International Trade and the GATT/WTO: Has Membership Benefited Africa?

Gertrude Nakakeeto
PhD Student
Ag. &Applied Economics
Texas Tech University
Lubbock, Texas, USA
gertrude.nakakeeto@ttu.edu

Rahman Shaikh M
Associate Professsor
Ag. &Applied Economics
Texas Tech University
Lubbock, Texas, USA
shaikh.m.rahman@ttu.edu

Jaime Malaga
Professor
Ag. &Applied Economics
Texas Tech University
Lubbock, Texas, USA
Jaime.malaga@ttu.edu

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Abstract

Contemporary economics literature has rigorously investigated the trade flow benefits of the countries' membership in the General Agreement on Tariffs and Trade (GATT), and its successor the World Trade Organization (WTO). One important though untested conclusion from this literature is that developing (middle income) and least developed (low income) countries have received little or no benefit from their membership to GATT/WTO due to the special treatment accorded to them by the agreements of the multilateral trading institution. This article investigates this issue using a panel data set of agricultural and non-agricultural trade flows. The trade data is obtained from UNCOMTRADE and it is composed of African country exports (53) to the Rest of the World (193 countries) for the period 1990-2014. The gravity model results are very interesting: On average, membership to GATT/WTO has increased African Agricultural (AG) and nonagricultural (NONAG) exports to the ROW by more than 3 folds (249.03% and 289.61%, respectively). The PPML results reveal that membership in the GATT/WTO does not impact African trade at the intensive margin of trade and that the expansion of intra African trade under the GATT/WTO is 100 % driven by new trade relationships (the extensive margin of trade). Finally, membership to the GATT/WTO does not impact trade among developing countries, developing country imports from least developed countries but has expanded agricultural trade among least developed countries by more than 8 folds and nonagricultural trade by 78%. Surprisingly, there has been more access to agricultural markets than nonagricultural markets. These results are robust to various country aggregations and incorporate recent advances in the specification and estimation of the gravity equation to account for sample selection problems, omitted variable bias, and heteroskedasticity.

Key Words: Africa, intra-African trade, GATT, WTO, gravity equation

I. Introduction

It is generally assumed that the eight completed rounds of trade negotiations under the World Trade Organization (WTO, hereafter) and its predecessor the General Agreement on Tariffs and Trade (GATT, hereafter), have failed to liberalize trade among developing and least developed countries (GATT, 1948; Subramanian and Wei, 2007; Rose, 2007)[1]. This is probably because,

[1] 1947 (Geneva-Tariffs), 1949 (Annecy –Tariffs), 1951 (Torquay- Tariffs), 1956 (Geneva-Tariffs), 1960-1961 (Geneva-Dillion Round-Tariffs), 1964-1967 (Geneva-Kennedy Round-Tariffs), 1973-1979 (Geneva-Tokyo Round-Tariffs, non-tariff measures and "Framework agreements", 1984-1994 (Uruguay Round –Tariffs, non-tariff measures, rules, services, intellectual property, dispute settlement, textiles, agriculture, and creation of WTO), 2001-to date (Doha Development Agenda –still under negotiation)

with the exception of the Uruguay Round, all past rounds have focused on liberalizing trade in non-agricultural commodities. Liberalization of agricultural trade has been modest with global agricultural tariff rates averaging at 62% (Gibson, Wainio, Whitley, and Bohman. 2001). Indeed, given the export product composition of low income countries, it appears like the GATT/WTO has favored developed countries trade more than the developing and least developed countries (Subramanian and Wei 2007; Balding 2010; Grant and Boys 2011). While the GATT/WTO has been highly applauded for its success (Bagwell and Staiger 2002; Bhagwati 1991; Irwin 1995), everyone believes that the special treatments given to developing and least developed countries and the failure to open up agricultural markets has technically marginalized them in the global trading system.

In a recent empirical article exploring the relationship between membership in the GATT/WTO and agricultural trade flows, Grant and Boys (2011) find that the multilateral trade institution has delivered significant positive effects on members' agricultural trade. Despite the special treatment attached to trade in agricultural products and the reluctance of members to reduce tariffs in agricultural trade, GATT/WTO has promoted trade in agriculture by 114% (Grant and Boys 2011). In other words, membership in GATT/WTO approximately doubled members' agricultural trade. In a similar study focusing on the asymmetric structure and institutional theory of the GATT/WTO, Subramanian and Wei (2007) report that GATT/WTO promotes trade "strongly" but only for industrialized countries. This result has been investigated further in a more detailed empirical analysis by Grant and Boys (2011). By grouping countries according to development status (i.e., high income (HIC), middle income (MIC) and low income (LIC)), Grant and Boys (2011) report that the GATT/WTO increases agricultural trade between HIC members by 206 % ((exp (1.12)-1) *100), HIC members' agricultural imports from MIC members increases

by 163% ((exp (0.97)-1)*100), while HIC members' agricultural imports from LIC members increases by only 124% ((exp(0.81)-1)*100). These results are similar to the findings in Balding (2010) that middle and low income countries do not seem to have benefited from GATT/WTO the way the high-income countries have (see also Mujahid & Kalkuhl, 2015; Tomz, Goldstein and Rivers 2007)

There are quite a number of fundamental problems with the current literature. First, it assumes that African countries are homogenous (Mujahid & Kalkuhl, 2015). Second, it assumes that the developing and least developed countries (middle income/low income countries) can only benefit from GATT/WTO through accessing markets in the developed countries (high income countries). The conclusion that developing countries have experienced limited trade has also been reached based on this assumption, but there is no empirical evidence to support this claim. Don't the developing and least developed countries trade among themselves? Do we know if GATT/WTO has facilitated this kind of trade? In addition, assessments of the contribution of GATT/WTO following the definitions of developing or middle income countries provided by the United Nations or World Bank seem to be misleading (i.e., see Mujahid & Kalkuhl, 2015; Tomz, Goldstein and Rivers 2007; Grant and Boys 2011). This is because the World Band/United Nations group countries with bigger per capita incomes such as Brazil ($11,728.8), Argentina ($12,234.9), and Korea ($27,989.4) together with economies such as Nigeria ($ 3,203.2) and Kenya ($1,368.5) which have substantially smaller per capita incomes into one category "*Developing countries*" (World Bank, 2014).

If the gross domestic product (GDP) is a good predictor of a country's production and demand potential (Tinbergen, 1962), then results based on these groupings may not be particularly representative of African countries. In addition to the differences in production and consumption

as measured by GDP, African countries are different from countries in other continents in so many ways. For example, as of May 2016, there were 48 least-developed countries (LDC) in the World listed by the United Nations. Thirty-four (34) out of 48 LDC are African countries which represent about 65% of the countries in the continent. In fact, the continent has the largest proportion of least developed countries in the world. Further, the GATT/WTO lists 34 LDC members and out of these, 25 are African countries, accounting for 73.5% of the LDC in the GATT/WTO. Yet, to date, 42 out of 55 African countries are members of the WTO, and 36 of these countries joined GATT/WTO before 1994. So, do we really know how these countries have benefited from their GATT/WTO membership?

In this paper, we investigate the impact of GATT/WTO on agricultural (AG) and nonagricultural (NONAG) trade among medium income (developing) countries, among low income (least developed) countries and, between middle income (developing) and low income (least developed) countries. We concentrate on African countries as a case to get the best estimate of the contribution of GATT/WTO on small countries' trade. We use the imports of the Rest of the World (ROW hereafter) from 53 African countries. We assemble a panel of agricultural and non-agricultural trade flows covering the period of 1990-2014. We then use a gravity model to estimate the effects of GATT/WTO membership on agricultural and non-agricultural trade flows of developing and least developed countries of Africa. We follow closely the framework presented in Grant and Boys (2011) to ensure consistency but we also incorporate recent advances in the specification and estimation of the gravity model to correct for sample selection bias by including zero trade flows in our analyses. We estimate the intensive margin (i.e., trade growth from already existing trading relationships) and extensive margin of trade (i.e., trade growth from the creation of new trading relationships). We use the Poisson Pseudo-Maximum Likelihood (PPML) estimator

of (Santos-Silva and Tenreyro (2006); Silva & Tenreyro 2010; Silva & Tenreyro 2011; Fally 2015; Silva, Tenreyro, & Windmeijer 2015), to deal with the zero trade flows and heteroskedasticity. Our estimations include various fixed effects to deal with omitted variable bias.

Our analysis finds that, on average, membership to GATT/WTO has increased African Agricultural and nonagricultural exports to the ROW by more than 3 folds (249.03% and 289.61%, respectively). Further, although we find no significant impact on trade among developing countries, membership to the World Trade Organization has increased agricultural trade among least developed countries by more than 8 folds and nonagricultural trade by 78%. Surprisingly, there has been more access to agricultural markets than nonagricultural markets. Lastly, our results show that the trade benefit from membership to the GATT/WTO for African countries is 100% driven by new trade relationships (the extensive margin of trade).

