agricultural trade effect ((exp(0.09 + 0.20)-1)*100) is the result of increasing the intensity of trade per destination market (X_{ot}/D_{ot}) as opposed to serving more destinations. Thus, it appears that membership in the GATT/WTO allows countries to serve more markets in agriculture, perhaps in the earlier years, and later intensify these trade relationships in later years compared to non-member countries.

In the next three rows of tables 3 and 4 we rerun the aggregate destination market regressions but allow the GATT/WTO dummy variable to vary by development status. The only economically meaningful and statistically significant result for manufacturing trade is the destination market dimension for developing countries. Here, the aggregate trade effect of membership is to increase developing country trade by 34 percent ((exp(0.23 + 0.06)-1)*100) but the destination margin of exports accounts for almost 80 percent (0.23/0.29) of this manufacturing trade increase. In agriculture, both developed county margins are statistically significant and contribute to a sizeable GATT/WTO trade effect of 127 percent increase in aggregate agricultural exports. Interestingly, sixty percent of the developed country trade increase is due to trading more intensely per destination market. For developing country agricultural exports, membership is also significant but operates exclusively through the expansion of trade to more destination countries. This result underscores the importance of GATT/WTO membership for opening new markets for developing countries.

Scenario 2 considers the product margin and exports per product using bilateral data (i.e., country-pairs) in a gravity-like regression. To maintain a specification consistent with Rose's (2004) original work these regressions include logs of GDP and land area for importer and

exporter, log distance, five colonial indicator variables, a common language and border dummy, landlocked dummies, and year fixed effects (all of which are omitted for brevity) (table 2). While this specification admittedly omits more recent advances in the specification and estimation of the gravity equation, it does allow us to see how the diversification and specialization margins impact the policy variables of interest. The results shed considerable light on the margins through which membership impacts trade (table 2). In manufacturing trade, GATT/WTO membership is associated with a 52 percent increase in bilateral trade ((exp(0.45 – 0.03)-1)*100) and all of this increase is attributable to members shipping more products (N_{odt} equation). Conversely, in agriculture, the GATT/WTO trade effect is associated with a more diversified product mix as well as deepening export sales per product (X_{odt}/N_{odt}) between countries. Being party to the GATT/WTO increases trade by 62 percent ((exp(0.30 + 0.18)-1)*100) compared to two non-members and over 60 percent of this effect (0.30/0.48) is attributable to a more diversified product mix. The effect of regional trade agreements is positive across both margins and sectors. However, regional agreements appear to operate more on the intensive margin of export sales per product compared to an increasing number of products exported. This important results is consistent with the differing functions of these institutions and the levels of trade liberalization ambition pursued by RTAs compared to the GATT/WTO, where the former often requires a much deeper cut to tariffs and other regulatory bottlenecks thereby lowering variable trade costs, whereas the multilateral organization is more apt to lowering fixed costs and facilitating trade relationships.

VI. CONCLUSIONS

Since Rose's (2004) original findings that membership was not associated with higher trade a large and growing body of literature has emerged to explain or overturn this result using updated

data, alternative membership definitions, the development status of countries, sectors that were covered by multilateral trade liberalization efforts, and more sophisticated econometric techniques to deal with unobserved heterogeneity and zero trade flow records. However, very few studies have explored the simple fact that membership in the GATT/WTO may not be about increasing the intensity with which members trade but more about establishing trade relationships with more destinations markets and exporting a more diversified product basket compared to non-members. This study provides a very preliminary look at the different margins by which membership in the GATT/WTO impacts trade.

Using a formal econometric model of bilateral trade flows decomposed into destination market and product diversification and specialization margins, we found that membership in the GATT/WTO operates almost exclusively through being able to access more destination markets and shipping and more diversified product mix relative to non-members. This results was also true in agriculture although in this sector membership also encourages a greater trade through the intensive margin but at a smaller level compared to the extensive margin. For RTAs the effect was reversed suggesting that while the GATT/WTO stimulates the development of new and expanding trade relationships, RTAs encourage greater specialization across existing product varieties. Thus, the coexistence of RTAs within the multilateral system seems to point to a complementary relationship.