II. The Gravity model

Previous studies estimating the trade impact of GATT/WTO membership have used the gravity model (see, e.g., Rose 2004a; Subramanian and Wei 2007; Tomz, Goldstein, and Rivers 2007; Grant and Boys 2011). This model has been identified as one of the most stable relationships in economics due to its ability to correctly predict bilateral trade flows (Leamer and Levinsohn 1995; De Benedictis and Taglioni 2011; Behrens, Ertur, and Koch 2012). In addition, the model has been reported to explain most of the variation in international trade (Rose, 2004a). Moreover,

the model has a wide application (see also, Disdier et al. 2008; Peterson et al 2013; Felbermayr and Kohler 2006; Chaney 2008).

However, various theoretical formulations of the model have been developed since its introduction to trade analysis by Tinbergen (1962). Forexample, Anderson (1979) proposes a gravity model based on a demand function with constant elasticity of substitution (CES). Other authors have proposed theoretical formalations based on Armington structure of consumer preferences in monopolistic competition (Krugman 1980; Bergstrand 1984; Bergstrand 1985; and Helpman 1987). Others have proposed formulations which account for firm heterogeneity (Bernard 2003; Melitz 2003; Chaney 2008). Recently, Anderson and Van Wincoop (2003) improved on Anderson (1979) formulation and showed that bilateral trade flows not only depend on bilateral trade costs due to spartial distance, language differences, trade restrictions among others (Bilateral Resistance) but also on the relative weight of these obstacles with respect to all other countries (i.e., the *Multilateral Resistance*).

In studying the trade impact of GATT/WTO on world trade, the use of the gravity model has been spearheaded by Rose (2004a). Rose's (2004) basic gravity model applied to a data set of average bilateral trade flows for the period, 1950-1999 is specified as follows:

$$X_{ijt} = \alpha_0 + \alpha_1 lGDP_{it} + \alpha_2 lGDP_{jt} + \sum_{n=1}^{N} \beta_n Other^{n}_{ij(t)} + \sum_{t} \phi_t \theta_t + \lambda_1 Bothin_{ijt} + \lambda_2 Onein_{ijt} + \lambda_3 GSP_{ijt} + \varepsilon_{ijt} \quad (1)$$

where X_{ijt} is natural logarithm of the average value of real bilateral trade between the exporting country *i* and the importing country *j* in year *t*, $lGDP_{it}$ ($lGDP_{jt}$) is natural logarithm of *i*'s (*j*'s) real gross domestic product, $Other^{n}_{ij(t)}$ is a vector of observable factors that either enhance or reduce trade flows. These factors include: $Lang_{ij}$, a binary variable which equals one if *i* and *j* have a common language and zero otherwise, $Cont_{ij}$, a binary variable which equals one if *i* and *j* share a

land boarder, $Landl_{ij}$, the number of landlocked countries in the country pair, $Island_{i(j)}$, the number of island nations in the pair, $Area_{i(j)}$,the area of the country in square kilometers, $ComCol_{ij}$, a binary variable which is unity if *i* and *j* were ever colonies after 1945 with the same colonizer, $CurCol_{ij}$, a binary variable which is unity if *i* is a colony of *j* at time *t* or vice versa, $Colony_{ij}$, a binary which is unity it *i* ever colonized *j* or vice versa, $ComNat_{ij}$, a binary variable which is unity if *i* and *j* remained part of the same nation during the period covered by the sample, θ_t is a set of time fixed effect, CU_EIA_{ijt} (RTA_{ijt}), two dummy variables indicating if countries in the bilateral pair belong to the same customs union in a particular year as denoted by CU_EIA_{ijt} and if countries in the bilateral pair belong to the same Free Trade Area (FTA) or Partial Scope agreement (PSA) as denoted by (RTA_{ijt}), $Bothin_{ijt}$, a binary variable indicating whether both countries in the bilateral pair are members of the GATT/WTO in year *t* (equal to 1) or not (equal to 0), $Onein_{ijt}$, a binary variable indicating whether only one of the countries in the bilateral pair is a member of the GATT/WTO (equal to 1) or not (equal to 0), GSP_{ijt} is a binary variable which equals one is *i* is a beneficiary of *j* or vice versa in time *t*, α and ϕ are vectors of nuisance coefficients, and ε_{ijt} is a log-normally distributed error term. Parameters λ_1 measure the effect of GATT/WTO membership on international trade if both countries in the bilateral pair are members of the GATT/WTO while λ_2 measures the trade effect of GATT/WTO membership when only one country in the bilateral pair is a member. In addition, $\lambda_1 > 0$ captures trade creation among members of the GATT/WTO while $\lambda_2 < 0$ captures the trade diversion effect of GATT/WTO from nonmembers.

However, the model in equation (1) uses average bilateral trade flows in the dependent variable which according to De Benedict and Taglioni (2011), is not supported by the theory of the gravity model. The authors instead recommend the use of unidirectional trade flows. In addition, the authors also argue that the conversion of trade data into real terms is theoretically not

right, because the gravity equation is a modified expenditure equation and therefore, trade data should not be deflated by a price index (De Benedict and Taglioni (2011). These issues have been addressed in the model used by Grant and Boys (2011) as shown in equation (2) below. In addition, their specification allows the estimation of separate effects of GATT/WTO on agriculture (AG) and non-agricultural (NONAG) trade. The authors specify the gravity model of unidirectional trade flows for AG and NONAG trade as follows.

$$X_{ijt}^{k} = \alpha_0 + \alpha_1^k lGDP_{it} + \alpha_2^k lGDP_{jt} + \sum_{n=1}^{N} \beta_n^k Other_{ij(t)}^n + \sum_t \phi_t \theta_t + \lambda_1^k Bothin_{ijt} + \lambda_2^k Onein_{ijt} + +\lambda_3 GSP_{ijt} \varepsilon_{ijt} \quad , \qquad (2)$$

where X_{ijt}^{k}, is the natural logarithm of imports from country *i* to country *j* while *k* indicates the AG and NONAG sectors. $lGDP_{it}$ ($lGDP_{jt}$) is natural logarithm of *i*'s (*j*'s) nominal gross domestic product. The additional variables in the vector $Other_{ij(t)}^n$ are as defined in equation (1).

Again, based on the framework of Anderson and Van Wincoop (2003); Baldwin and Taglioni (2006); and De Benedictis and Taglioni (2011) a more theorectically consistent model is given in equation 3. This model assumes all products *k* are unique and differentiated by their country of origin *i*, consumer preferences in the destination country *j* for product *k* are weakly separable, and are represented by a Constant Elastictity of Substitution (CES) utility function. The model also assumes that each country only produces one product and the markup depends on the distance between the two trading partners.

$$X_{ijt}^{k} = t_{ijt}^{1-\sigma} \frac{GDP_j}{P_j^{1-\sigma}} \frac{GDP_i}{\Omega_i} \quad , \qquad (3)$$

Where $t_{ijt}^{1-\sigma}$ includes all the bilateral trade costs that create a wedge between domestic and foreign goods prices (distance, tariffs, nontariff measuers (NTMs), among others). However, some of these

costs are not observed. P_j is country *j*'s CES price index and it measures the openness of a nation to from the world, σ is the elasticity of substitution among product varieties and it is assumed to be greater than one (goods are assumed to be substitutes). GDP_j (GDP_i) is country *j's (i)* GPD proxying for market size (production capacity). Ω_i, is the average of all importer's market demand weighted by trade costs. It measures the openness of the world to a nation's exports and it is given by: $\Omega_i = \sum_j \left[(t_{ijt})^{1-\sigma} \frac{GDP_j}{P_j^{1-\sigma}} \right]$.

Following this theoretical model, the parameter estimates from gravity equation in 1) and 2) suffer from omitted variable bias resulting from the omission of the multilateral dimension of the gravity model (De Benedictis and Taglioni, 2011; Anderson and van Wincoop, 2003; and Feenstra, 2004). Due to the difficulties associated with measuring and observing multilateral price data, recent research recommends estimating the gravity model with time-varying importer and exporter fixed effects in a panel data setting as a consistent alternative (Grant and Boys, 2011; De Benedictis and Taglioni, 2011).

The second issue is that the model in equation (3) assumes heterogeneity of firms. This means that not all firms in the country export, not all products are exported to all destinations, and not all countries in the world are necessarily served (De Benedictis and Taglioni, 2011). In addition, it also assumes that changes in trade barriers cause changes in the set of exporters leading to the extensive margin of trade. This assumption is related to the existence of zero trade flows in the trade matrix. The implication of these zero trade flows for the gravity equation is that they may signal a selection problem (De Benedictis and Taglioni, 2011). If the zero entries are the result of the firm choice of not selling specific goods to specific markets, the standard OLS estimation of the gravity equation would be inappropriate as it would give biased results (De Benedicts and

Taglioni, 2011). Grant and Boys (2011) also highlight that the existent of zero trade flows in trade data are not random, but rather indicate the existence of large unobservable trade barriers that are potentially correlated with the variables in the vector $Other^{n}_{ij(t)}$, which may deter countries from exporting at a given market price. Consequently, omitting the zero trade flows ignores the possibility that GATT/WTO membership not only induces existing country pairs to trade more (the *intensive margin* of trade), but also provides incentives for countries to create new trading relationships with other countries in GATT/WTO (the *extensive margin* of trade) (Grant and Boys 2011). In most applications, the selection bias results from the fact that the log of zero is undefined, thus the dependent variable in the gravity model is limited to country pairs with strictly positive trade values. Third, the use of the traditional log-linear gravity regression is inconsistent due to the inappropriate treatment of zero trade flows and the existence of heteroscedasticity in bilateral trade flows (Liu 2009; Santos –Silva and Tenreyro 2006; Cameron and Trivedi 2010).