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Table 1. Summary of Studies Examining WTO Trade Effects

Author(s)	Sector(s) of Focus	Time Frame (Panel Pd.)	Countries in Sample	Regressand	WTO Specifi-cation	Model Specification					Unique Specification / Study Features Introduced [b]	Key Findings Regarding WTO Trade Facilitation
						Fixed Effects [a]				Zero-Flows		
						C	Y	IM-Y, EX-Y	C-C			
Rose (2004)	Merchandise Trade	1948-1999 (5 yr.)	178	Bilateral trade (Avg.)	AM AM-AR AM-AD		✓		✓		Considered: Effects over negotiation rounds, dynamic analysis, country-pair RE	Membership not associated with higher trade flows
Tomz et al. (2007)	Merchandise Trade	1948-1999 (5 yr.)	178	Bilateral trade (Avg.)	Informal AM-AR AM-AD	✓	✓		✓		Careful treatment of WTO non-member participants (NMPs)	Significant, positive, trade flow effects for both members and NMPs
Subramanian and Wei (2007)	Agriculture, Non-agriculture	1950-2000 (5 yr.)	172	Imports	AM-AD			✓			▪ Hierarchical FTA coding ▪ Exclusion of small trade values ▪ Include partner role (importer, exporter) by development, membership status	▪ Large, positive effects for industrialized countries, liberalized manufactured product trade ▪ Not facilitating for developing countries, agriculture products
Liu (2009)	Merchandise Trade	1945-2003 (5 yr.)[c]	210	Imports	AM		✓		✓	✓	▪ PPML estimation approach ▪ Estimated intensive, extensive margins	▪ Strong, positive impact of membership ▪ Trade increased through both intensive (~70% increase) and extensive (~30%) margins
Roy (2011)	Merchandise Trade	1950-2000 (5 yr.)	210	Imports	AM Informal			✓	✓	✓		Mixed results; including statistically negative impact
Eicher and Henn (2011)	Merchandise Trade	1950-2000	177	Imports	Informal AD		✓	✓			Specifies individual PTAs; WTO/PTA terms-of-trade measure	▪ Insignificant, sometimes negative ▪ Countries with reduced tariffs prior to accession experienced significant, positive effects
Grant and Boys (2012)	Agriculture, Non-agriculture	1980-2004 (4 yr.)	215	Imports	AM AD AM-AD		✓	✓	✓	✓	Enhanced representation of the Ag Sector	Significant trade flow benefits; including for developing countries, agriculture sector products

Author(s)	Sector(s) of Focus	Time Frame (Panel Pd.)	Countries in Sample	Regressand	WTO Specifi-cation	Model Specification					Unique Specification / Study Features Introduced [b]	Key Findings Regarding WTO Trade Facilitation
						Fixed Effects [a]				Zero-Flows		
						C	Y	IM-Y, EX-Y	C-C			

Notes:
Fixed Effects: C = Country; IM = Importer; EX = Exporter; Y = year
WTO Specification: AM = Asymmetric membership (Both partners in, One partner in); AR = Asymmetric Regions; AD = Asymmetric (Country) Development or Income; Informal = Informal membership
[a] Inclusion of the indicated fixed effects varied across specifications
[b] Specification or modelling innovations introduced in a previous paper in this series are not repeated in later papers
[c] Implied but not explicitly stated in study
[c] Working paper

Table 2. Summary Statistics for Dependent Variables in the SITCR1 and HS1996 Datasets