Fourth, the structural formulation of the GATT/WTO requires that members extend to each other Most Favored Nation (MFN) tariff rates. This means that trade among GATT/WTO members is subjected to lower tariff rates compared to trade involving nonmembers. However, it is possible for an importing member to subject MFN tariff rates to its nonmember trade partners. In this case the nonmember exporter benefits from the more liberal export market without seeking membership of the GATT/WTO. On the other hand, an exporting GATT/WTO member trading with a non-member of the GATT/WTO, is likely to face unfavorable tariff structures of the nonmember importer since the importer country has no obligations to liberalize its trade. Theoretically, this means that for trade flows involving one member in the bilateral flow, pairs with only member importers are expected to have more trade than pairs involving only member exporters. So, to account for these effects, we separate the WTO_onein_{ijt} variables into $Import\_only_{ijt}$ and

Exporter_only$_{ijt.}$ The gravity model that includes structural GATT/WTO effects, time-varying importer and exporter fixed effects but omits zero trade flows is as follows:

$$x_{ijk}^{k} = \alpha_{it}^{k} + \alpha_{jt}^{k} + \sum_{n=1}^{N} \beta_{n}^{k} Other_{ijt}^{k} + \lambda_{1gp}^{k}(Bothin_{gp})_{ijt} + \lambda_{2gp}^{k}(IMPin_{gp} \_ EXPNot_{gp})_{ijt}, \quad (4)$$
$$+ \lambda_{3gp}^{k}(IMPNot_{gp} \_ EXPin_{gp})_{ijt} + \varepsilon_{ijt}^{k}$$

where x_{ijk}^{k} is the logarithm of the value of unidirectional imports of country *j* from country *i* in sector *k* (AG or NONAG), α_{it}^{k} and α_{jt}^{k} are the time varying exporter and importer fixed effects, respectively to control for each country's multilateral resistance terms. $Other_{ijt}^{k}$ is the vector of time varying trade promoting and trade impending factors as already defined in equation (1) and (2). $(Bothin_{gp})_{ijt}$ is a dummy variable equal to one if the importing country *i* and exporting country *j* are both members of GATT/WTO, $(IMPin_{gp}\text{-}EXPNot_{gp})_{ijt}$ is a dummy variable equal to one if the importing country *j* is a member of GATT/WTO but not the exporting country *i*, $(IMPNot_{gp}\text{-}EXPin_{gp})_{ijt}$ is a GATT/WTO dummy variable equal to one if the importing country *j* is not a member of GATT/WTO but the exporting country *i* is a member.

The subscript *gp* on the GATT/WTO dummy variables is a country grouping variable used to categorize countries by geographical location (i.e., inter-African versus Intra-African), development status or income level, and tariff clusters of the importing and exporting African countries. We use the categories of countries by development or income status as defined by Grant and Boys (2011) i.e., i) high income (developed) countries (HIC); ii) middle income (developing) countries (MIC); and iii) low income (least developed) countries (LIC). This classification is intended to capture and or test the asymmetric treatment of GATT/WTO trade liberalization agreements on countries in different development categories. It should be remembered that while developed and developing countries were required by the Agreement on Agriculture to reduce

their tariffs tremendously, the least developed countries were exempted from tariff reductions and were only required to either convert their non-tariff measures (NTMs) to tariffs or bind their tariffs and create ceiling which they cannot change in future (Uruguay Round Agreement on Agriculture (URAoA)). By categorizing countries in this manner, we can study the impact of GATT/WTO on intra- and inter-African trade more generally and then investigate this impact for agriculture and non-agricultural trade of the MICs and LICs in Africa. Effectively, this allows us to delineate the actual share of African country GATT/WTO membership benefit in terms of trade promotion.

Further, the United States Department of Agriculture (USDA) categorizes African countries into three groups according to their average agricultural ad valorem tariffs rates: Sub-Saharan Africa, Northern Africa, and Southern Africa. According to USDA (2001), Southern African countries have the lowest average tariffs (about 38%), followed by North Africa (about 65%) while sub-Saharan African countries have the highest tariff rates (about 78%). We use these differences by region to account for the differences in protection levels exhibited by the different regions in Africa. We use country classifications from the African Development Bank website to create the three groups. [2]

In particular, we address three key issues. First, we investigate whether the GATT/WTO has contributed to the intra-African trade despite the fact that all African countries produce and export agricultural products and raw materials for which liberalization has been limited. To accomplish this we replace variables $(Bothin_{gp})_{ijt}$, $(IMPin_{gp}\text{-}EXPNot_{gp})_{ijt}$ and $(IMPNot_{gp}\text{-}EXPin_{gp})_{ijt}$ in equation (3) with four new variables: $intra\text{-}Africa\_bothin_{ijt}$, a dummy variable which equals one if both countries in the bilateral pair are African and are members of GATT/WTO in a

[2] http://www.afdb.org/en/countries/central-africa/

particular year and zero otherwise; *intra-Africa_onein*$_{ijt}$, a dummy variable which equals one if both countries in the bilateral pair are African and only one of the countries is a member of the GATT/WTO and zero otherwise; *inter-Africa_bothin*$_{ijt}$, a dummy variable which equals one if one of the countries in the bilateral pair is not African but both countries are members of the GATT/WTO and zero otherwise; and *inter-Africa_onein*$_{ijt}$, a dummy variable which equals one if one of the countries in the bilateral pair is not from the African continent and only one of the countries is a member of the GATT/WTO and zero otherwise.

Second, we investigate whether the GATT/WTO promotes agricultural trade among MICs and LICs with a case of Africa. To accomplish this, we categorize countries using the following variables: *dev'tImp_dvgExp_bothin*$_{ijt}$, a dummy variable which equals one if a developed country imports from a developing African country and both are members of the GATT/WTO and equals zero otherwise. *dev'tImp_ldcExp_bothin*$_{ijt}$, a dummy variable which equals one if a developed country imports from a least developed African country and both are members of the GATT/WTO and zero otherwise. *dvgImp_ldcExp_bothin*$_{ijt}$, a dummy variable which equals one if a developing country imports from a least developed African country and both are members of the GATT/WTO and zero otherwise. *dvgImp_dvgExp_bothin*$_{ijt}$ a dummy variable which equals one if developing country imports from a developing African country and both are members of the GATT/WTO and zero otherwise. *ldcgImp_ldcExp_bothin*$_{ijt}$ a dummy variable which equals one if a least developed country in the rest of the world imports from a least developed African country and both are members of the GATT/WTO and zero otherwise. Variables with *Onein* carry the same description only that one of the countries in the bilateral pair is a member of the GATT/WTO.

Third, we investigate whether the GATT/WTO promotes trade within and between African countries under the three different tariff clusters. To accomplish this we create four variables: *intra_cluster_bothin*$_{ijt,}$ a dummy variable which equals one if both countries in the bilateral pair are African, belong to the same tariff cluster, and are both members of the GATT/WTO *intra_cluster_onein*$_{ijt}$, a dummy variables which equals one if the two countries in the bilateral pair are African, belong to the same tariff clusters, and one of them is a member of the GATT/WTO, *inter_cluster_bothin*$_{ijt}$, is a dummy variable which equals one if both countries in the bilateral pair are African, belong to different tariff clusters, and both are members of the GATT/WTO, *inter_cluster_onein*$_{ijt}$, group African countries according to their tariff clusters.

To solve this zero-trade flow problem, the literature offers a few solutions which include: (i) ignore the zeroes, (ii) add a small value to the trade flows (i.e., $1+X_{ijt}$), (iii) assume some sort of truncation or data censoring, (iv) Use the two step Heckman procedure to control for selection bias, and (v) the use nonlinear estimators such as Santos Silva and Tenreyro (2006)'s Poisson Pseudo-Maximum-Likelihood (PPML) estimator (De Benedicts and Taglioni, 2011). Using simulations, this estimator has been found to be a consistent and workhorse estimator in the presence of heteroskedasticity and zero trade flows in the dependent variable (Santos Silva and Tenreyro 2006; Silva & Tenreyro 2010; Silva & Tenreyro 2011). We therefore choose to estimate our gravity model with the PPML estimator. The model that uses the PPML estimator and accounts for multilateral resistance terms, and zero trade flows is specified as follows:

$$x_{ijk}^{k} = \exp\left\{\begin{array}{c}\alpha_0 + \alpha_t + \alpha_{jt} + \sum_{n=1}^{N}\beta_n^k Other_{ijt}^{k} + \lambda_1^k (Bothin)_{ijt} + \lambda_2^k (IMPin\ \_EXPNot\ )_{ijt} \\ + \lambda_3^k (IMPNot\ \_EXPin\ )_{ijt} + \varepsilon_{ijt}^{k}\end{array}\right\} \quad (5)$$

Where all variables are constructed as before but the dependent variable is now in levels.