	Dep. Variable	Mean	Std. Dev.	Minimum	Maximum
----------SITC Rev. 1 Database----------					
Total Trade					
	X_{ij} ($ Mil.)	$230	$2,830	$0.001	$335,000
	N_{ij} (No. of products)	55	102	1	605
	X_{ij}/N_{ij} ($ Mil.)	$1.60	$17.7	$0.001	$2.59
All Ag.					
	X_{ij} ($ Mil.)	$25	$234	$0.001	$18,300
	N_{ij} (No. of products)	12	20	1	145
	X_{ij}/N_{ij} ($ Mil.)	$0.801	$3.67	$0.001	$600
Proc. Ag.					
	X_{ij} ($ Mil.)	$18	$163	$0.001	$11,100
	N_{ij} (No. of products)	9	14	1	82
	X_{ij}/N_{ij} ($ Mil.)	$0.714	$3.98	$0.001	$771
Bulk Ag.					
	X_{ij} ($ Mil.)	$12.4	$111	$0.001	$9,640
	N_{ij} (No. of products)	5	8	1	60
	X_{ij}/N_{ij} ($ Mil.)	$0.971	$4.41	$0.001	$366
----------HS6-Digit (1996) Database----------					
Total Trade	X_{ij} ($ Mil.)	$449	$4,201	$0.001	$331,000
	N_{ij} (No. of products)	297	669	1	5,036
	X_{ij}/N_{ij} ($ Mil.)	$1.25	$18.3	$0.001	$3,649
All Ag.					
	X_{ij} ($ Mil.)	$43.3	$337	$0.001	$18, 800
	N_{ij} (No. of products)	34	68	1	581
	X_{ij}/N_{ij} ($ Mil.)	$0.591	2,255	$0.001	$150
Proc. Ag.					
	X_{ij} ($ Mil.)	$33.2	$245.4	$0.001	$12,000
	N_{ij} (No. of products)	26	47	1	357
	X_{ij}/N_{ij} ($ Mil.)	$0.534	$2.20	$0.001	$183
Bulk Ag.					
	X_{ij} ($ Mil.)	$19.5	$153	$0.001	$12,200
	N_{ij} (No. of products)	15	28	1	229
	X_{ij}/N_{ij} ($ Mil.)	$0.748	$3.70	$0.001	$293

Note: Dollar values for X_{ij} and X/N_{ij} are in millions of US Dollars. N_{ij} reports statistics on the number of products traded for all country pairs in the database.

Table 3. Gravity with Intensive and Extensive Margins, Panel Data SITCR1 1965-2010

	1. Aggregate Trade and Destination Margins				2. Bilateral Diversification/Specialization Margins				3. Bilateral HK/FK Extensive & Intensive Margins			
	Manufacturing		*Agriculture*		*Manufacturing*		*Agriculture*		*Manufacturing*		*Agriculture*	
	D_{ot}	X_{ot}/D_{ot}	D_{ot}	X_{ot}/D_{ot}	N_{odt}	X_{odt}/N_{odt}	N_{odt}	X_{odt}/N_{odt}	IM_{odt}	EM_{odt}	IM_{odt}	EM_{odt}
Exporter in WTO	0.18***	0.07	0.18***	0.11								
	(0.06)	(0.11)	(0.05	(0.11)								
Developed Country in WTO	0.12	0.34	0.33**	0.49**								
	(0.12)	(0.26)	(0.13)	(0.23)								
Developing Country in WTO	0.23***	0.06	0.18***	0.00								
	(0.08)	(0.12)	(0.06)	(0.12)								
Least Developed Country in WTO	0.11	-0.32	-0.01	-0.11								
	(0.08)	(0.29)	(0.07)	(0.29)								
Bothin WTO					0.45***	-0.03	0.30***	0.18***				
					(0.02)	(0.03)	(0.02)	(0.03)				
Onein WTO					0.13***	-0.03	0.06***	0.03				
					(0.02)	(0.03)	(0.02)	(0.03)				
RTA					0.15***	0.40***	0.43***	0.64***				
					(0.03)	(0.03)	(0.03)	(0.04)				
GSP					0.22***	0.16***	(0.11***	0.14***				
					(0.02)	(0.03)	(0.02)	(0.03)				
N	1,687	1,687	1,683	1,687	183,995	183,995	142,725	142,725				
Adj R^2	0.71	0.92	0.87	0.87	0.68	0.46	0.57	0.32				
RMSE	0.35	0.67	0.64	0.64	1.08	1.60	0.88	1.75				