III. Data and Data sources

Bilateral trade data for the period of 1990-2014, are collected from the United Nations Commodity Trade (UN COMTRADE) database. This database contains detailed imports and export statistics reported by nearly 200 countries. It has accumulated annual trade data from 1962 to the most recent year. The trade data is listed under different classification systems (i.e., Standard International Trade Classification (SITC), Harmonized System of Classification (HS), and Classification by Broad Economic Categories (BEC)). We draw trade data classified under the Harmonized System of Classification (HS). Thus, we can categorize products in a way that allows us to group products systematically. The database lists 97 product chapters (i.e., product aggregation at the two-digit level) and an additional chapter labelled HS99 for products not specified anywhere else. We use this product aggregation information to separate agricultural and nonagricultural trade. We categorize product chapters 01 (HS01: Live Animals) to 24 (HS24: Tobacco and manufactured tobacco substitutes) as agriculture (food) and product chapters 25 (HS25: salt, Sulphur, earth, stone, plaster, lime and cement) to 97 (HS97: works of art. Collectors

pieces and antiques) as nonagricultural.[3] To be complete, we have also included chapter 99 (HS99) which contains commodities not elsewhere specified as part of the nonagricultural trade[4].

Following De Benedictis and Taglioni (2011), we use unidirectional bilateral import values on a nominal basis. Similar data has been used by Liu (2009) and Grant and Boys (2011). In fact, Liu (2009) notes that import data are regarded as more reliable or accurate than export data because customs are more interested in tracking import for tariff revenue collection. Moreover, because most the African countries are least developed, there are issues obtaining export data on each of these countries for all the periods under study. Therefore, we use rest of the world's imports of both agricultural and nonagricultural products from African countries.

However, the UNCOMTRADE database does not report missing or zero trade flows. To overcome this limitation, we follow the procedure similar to the one used in Grant and Boys (2011). We assume that in an ideal trade environment, all countries free to trade with all other countries in the world. This means that, countries in the rest of the world would like to import all products from all the African countries for all the years of our study. Therefore, if in a given year a country reports importing from only five countries out of the 53 African countries in our study,

[3] The 24 agricultural chapters are: Live Animals (HS01), Meat and edible meat offal (HS02), Fish, Crustaceans , mollusks, aquatic invertebrates (HS03), Dairy products eggs, honey, edible animal products (HS04), Products of animal origin (HS05), Live trees, plants, bulbs, roots, cut flowers (HS06), Edible vegetables and certain roots and tubers (HS07), Edible fruit, nuts, peel of citrus fruit, melons (HS08), coffee, tea, mate and spices (HS09), Cereals (HS10), milling products, malt, starches , inulin, wheat gluten (HS11), Oil seed, Oleagic fruits, grain, seed, fruit, etc (HS12), Lac, gums, resins, vegetable saps and extracts nes (HS13), Vegetable plaiting materials, and vegetable products nes (HS14), Animal, vegetable fats and oils, cleavage products, etc (HS15), Meat, fish and seafood food preparations nes (HS16), Sugars and sugar confectionery (HS17), Cocoa and cocoa preparations (HS18), Cereal, flour, starch, milk preparations and products (HS19), Vegetable, fruit, nut, etc food preparations (HS19), Miscellaneous edible preparations (HS20), Beverages, spirits and vinegar (HS21), Residues, wastes of food industry, animal fodder (HS23), Tobacco and manufactured tobacco substitutes (HS24).

[4] The problem with the data under the HS classification is that many countries have missing data for different years. To reduce missing data, the data was drawn from the database as HS are reported. In this case the data constitutes trade flows for the different versions of HS.

for that particular year we assign a value of zero to the imports from all the other countries for which data are not reported. But if a country has no record of trade with any country for a given year, we do not assign zero values, and in this case, we do not include trade flows for that year. For example, countries such as South Africa, Lesotho, Swaziland, Namibia and Botswana have missing data for the period of 1990-1997 and thus no observations are recorded in our sample for these countries over these years.

Note that there have been some inceptions of new nations as a result of splitting during the study period (e.g., the breaking up of Sudan into South Sudan and Sudan in 2012 and the breaking off of Eritrea from Ethiopia in 1991). Also, some countries have dissolved and new countries have emerged (i.e., the dissolution of Czechoslovakia into Slovakia and Czech Republic in 1993). Although Liu (2009) recommends that such countries should be deleted on grounds that they might contaminate the results especially relating to extensive margins of trade, in our case we have chosen to only drop South Sudan because the other countries have enough years of observations after the splitting and emergence in our sample.

Data on nominal (reported at current prices in US dollars) gross domestic product (GDP) are collected mainly from the World Bank (WDI) and the United Nations National Accounts (UNNA).[5] GDP data for the countries that are not reported in WDI or UNNA are collected from various sources.[6] Data on distance, contiguity, common language, and colonial ties are sourced

[5] http://data.worldbank.org/indicator/

[6] GDP data for Anguilla is collected from: http://www.kushnirs.org/macroeconomics_/en/anguilla__gdp.html (accessed on May 6th, 2016). GDP data for Neth. Antilles is collected from: http://www.kushnirs.org/macroeconomics_/en/netherlands_antilles__gdp.html. GDP data for Cook Islands is collected from: http://www.kushnirs.org/macroeconomics_/en/cook_islands__gdp.html. GDP data for Myanmar is collected from: http://www.kushnirs.org/macroeconomics_/en/myanmar__gdp.html. GDP data for Montserrat is collected from:

from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) geo-distance dataset (Mayer and Zignago 2006). [7]

The indicator variable on GATT/WTO membership is constructed by accounting for the year a country became a member. This is done for both the importing and exporting countries. As of 29th July 2016, the WTO lists 164 members including the European Union.[8] In our data, we consider trade of each of the 15 member countries of the EU separately because in our trade data we have no trade partner called the European Union. Because our study period is 1990 to 2014, countries that have accessed WTO after 2014 are assigned a value of zero for the WTO membership. These countries include: Kazakhstan (KAZ-2015), Seychelles (SYC-2015), Afghanistan (AFG-2016), and Liberia (LBR-2016). The WTO also lists 22 observer governments which are yet to be WTO members.[9] The indicator variable for WTO membership involving these countries has a zero value for all the years in our study period.

Data on Regional Trade Agreements (RTAs) are accessed from the WTO website[10]. By February 2016, the WTO reports to have received 454 notifications of RTAs (counting goods, services, and accessions together). Out of these, 267 are currently in force. Regional Trade

http://www.kushnirs.org/macroeconomics_/en/montserrat__gdp.html.
GDP data for Turks and Caicos Islands is collected from:
http://www.kushnirs.org/macroeconomics_/en/turks_caicos_islands__gdp.html.
No GDP data sources could be found for Guadeloupe, French Guiana, Martinique and, Wallis and Fatuna Islands. Additional data is obtained from the national accounts main aggregates database. http://unstats.un.org/unsd/snaama/dnllist.asp. Other countries such as Afghanistan have missing data for the period 1988-2000, Aruba (1988-1994), Faeroe Islands (1988 to 1997) among others.

[7] The other trading partners for Africa include: Montenegro (MNE), Mayotte (MYT), State of Palestine (PSE), Romania (ROU), Serbia and Montenegro (SCG), Serbia (SRB) and Timor –Leste (TLS) but these have been dropped from the dataset because they are not listed in the CEPPII files for distance data

[8] https://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm

[9] Afghanistan, Algeria, Andorra, Azerbaijan, Bahamas, Belarus, Bhutan, Bosnia and Herzegovina, Comoros, Equatorial Guinea, Ethiopia, Holy see (Vatican), Iran, Iraq, Lebanese Republic, Liberia, Republic of Libya, Sao Tome and Principle, Serbia, Sudan, Syrian Arab Republic, Uzbekistan.

[10] http://rtais.wto.org/UI/PublicAllRTAList.aspx

Agreements are categorized as Free Trade Areas (FTAs), Customs Unions (CU), Free Trade Agreement and Economic Integration Agreement (FTA &EIA), Customs Union and Economic Integration Agreement (CU&EIA), and Partial Scope Agreements (PSA). In our analysis, we create two categories of regional agreements: i) the Customs Union which includes both the Customs Union (CU) and the Customs Union and Economic Integration Agreement (CU&EIA); ii) Regional Trade Agreement (RTA) which includes the Free Trade Area (FTA), Free Trade Agreement and Economic Integration Agreement (FTA&EIA) and the Partial Scope Agreement (PSA). These variables are constructed as binary variables which equals unity if both the importer (*j*) and exporter (*i*) countries in the bilateral pair are members of the trade agreement in a given year, and zero otherwise.

Due to the nature of our trade data which includes exports from African countries to the rest of the world, we identify six (6) customs unions and these include: Common Market for Eastern and Southern Africa (COMESA), East African Community (EAC), Economic and Monetary Community of Central Africa (CEMAC), Economic Community of West African States (ECOWAS), Southern African Customs Union (SACU), and the West African Economic and Monetary Union (WAEMU). We also identify sixteen (16) Free Trade Areas associated with African Countries.[11] lastly, we identify three (2) Partial Scope Agreements (PSAs): Global System of Trade Preferences among Developing Countries (GSTP) 1989, Mauritius-Pakistan 2007, and the Protocol on Trade Negotiations (PTN) 1973.

[11] EFTA - Egypt (2007), EFTA - Morocco (1997), EFTA-SACU (2008), EFTA _Tunisia (2005), EU - Algeria (2005), EU - Côte d'Ivoire (2009), EU - Eastern and Southern Africa States Interim EPA (2012), EU - Egypt (2004), EU - Morocco (2000), EU - South Africa (2000), EU - Tunisia(1998), Pan-Arab Free Trade Area (PAFTA)-1998, Southern African Development Community (SADC-2000), Turkey - Morocco (2006), Turkey - Tunisia (2005), US - Morocco (2006)

Data on Preferential Trading Arrangements (PTAs) or Generalized System of Preferences (GSPs) is obtained from the WTO website.[12] To date, there are 29 preferential trading arrangements.[13] Like other contemporary studies, our analysis considers the U.S. preferences extended to African Nations under the African Growth and Opportunity Act and the EU preferences extended to the African countries.

In summary, our panel dataset consists of 193 importing countries in the rest of the world that import from 53 African countries. It should be noted that among the 193 importing countries 46 are African countries (see Appendix 2 for the list of countries considered). The data spans from 1990–2014 at two-year regular intervals. Table 1 below shows summary statistics of the key gravity model variables. The positive agricultural (AG) and non-agricultural (NONAG) data contain 33991 and 49240 observations respectively. In the AG data set, trade between members of the GATT/WTO accounts for 75% of the AG trade flows, trade involving one member of the GATT/WTO accounts for 24% of the AG trade flows while only 1.7 % of the trade flows exist between nonmembers of the GATT/WTO.

In the NONAG dataset, trade between members of the GATT/WTO accounts for 73% of the total NONAG trade flows, trade involving one member in a bilateral pair accounts for 25% of the trade flows, and trade involving nonmembers accounts for 2 % of the trade flows. It should also be noted that out of the 53 African exporting countries, only eleven countries are not members

[12] http://ptadb.wto.org/ptaList.aspx

the GATT/WTO during the study period.[14] Out of the 193 importing countries, 33 countries are not members of the GATT/WTO during the study period[15].

Table 1. Key Gravity Model Variables

Variable	Description	Mean n=33991	Std. Deviation
$Total\_Ag_{ijt}$	Total unidirectional trade in Agriculture	9823164	4.71e+07
$GDPimp_{jt}$	Gross Domestic Product of the importing country	6.38e+11	1.79e+12
$GDPexp_{it}$	Gross Domestic Product of the exporting country	3.68e+10	7.79e+10
$Dist_{ij}$	Distance between important cities	6385.516	3573.287
$Contig_{ij*}$	Countries share a common boarder	0.037	0.189
$Lang_{ij}$	Countries share common official language	0.272	0.445
$Colonyij_{*}$	Countries have ever had a colonial link	0.020	0.138
$Comcol_{ij*}$	Countries have had a common colonizer after 1945	0.150	0.357
$Colony\_1945_{ij*}$	Countries have had a colonial relationship after 1945	0.015	0.123
$Same\ Ctry_{ij}$	Countries were the same country	0.020	0.141
Area /Area	Product of the Area of Country *i* and *j*	24.450	3.021
$Landlocked_{ij*}$	Number of Landlocked countries	0.414	0.577
$Island_{ij}$	Number of Island countries	0.151	0.376
CU_{ijt*}	Countries are members of the Customs Union	0.072	0.258
RTA_{ijt*}	Countries are members to a Regional trade agreement	0.156	0.363
GSP_{ijt*}	Importer country grants Generalized System of Preferences to the exporter	0.201	0.401
$Bothin_{ijt*}$	Both countries are members of GATT/WTO	0.745	0.436
$Onein_{ijt*}$	One of the countries is a member of GATT/WTO	0.237	0.425
None_WTO	Both countries are not members of the GATT/WTO	0.018	0.132

*Indicator variables taking the value of one if the condition holds. These statistics are for the AG dataset.

[14]African exporting countries that are not GATT/ WTO members: Comoros (COM), Algeria (DZA), Eritrea (ERI), Ethiopia (ETH), Equatorial Guinea (GNQ), Liberia (LBR—Joined 2016), Libya (LBY), Sudan (SDN), Somalia (SOM), Seychelles (SYC-not considered because it joined in 2015) and Sao Tome and Principle (STP).

[15] Importing countries that are not GATT/WTO members: 33 members Aruba (ABW), Afghanistan (AFG-joined 2017), Anguilla (AIA), Andorra (AND), Antigua (ANT), Azerbaijan (AZE), Bahamas (BHS), Bosnia and Herzegovina (BIH), Belarus (BLR), Bermuda (BMU), Bhutan (BTN), Cook Islands (COK), Comoros (COM), Algeria (DZA), Eritrea (ERI), Ethiopia (ETH), Faeroe islands (FRO) , Micronesia (FSM), Greenland (GRL), Iran (IRN), Kiribati (KIR), Lebanon (LBN), Libya (LBY), Montserrat (MSR), New Caledonia (NCL), Palau (PLW), French Polynesia (PYF), Sudan (SDN), Sao Tome and Principle (STP), Syria (SYR), Turks and Caicos Islands (TCA), Turkmenistan (TKM), Tuvalu (TUV).

IV. Estimation Results

The results are presented in two parts: Part One and Part Two. Part One has three subsections. The results in this part are estimated using positive trade flows. Estimations in this part use equations (1), (2), and (4) to facilitate comparison with the results reported in the literature. In subsection I, we present the results of the benchmark specification, a log-linear gravity estimation similar to the one presented in Rose (2004a) but applied to unidirectional total import data. These results are displayed in column 1 of table 2. The table also present results using Grant and Boys (2011) AG and NONAG specifications but now applied to African exports for the period 1990 -2014. The results of this table are intended to provide a general overview of the impact of GATT/WTO on African country exports. In subsection II, we present results of the impact of GATT/WTO on trade among African countries (intra-African trade) versus trade between African and non-African countries in the ROW (inter-African trade). The results of this analysis are presented in table 3. In subsection III, we examine the disproportionateness in members' trade resulting from differences in import tariffs charged by different groups of African countries. We refer to these country groups as tariff clusters.

Part Two results are estimated using bilateral trade flow data for AG and NONAG trade that includes zero trade flows. The estimations in this part allow us to account for trade growth in existing trade relationships (intensive margin) and trade growth due to changes in the number of active bilateral trade relationships (extensive margin). In addition to the categorization of countries considered in part one, we also investigate the differences in members' trade resulting from differences in development status. We categorize countries as either developed (high income), developing (medium income) or least developed (low income) countries. The results in this section

are estimated using the PPML estimator of Santos and Tenreyro (2006,2009,2011). The results for this part are displayed in tables 5, 6, and 7.

Part I Results

Subsection I: An Over View of the Impact of GATT/WTO Membership on African's Trade

The results in this subsection are intended to provide a general overview of the impact of GATT/WTO on African exports. The results are presented in table 2. In column 1, we use Rose's basic log-linear gravity model stated in equation (1) but in our case the dependent variable is a natural log of total unidirectional imports from 53 African countries. In column 2, we use Grant and Boys (2011) log-linear estimation (equation 2) to separate the GATT/WTO impact on agricultural (AG) and nonagricultural (NONAG) trade flows. Given the panel nature of our data, we are faced with choosing the panel data model that best fits our data. A comparison of the random effects (RE) model and the fixed effects (FE) model using the Hausman's test rejects the RE model in favor of the FE (Cameron and Trivedi, 2010; Cameron and Trivedi, 2005; Cameron and Trivedi, 2009). We, therefore, opt to continue our analyses with the FE model. The advantage of using the fixed method is that each country is modeled as its own control. This is accomplished by making comparisons within individual countries and then averaging those differences across all countries in the sample (Allison, 2006).

All estimations in this subsection use positive trade flows and thus they only account for the impact of GATT/WTO at the intensive margin of trade (trade among already existing trade partners). Columns 1&2 have year fixed effects, column 3 has year dummies and time-invariant country-pair fixed effects, to account for cross-sectional variation in the data. Column 4 has time varying country-specific fixed effects and time invariant bilateral pair fixed effects. In all the

estimations, standard errors are robust to clustering by country pairs. The coefficients on $bothin_{ijt}$ are positive in all cases and are very large compared to the coefficients presented in Rose (2004), Liu (2009), and Grant and Boys (2011) for similar specifications. All coefficient estimates of the gravity model covariates under the different specifications have the expected signs as per the theory of the gravity model.