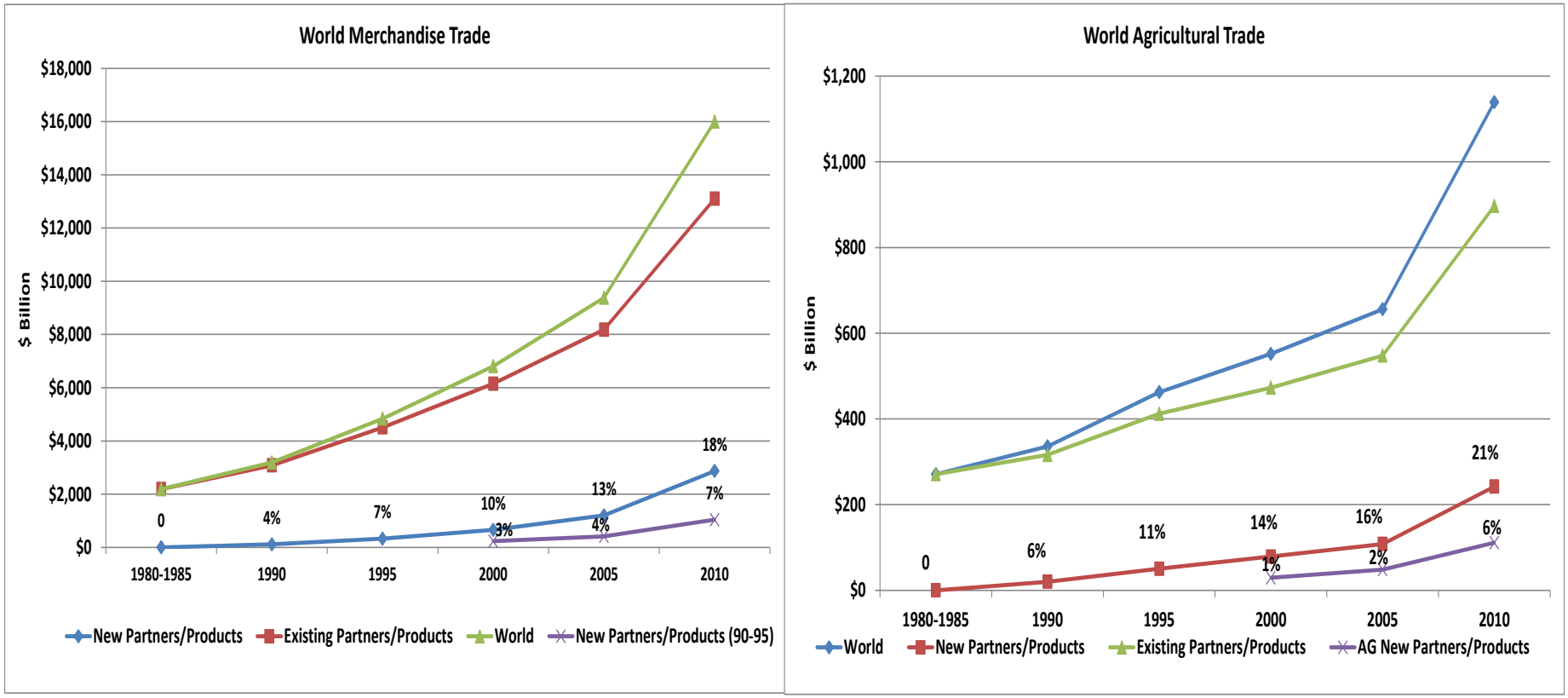
Note: Columns labeled N_{od} (X_{od}/N_{od}) denote regressions where the dependent variable is the log number of SITC 4-digit products (log average sales per product). Aggregate regressions include country-specific and year fixed effects. Scenario 2 includes year fixed effects, logs of GDP and land area for importer and exporter, log distance, five colonial indicator variables, a common language and border dummy, and landlocked dummies all of which are omitted for brevity. Scenario 3 also includes country-time fixed effects. Standard errors are reported in parentheses and are robust to clustering on exporters in scenario 1 and country-pairs in scenarios 2 and 3. One, two, and three asterisks denote significance at the ten, five, and one percent levels, respectively.

Table 4. Gravity with Intensive and Extensive Margins, Panel Data HS1996, 1998-2010

	1. Aggregate Trade and Destination Margins				2. Bilateral Diversification/Specialization Margins				3. Bilateral HK/FK Extensive & Intensive Margins			
	Manufacturing		*Agriculture*		*Manufacturing*		*Agriculture*		*Manufacturing*		*Agriculture*	
	D_{ot}	X_{ot}/D_{ot}	D_{ot}	X_{ot}/D_{ot}	N_{odt}	X_{odt}/N_{odt}	N_{odt}	X_{odt}/N_{odt}	IM_{odt}	EM_{odt}	IM_{odt}	EM_{odt}
Exporter in WTO	0.02	0.01	0.09***	0.20*								
	(0.02)	(0.09)	(0.03)	(0.11)								
Developed Country in WTO	-0.02	0.04	0.06	0.18								
	(0.03)	(0.09)	(0.05)	(0.19)								
Developing Country in WTO	0.04	0.08	0.09*	0.15*								
	(0.03)	(0.11)	(0.04	(0.10)								
Least Developed Country in WTO	0.04	-0.21	0.12***	0.34								
	(0.03)	(0.29)	(0.02)	(0.48)								
Bothin WTO					0.40***	-0.19***	0.24***	0.03	0.09***	0.40***	0.31***	0.41***
					(0.04)	(0.05)	(0.04)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Onein WTO					-0.07*	-0.10**	-0.07*	-0.09	-----	-----	-----	-----
					(0.04	(0.05)	(0.04)	(0.06)	-----	-----	-----	-----
RTA					0.53***	0.32***	0.66***	0.62***	0.35***	0.02	0.54***	0.39***
					(0.04)	(0.03)	(0.03)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
GSP					-0.05**	0.17***	0.01	0.24***	-0.38***	0.74***	0.16***	0.41***
					(0.02)	(0.03)	(0.02)	(0.04)	(0.03)	(0.02)	(0.02)	(0.02)
N	2,322	2,322	2,322	2,322	273,723	273,723	194,442	194,442	259,852	259,852	192,952	192,952
Adj R^2	0.95	0.97	0.96	0.95	0.71	0.37	0.58	0.26	0.50	0.64	0.44	0.51
RMSE	0.11	0.39	0.15	0.41	1.26	1.58	1.09	1.69	1.65	1.61	1.57	1.57