The results in column 1 are particularly interesting, total exports from African GATT/WTO members to GATT/WTO members in the ROW have grown by 194% (= (exp (1.08)-1) *100) more than trade among non-members. This result is a complete opposite of what Rose (2004) found but similar to the results of Lui (2009) and Grant and Boys (2011). The results in column 4 indicate that AG trade among GATT/WTO members has grown by 100% ((exp (0.69)-1) *100) more than trade among non-members. The NONAG trade among GATT/WTO members has increased by 53.7 % ((exp (0.43)-1) *100) more than trade among nonmembers. These results also highlight that GATT/WTO membership has not had trade diversion effects at the intensive margin of trade for both AG and NONAG trade. The estimated impacts on trade resulting from one country in a bilateral pair being a member are positive for all specifications. It should be noted that, these average effects mask large differences across countries.

Further, the estimated impact of GATT/WTO membership is consistently larger for AG relative to NONAG trade, a finding similar to what Grant and Boys (2011) reports. On the average, these results show that African countries with GATT/WTO membership have had more trade with other members of GATT/WTO than African countries without membership trading with other nonmembers in the rest of the World. The results in column 4 are considered more reliable because the specification passes the omitted variables test (RESET Test). The limitation with these results is that they do not account for heterogeneity of countries.

Table 2. GATT/WTO Membership Effects on African Exports, Panel Data, 1990-2014

	1. Total Trade	***2. AG vs NONAG (Year dummies)***		***3. Time and time invariant bil. fixed effects***		***4. With time-varying importer and exporter FE &time invariant Bil.***	
		AG	**NONAG**	**AG**	**NONAG**	**AG**	**NONAG**
lnGDPimp	1.00***	0.74***	0.93***	0.25***	0.22***		
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)		
lnGDPexp	0.84***	0.62***	0.83***	0.13***	0.04***		
	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)		
$lnDist_{ij}$	-1.21***	-0.73***	-1.25***				
	(0.05)	(0.06)	(0.05)				
$Contig_{ij}$	1.25***	1.31***	1.30***				
	(0.21)	(0.23)	(0.22)				
$Lang_{ij}$	0.64***	0.33***	0.77***				
	(0.07)	(0.10)	(0.08)				
$Colony_{ij}$	2.12***	1.34**	1.69***				
	(0.36)	(0.64	(0.58)				
$Comcol_{ij}$	0.50***	0.41***	0.35***				
	(0.09)	(0.12)	(0.10)				
$Colony\_1945_{ij}$	-0.46	0.47	-0.13				
	(0.44)	(0.70)	(0.65)				
Same $Ctry_{ij}$	0.13	0.37	-0.08				
	(0.27)	(0.31)	(0.26)				
$ln(Areai*Areaj)_{ij}$	-0.06***	-0.06***	-0.03**				
	(0.01)	(0.02)	(0.01)				
$Landlocked_{ij}$	-0.53***	-0.26***	-0.77***				
	(0.05)	(0.07)	(0.05)				
$Island_{ij}$	0.00	0.09	0.09				
	(0.08)	(0.12)	(0.09)				
CU_{ijt}	1.17***	1.15***	1.14***	0.73***	0.87***	0.56*	0.77***
	(0.13)	(0.16)	(0.14)	(0.31)	(0.20)	(0.30)	(0.21)
RTA_{ijt}	0.69***	0.49***	0.77***	0.22***	0.26***	0.12	0.18**
	(0.08)	(0.10)	(0.09)	(0.07)	(0.07)	(0.07)	(0.07)
GSP_{ijt}	0.11	0.45***	-0.24***	-0.57***	-0.40***	-0.53***	-0.32***
	(0.09)	(0.11)	(0.09)	(0.08)	(0.08)	(0.08)	(0.08)
$Bothin_{ijt}$	1.08***	1.03***	1.24***	0.74***	0.38**	0.69***	0.43**
	(0.16)	(0.22)	(0.18)	(0.24)	(0.21)	(0.25)	(0.17)
$Onein_{ijt}$	0.47***	0.28	0.54***	0.54***	0.06	0.53***	0.12
	(0.16)	(0.22)	(0.18)	(0.22)	(0.19)	(0.23)	(0.20)
N	***53185***	***33991***	***49240***	***33991***	***49240***	***33991***	***49240***
Adj R squared	***0.46***	***0.30***	***0.43***	***0.747***	***0.739***	***0.742***	***0.778***
RESET TEST		***F (1, 6168) = 153.55***	***F (1, 7849) = 669.41***	***F (1, 27802) = 159.32***	***F (1, 41370) = 364.05***	***F (1,27814) = 1.93***	***F (1, 41382) = 0.10***
Prob > F =		***0.0000***	***0.0000***	***0.0000***	***0.0000***	***0.1652***	***0.7563***

Note: The dependent variable is the logarithm of nominal bilateral imports of the ROW from African countries. Standard errors are in parentheses and are robust to clustering by country pairs. *, **, *** denotes the level of significance at 10 %, 5% and 1% respectively. Columns 1&2 have year fixed effects. Colum 3 year dummies and time invariant country pair fixed effects.

Subsection II: The Impact of GATT/WTO on Intra Versus Inter African Trade.

The results in this subsection are intended to provide empirical estimates of the differential impact of GATT/WTO membership on intra African trade (trade among African countries) versus inter-African Trade (trade between African and non-African countries). By separating the average impact of GATT/WTO membership on African trade into intra-African and inter-African, we are able to isolate Africa for a more precise estimate of the gains from GATT/WTO membership to the African continent. In addition, results in subsection I show that membership by one country in a bilateral pair is associated with a positive impact on trade. However, as was noted in section II, the structural formulation of the GATT/WTO hypothesizes that having the importing country only as a member has a more trade promoting impact than when only the exporter is a member. We therefore separate this impact to get more precise estimates. The results are presented in table 3 and all estimations include time varying importer, time varying exporter, and time invariant country pair fixed effects. It is important to note that, the estimations are based on a partition approach versus base approach to multiplicative dummy variables estimation[16].

In column one, we separate the impact of having importer only or exporter only with membership to the GATT/WTO. In column two, we separate the variable $bothin_{ijt}$ to create a variable that accounts for trade among African countries that are both members of the GATT/WTO *(intra_africa_bothin(ijt))* and one that accounttts for trade between African and non African countries that are both members of the GATT/WTO (*inter_africa_bothin(ijt)).* Our results are consistent with the structural formulation of the GATT/WO. Agricultural trade flows where only the importer has membership with GATT/WTO, have grown by 107.6% ((exp (0.73)-1) *100)

[16] For details on the partition approach see: Yip, P. S., & Tsang, E. W. (2007). Interpreting dummy variables and their interaction effects in strategy research. *Strategic Organization*, *5*(1), 13-30.

more than trade among nonmembers. On the otherhand, Agricultural flows trade flows where only the exporter has membership have 62.1% ((exp (-0.97)-1) *100) less trade than flows among nonmembers. However, is it not clear why the estimates on *bothin* become insignificant when the *importer only* and *exporter only* are included in the estimation.

Columns 2 & 3 separate the GATT/WTO membership effect for trade among African countries and trade between African countries and other countries in the ROW. The results in these columns suggest that GATT/WTO membership has had no impact on intra African agricultural and nonagricultural trade at the intensive margin of trade. These results are the same as the results estimated by Mujahid & Kalkuhl (2015) who estimates a non-significant impact of GATT/WTO on food trade. However, there is a positive and significant impact of GATT/WTO on inter African Agricultural and Non-Agricultural trade. Inter African Agricultural trade among GATT/WTO members has grown by 113.83% ((exp (0.76)-1) * 100) more compared to trade among nonmembers. Inter African nonagricultural trade among members of the GATT/WTO has grown by 75.07% ((exp (0.56)-1) * 100) more than trade among nonmembers. Noticeable here is that these figures are very similar to the figure reported for *bothin* in column 4 of table 2. This makes us to think that the observed growth in African Agricultural and nonagricultural trade is driven by inter African trade.

On the other hand, nonmember exports of Agricultural products to non-African member countries have grown by 120.34% ((exp (0.79)-1) *100). Nonagricultural exports from nonmember have also grown by 58.41% (=100*(exp (0.46)-1)). It is important to recall at this point that the nonmember exporting countries referred to here are: Comoros, Algeria, Eritrea, Ethiopia, Equatorial Guinea, Liberia, Libya, Sudan, Somalia, Sao Tome and Principle, and Seychelles.