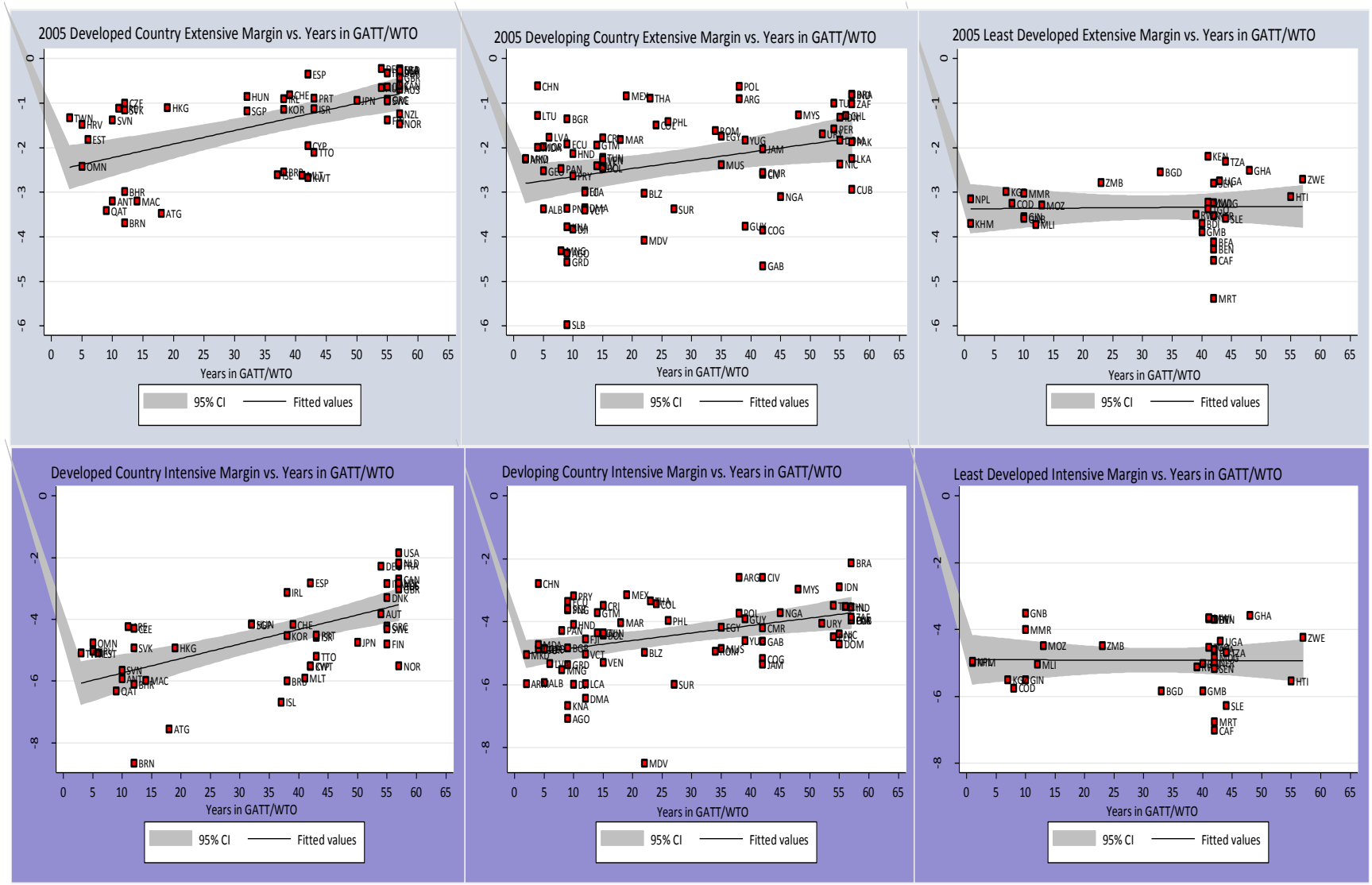
Note: Columns labeled N_{od} (X_{od}/N_{od}) denote regressions where the dependent variable is the log number of HS 6-digit products (log average sales per product). Aggregate regressions include country-specific and year fixed effects. Scenario 2 includes year fixed effects, logs of GDP and land area for importer and exporter, log distance, five colonial indicator variables, a common language and border dummy, and landlocked dummies all of which are omitted for brevity. Scenario 3 also includes country-time fixed effects. Standard errors are reported in parentheses and are robust to clustering on exporters in scenario 1 and country-pairs in scenarios 2 and 3. One, two, and three asterisks denote significance at the ten, five, and one percent levels, respectively.

Figure 1. World Merchandise and Agricultural Trade Growth, Base = 1980-1985



Source: Authors calculations from UN Comtrade Data, SITC Rev. 1, 4-digit product codes

Figure 2. Agricultural Intensive and Extensive Margins and Years in the GATT/WTO



Notes: upper (lower) panel scatterplots depict the relationship between the extensive (intensive) margin and years in the GATT/WTO for developed, developing and least-developed economies (moving left to right).

Appendix Table 1: Sample Countries (ISO 3-Digit Country Codes)