Table 3. The Impact of GATT/WTO on Intra versus Inter African Trade, Panel 1990-2014

	1. Time Varying importer and Exporter fixed FE		***2. Time Varying importer and Exporter fixed FE (Onein)***		***3. With time-varying importer and exporter FE (Import only/Exporter only)***	
	AG	NONAG	AG	NONAG	AG	NONAG
CU_{ijt}	0.57*	0.79***	0.56*	0.78***	0.57*	0.79***
	(0.31)	(0.21)	(0.30)	(0.21)	(0.31)	(0.21)
RTA_{ijt}	0.10	0.15**	0.12*	0.18***	0.09	0.14*
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)
GSP_{ijt}	-0.53***	-0.31***	-0.53***	-0.32***	-0.53***	-0.31***
	(0.09)	(0.09)	(0.09)	(0.08)	(0.09)	(0.08)
Bothinijt	-0.33	-0.34				
	(0.26)	(0.21)				
WTO_Impin_{ijt}	0.73***	0.45**				
	(0.22)	(0.20)				
WTO_Expin_{ijt}	-0.97***	-1.32***				
	(0.27)	(0.22)				
Intra_African Bothin$_{ijt}$			-1.33	-0.99	-1.48	-0.71
			(1.56)	(0.64)	(1.44)	(0.64)
Intra_African Onein$_{ijt}$			-1.33	-0.76		
			(1.51)	(0.59)		
Inter_African Bothin$_{ijt}$			0.76***	0.56**	-0.33	-0.38**
			(0.25)	(0.22)	(0.26)	(0.23)
Inter_African Onein$_{ijt}$			0.59**	0.20		
			(0.24)	(0.21)		
IntraAfrican_Impin_Expnot$_{ijt}$					-0.94	-0.22
					(1.32)	(0.66)
IntraAfrican_Impnot_Expin$_{ijt}$					-2.40**	-1.00*
					(1.62)	(0.59)
InterAfrican_Impin_Expnot$_{ijt}$					0.79***	0.46***
					(0.23)	(0.21)
InterAfrican_Impnot_Expin$_{ijt}$					-0.96***	-1.41***
					(0.27)	(0.24)
Constant	44.00	14.28	52.73*	18.07	42.89	12.77
	(29.61)		(29.19)	(23.39)	(29.15)	(23.10)
N	*33991*	*49240*	*33991*	*49240*	*33991*	*49240*
Ad R squared	*0.743*	*0.737*	*0.742*	*0.736*	*0.743*	*0.737*

Note: The dependent variable is the logarithm of nominal bilateral imports of the Rest of the World from African countries. All estimations include time varying importer and time varying exporter fixed effects with robust standard errors (in parentheses). *, **, *** denotes the level of significance at 10 %, 5% and 1% respectively.

Subsection III: Do tariff differences explain why African countries do not trade among themselves?

This section investigates further the issue of intra African trade. The estimations in this section are based on a dataset containing only African countries. The assumption is that countries within a tariff cluster are likely to trade more among themselves. The strategy is to group trade flows among countries of the same tariff structure together and assess the trade differential due to GATT/WTO membership[17]. *Intra-cluster* trade refers to trade among South African countries, Northern African countries, and Sub-Saharan African countries. *Intra-cluster* trade refers to trade between clusters (i.e., Southern African countries and Northern African countries). In our dataset, intra-cluster trade accounts for 48.9 % of the total intra-African agricultural trade flows and 49.4% of the intra African nonagricultural trade flows. The results are presented in table 4. Our results suggest that even after controlling for tariff differences within the continent, we cannot find any evidence that of GATT/WTO has benefited intra African agricultural and nonagricultural trade.

We however, find a negative impact of GATT/WTO on inter-cluster nonagricultural trade. These results are consistent with results in column 2 of table 2. Up to this point, our results suggest that intra African agricultural and nonagricultural trade has not benefited from the GATT/WTO framework.

[17] We wanted to group Africa countries into three tariff clusters: Northern Africa, Southern Africa, and Sub-Saharan Africa and then study the differentials for within cluster trade and inter cluster trade resulting from WTO membership for each category. However, this has not been possible because, we cannot create all the dummy variables for each of these categories. Some categories have no observation in our sample: For example, there are no observations for trade flows between southern Africa and Northern Africa countries that are both nonmembers of the WTO. Consequently, we could not estimate the full model with all the necessary multiplicative dummy terms due to issues of multicollinearity.

Table 4: The Impact of GATT/WTO Intra-Cluster Versus Inter-Cluster Trade, Panel 1990-2014

	1. ***Time Varying importer and Exporter fixed FE***			2. ***Time Varying importer and Exporter fixed FE***	
	AG	NONAG		AG	NONAG
1. Intra_cluster_bothin$_{ijt}$	-2.79	-0.08	*1. intra_cluster_bothin*$_{ijt}$	-2.66	-0.05
	(2.02)	(0.97)		(1.84)	(0.96)
2. Intra_cluster_onein$_{ijt}$	-2.27	0.14	*2a. Intra_cluster_ImpOnly*	-1.95	0.30
	(1.93)	(0.93)		(1.66)	(0.95)
			2b. Intra_cluster_ExpOnly	-3.51	-0.07
				(2.11)	(0.98)
3. Inter_cluster_bothin$_{ijt}$	1.01	-2.71***	*3. Inter_cluster_bothin*$_{ijt}$	0.56	-1.88**
	(0.76)	(0.83)		(0.78)	(0.86)
4. Inter_cluster_onein$_{ijt}$	0.95*	-1.88***	*4a. Inter_cluster_ImpOnly*	0.95*	-0.62
	(0.54)	(0.72)		(0.54)	(0.95)
			4b. Inter_cluster_ExpOnly	-0.09	-2.01***
				(1.24)	(0.74)
constant	12.37	39.70	constant	14.82	40.53
	(47.68)	(35.72)		(48.18)	(35.79)
Number of Observations	7846	12638		7846	12638
Adjusted R squared	0.693	0.709		0.693	0.709

Note: The dependent variable is the logarithm of nominal bilateral imports of the Rest of the World from African countries. All estimations include time varying importer and time varying exporter fixed effects with robust standard errors (in parentheses). *, **, *** denotes the level of significance at 10 %, 5% and 1% respectively. Results for a dummy variable for membership in a customs union, a dummy variable for membership in a Regional Trade Agreement, time varying importer, and time varying exporter are not reported for brevity.

Part II Results

The results in this section are based on dataset containing zero trade flows. We use the Poisson Maximum Likelihood estimator proposed by Silva and Tenreyro (2006), Silva & Tenreyro (2010), and Silva and Tenreyro (2011). Therefore, our gravity estimates are based on model (5). The results are reported in tables 5, 6 and 7. In table 5, are the general results estimating the impact of GATT/WTO of African exports to the rest of the World. The results in column 3 are restricted to trade among African countries. It is important to note that the results in this part represent total trade benefits from GATT/WTO membership (i.e., both intensive and extensive margins).

Our results suggest that on average, GATT/WTO has promoted African AG and NONAG exports to the ROW. Agricultural Trade has grown by 249.03% ((exp (1.25)-1) *100) more for trade flows among countries with GATT/WTO membership than trade flows among nonmember countries. NONAG trade for the same sample of countries has grown by 289.61% ((exp (1.36)-1) *100) more for trade among members than trade among nonmembers. These results are statistically significant at 5% level of significance. Our results for Agricultural trade are different to the findings reported by Mujahid & Kalkuhl (2015). In their paper, the authors report that GATT/WTO has increased total trade by 154.5% but no significant impact for Agricultural trade. TGR estimates a 49.2 % impact of GATT/WTO for trade flows involving at least one Sub-Saharan country. But their results are not directly comparable since they use real total trade flows and trade involving at least one sub-Saharan country. The results in column two agree with our earlier hypothesis that trade flows involving *importer only* are expected to be higher than trade flows involving the *exporter only* as a GATT/WTO member.

Table 5: Impact of GATT/WTO of African AG & NONAG Exports, (with Zero flows)

	1.Bil. Imp_ Exp FE & Time dummies		***2.Bil. Imp_ Exp FE, Time dummies, (Asymmetric onein)***		***3. Bil. Imp_ Exp FE & Time dummies (Intra African trade.)***	
	AG	NONAG	AG	NONAG	AG	NONAG
$\ln GDPimp_{jt}$	0.33	0.85***	0.32	0.83***	-0.06***	-0.01
	(0.44)	(0.18)	(0.44)	(0.19)	(0.01)	(0.02)
$\ln GDPexp_{it}$	0.43***	0.01	0.43***	0.01	0.50*	0.05
	(0.07)	(0.01)	(0.07)	(31.9)	(0.19)	(0.04)
CU_{ijt}	0.15	-0.22	0.16	-0.22	-0.24	-0.39*
	(0.25)	(0.23)	(0.25)	(0.23)	(0.26)	(0.21)
RTA_{ijt}	0.02	-0.12	0.01	-0.12	-0.38	0.25
	(0.10)	(0.08)	(0.10)	(0.08)	(0.36)	(0.51)
GSP_{ijt}	-0.44**	0.10	-0.44**	0.12		
	(0.17)	(0.17)	(0.17)	(0.17)		
$Bothin_{ijt}$	1.25**	1.36***	0.29	1.05**	3.29***	0.81
	(0.55)	(0.49)	(0.49)	(0.45)	(1.02)	(1.03)
$Onein_{ijt}$	0.78**	0.88**			2.52***	0.56
	(0.37)	(0.39)			(0.90)	(0.43)
Imp_Only_{ijt}			0.83**	1.05**		
			(0.38)	(0.43)		
Exp_Only_{ijt}			-0.26	0.35		
			(0.42)	(0.37)		
N	***72725***	***93043***	***72725***	***93043***	***19131***	***24836***
R squared	***0.91***	***0.88***	***0.91***	***0.88***	***0.85***	***0.77***
RESET(Chi2(1))	***= 0.71***	***=4.09***	***= 0.60***	***= 4.37***	***= 0.21***	***= 0.01***
Prob > chi2	***= 0.40***	***=0.04***	***= 0.44***	***= 0.04***	***= 0.65***	***= 0.93***

Note: The results in this table are estimated using xtqml, all estimations include year dummies and robust standards error, reported in parentheses. *, **, *** denote the level of significance at 10 %, 5% and 1% respectively. RESET is the RAMSEY RESET TEST for omitted variables. Other estimations involving only the time dummies and bilateral pair country fixed effects do not pass the reset test and thus are not presented in this table.