Developed Countries (DC) (56 Countries)			
Aruba (ABW)	Denmark (DNK)	Macau (MAC)	Spain (ESP)
Andorra (AND)	Equatorial Guinea (GNQ)	Malta (MLT)	Sweden (SWE)
Antigua & Barbuda (ATG)	Estonia (EST)	Martinique (MTQ)	Switzerland (CHE)
Australia (AUS)	Finland (FIN)	Netherland Antilles (ANT)	Taiwan (TWN)
Austria (AUT)	France (FRA)	Netherlands (NLD)	Trinidad and Tobago (TTO)
Bahamas (BHS)	Germany (DEU)	New Caledonia (NCL)	United Arab Emirates (ARE)
Bahrain (BHR)	Greece (GRC)	New Zealand (NZL)	United Kingdom (GBR)
Barbados (BRB)	Guadeloupe (GLP)	Norway (NOR)	United States of America (USA)
Belgium & Luxembourg (BLX)	Hong Kong (HKG)	Oman (OMN)	
Bermuda (BMU)	Hungary (HUN)	Portugal (PRT)	
Brunei Darussalam (BRN)	Iceland (ISL)	Qatar (QAT)	
Canada (CAN)	Ireland (IRL)	Saudi Arabia (SAU)	
Cayman Islands (CYM)	Israel (ISR)	Singapore (SGP)	
Croatia (HRV)	Italy (ITA)	Slovakia (SVK)	
Cyprus (CYP)	Japan (JPN)	Slovenia (SLV)	
Czech Republic (CZE)	Kuwait (KWT)	South Korea (KOR)	
Developing Countries (DING) (87 Countries)			
Albania (ALB)	Dominica (DMA)	Malaysia (MYS)	Sri Lanka (LKA)
Algeria (DZA)	Dominican Republic (DOM)	Maldives (MDV)	St. Kitts and Nevis (KNA)
Angola (AGO)	Ecuador (ECU)	Mauritius (MUS)	St. Vincent /Grenadines (VCT)
Argentina (ARG)	Egypt (EGY)	Mexico (MEX)	Sudan (SDN)
Armenia (ARM)	El Salvador (SLV)	Moldova, Rep.of (MDA)	Suriname (SUR)
Azerbaijan (AZE)	Fiji (FJI)	Mongolia (MNG)	Swaziland (SWZ)
Belarus (BLR)	Gabon (GAB)	Morocco (MAR)	Syrian Arab Republic (SYR)
Belize (BLZ)	Georgia (GEO)	Namibia (NAM)	Thailand (THA)
Bhutan (BTN)	Grenada (GRD)	Nicaragua (NIC)	Tunisia (TUN)
Bolivia (BOL)	Guatemala (GTM)	Nigeria (NGA)	Turkey (TUR)
Bosnia and Herzegovina (BIH)	Guyana (GUY)	Pakistan (PAK)	Turkmenistan (TKM)
Botswana (BWA)	Honduras (HND)	Panama (PAN)	Ukraine (UKR)
Brazil (BRA)	India (IND)	Papua New Guinea (PNG)	Uruguay (URY)
Bulgaria (BGR)	Indonesia (IDN)	Paraguay (PRY)	Venezuela (VEN)
Cameroon (CMR)	Iran (IRN)	Peru (PER)	Yugoslavia (YUG)
Cape Verde (CPV)	Iraq (IRQ)	Philippines (PHL)	
Chile (CHL)	Jamaica (JAM)	Poland (POL)	
China (CHN)	Jordan (JOR)	Romania (ROM)	
Colombia (COL)	Kazakhstan (KAZ)	Russian Federation (RUS)	
Congo (COG)	Latvia (LVA)	Saint Lucia (LCA)	
Costa Rica (CRI)	Lebanon (LBN)	Serbia and Montenegro (SCG)	
Côte d'Ivoire (CIV)	Libyan Arab Jamahiriya (LBY)	Seychelles (SYC)	
Cuba (CUB)	Lithuania (LTU)	Solomon Islands (SLB)	
Djibouti (DJI)	Macedonia (former Yugoslav Rep.) (MKD)	South Africa (ZAF)	
Least-Developed Countries (LDCs) (42 Countries)			
Afghanistan (AFG)	Ethiopia (ETH)	Malawi (MWI)	Tajikistan (TJK)
Bangladesh (BGD)	Gambia (GMB)	Mali (MLI)	Tanzania, United Rep. of (TZA)
Benin (BEN)	Ghana (GHA)	Mauritania (MRT)	Togo (TGO)
Burkina Faso (BFA)	Guinea (GIN)	Mozambique (MOZ)	Uganda (UGA)
Burma (MMR)	Guinea-Bissau (GNB)	Nepal (NPL)	Uzbekistan (UZB)
Burundi (BDI)	Haiti (HTI)	Niger (NER)	Viet Nam (VNM)
Cambodia (KHM)	Kenya (KEN)	North Korea (PRK)	Yemen (YEM)
Central African Republic (CAF)	Kyrgyzstan (KGZ)	Rwanda (RWA)	Zambia (ZMB)
Chad (TCD)	Lao People's Dem. Republic (LAO)	Senegal (SEN)	Zimbabwe (ZWE)
Comoros (COM)	Liberia (LBR)	Sierra Leone (SLE)	
Congo (Dem. Republic) (COD)	Madagascar (MDG)	Somalia (SOM)	