In table 6, we compare estimates from data without zeros and data with zeros. We then use these estimates to separate the impact of GATT/WTO due to trade growth from existing trade partners (the intensive margins) and trade growth due to new trade relationships (the extensive margins. To save space, we report only the GATT/WTO policy variables of interest. Three scenarios are considered based on the definition of the policy variables. For each scenario, we estimate the gravity equation four times (i.e., estimations using data on positive AG flows, positive NONAG flows, AG with zeros, and NONAG with zero flows). In scenario 1, we consider trade

among African countries and we use the policy variable bothin that gives the general overview of the impact of GATT/WTO on Africa's trade. In scenario 2 we consider trade between African countries and the ROW. We disaggregate the policy variable into intra African and inter African trade. In scenario 3, we consider trade among African countries and we separate the GATT/ WTO policy variable to account for the different tariff clusters. All regressions use xtqml with year dummies and time invariant country pair fixed effects with robust standard errors.

The results in column 1 are the estimates for the impact of GATT/WTO at the intensive margin of trade. These results are estimated using the PPML estimator. Except for results in scenario 1, the rest of the results in this column are comparable to the results reported in part 1. One quick observation is that the results reach similar conclusions only that, the PPML estimator has larger estimates compared to those obtained under OLS. The results in column two are estimated with zero trade flow but using policy variables as defined in part 1. These results estimate the impact of GATT/WTO on African trade on both the intensive and extensive margin of trade. the difference between the results in column 1 and 2 for AG and NONAG give the estimate for the impact of GATT/WTO and the extensive margin. We report this estimate as share of the total margin.

The results are very informative. Membership in the GATT/WTO has no impact on African trade at the intensive margin (trade among already existing partners) but promotes African trade at the extensive margin of trade (trade resulting from new trading relationships). Thus, the growth in African Ag and NONAG trade under the GATT/WTO framework is 100 % driven by new trade relationships. At the extensive margin of trade, our results suggest that membership in the GATT/WTO increases intra African AG trade by 27,488.94 % ((exp (5.62)-1) *100), intra African

NONAG trade by 1735.68% ((exp (2.91)-1) *100), intra cluster AG by 4281.60% ((exp (3.78)-1) *100), intra cluster NONAG by 669.06% ((exp (2.04)-1) *100).

In addition, the estimates for AG are consistently larger than the estimates for NONAG trade. These results are surprising because agriculture has not received that much liberation as NONAG trade. This trend is like the one reported in Grant and Boys (2011). The authors attribute this result to several factors: "first, *developing countries have progressively reduced their own agricultural export tariffs. Second, GATT/WTO establishes procedures that reduce uncertainty in international transactions, makes rules that exemplify transparency among members about their trade policies, and provided legal means to circumvent discriminatory actions. Third, GATT/WTO facilitates coordination and thus gives incentive to countries to invest in new trading relationships.*

However, the fact that GATT/WTO does not promote trade at the intensive margin is an indicator of more serious underlying problems. The fact that trade at the cluster level is not significant points us to issues of infrastructure and the fact that countries within a cluster are likely to be more similar causing less basis for trade.

In table 7 we present results using country categories based on development status. Again, only results of the policy variables of interest are reported. By grouping countries as developed, developing, and least developed, we test the popular untested hypothesis that is implicit in many trade research papers studying the impact of GATT/WTO on trade. This hypothesis stems from the treatment the GATT gave to different country groups during the first eight rounds of negotiations. Exemptions from tariff reductions given to least developed countries are believed by most trade economist to have crippled the counties trade among themselves and trade with the developed and developing countries.

Table 6: Zero Trade Flows and the Extensive and Intensive Margin of Trade.

	Intensive Margins (1) PPML		Total margins (2) PPML		Extensive Margin of Trade	
	AG	**NONAG**	**AG**	**NONAG**	**AG, as a % of Total**	**NONAG, as a % of Total**
Scenario1	***Without Zero trade flows***		***With zeros trade flows***		***Trade among African countries***	
1. Bothin$_{ijt}^{a}$	**-0.53**	**-0.89**	**3.29*** **	**0.81**	**100%**	**0**
	(0.74)	**(1.01)**	**(1.02)**	**(1.03)**		
2. Onein$_{ijt}^{a}$	-0.10	-0.86**	2.52***	0.56		
	(0.62)	(0.41)	(0.90)	(0.43)		
Scenario 2	***Without zeros trade flows***		***With Zeros trade flows***		***Inter Vs Intra African Trade***	
1. Intra_Africa Bothin$_{ijt}^{b}$	**-0.08**	**-0.27**	**5.62*** **	**2.91*** **	**100%**	**100%**
	(0.79)	**(1.04)**	**(1.04)**	**(0.93)**		
2. Intra_Africa Onein$_{ijt}^{b}$	0.10	-0.86**	3.87***	1.61***		
	(0.67)	(0.43)	(0.94)	(0.56)		
3. Inter_Africa Bothin$_{ijt}^{b}$	1.30***	1.29**	1.23**	1.34***		
	(0.40)	(0.54)	(0.56)	(0.50)		
4. Inter_Africa Onein$_{ijt}^{b}$	0.86***	0.85**	0.77**	0.88**		
	(0.30)	(0.42)	(0.37)	(0.39)		
Scenario 3	***Without zeros trade flows***		***With Zeros trade flows***		***Intra Vs Inter Cluster***	
1. Intra_cluster_bothin$_{ijt}^{c}$	**-0.58**	**0.95**	**3.78*** **	**2.04*** **	**100%**	**100%**
	(0.48)	**(0.77)**	**(1.32)**	**(0.77)**		
2. Intra_cluster_onein$_{ijt}^{c}$	-0.95***	-0.35	2.03*	0.91*		
	(0.14)	(0.25)	(1.22)	(0.49)		
3. Inter_cluster_bothin$_{ijt}^{c}$	0.08	-2.29	3.45***	-0.04		
	(0.38)	(1.41	(0.98)	(1.37)		
4. Inter_cluster_onein$_{ijt}^{c}$	1.07***	-1.52**	3.67***	0.06		
	(0.08)	(0.72)	(0.85)	(0.73)		

Note: Coefficients reported in a, b, and c are estimated different equations. Each of the estimations are estimated four times to get estimates or AG and NONAG with and without zero trade flows. In all estimations, the dependent variable is bilateral trade in levels. In all estimations, variables are estimated but are simply not reported in this table. These variables include $GDP_{it\ (jt),}$ CU_{ijt}, RTA_{ijt}, and GSP_{ijt}. All estimations include year dummies and time invariant country pair fixed effects. The extensive margin of trade as share of total margin is calculated as: 1-{(exp(b_without zeros)/exp(b-withzeros)}

The results are presented in table 7. Two categories of results are reported, results for trade among African countries those for trade between African countries and the ROW. We also separate the policy variable with one country as a member into *import only* and *exporter only*.

Our results are reliable as the specifications pass the omitted variable test. A key finding in this result is that trade among developing countries has not been impacted by GATT/WTO membership. In addition, developing country imports from least developed countries have also not been impacted by GATT/WTO membership. Least developed country exports to developed countries have dropped under the GATT/WTO framework. However, GATT/WTO has promoted both AG and NONAG trade among least developed countries and least developed country imports from developing countries. The results suggest that AG trade among least developed countries has grown by 708.49% ((exp (2.09)-1) *100) more while NONAG trade has grown by 76.83% ((exp (0.57)-1) *100). AG trade between least developed importer and developing exporter has grown by 330.60% ((exp (1.46)-1) *100) while NONAG trade has grown by 44.77% ((exp (0.37)-1) *100).

Table 7: Asymmetric Effects of GATT/WTO Membership by Development Status

	PPML (including zero trade Flows) Including All Partners				***PPML (including zero trade Flows) Trade Among African Countries***			
	1.		***2.***		***3.***		***4.***	
	AG	**NONAG**	**AG**	**NONAG**	**AG**	**NONAG**	**AG**	**NONAG**
Asymmetric one in								
Dev'tImp_LdcExp_bothin$_{ijt}$	-0.42**	-1.20***	-0.42**	-1.19***				
	(0.20)	(0.45)	(0.20)	(0.45)				
DvgImp_DvgExp_bothin$_{ijt}$	0.27	-1.33	0.84	-2.70**	-0.71	-3.88**	-1.76	-4.51***
	(0.56)	(0.84)	(0.98)	(1.20)	(1.38)	(1.60)	(1.55)	(1.73)
DvgImp_LdcExp_bothin$_{ijt}$	0.35	-0.67*	0.34	-0.678	-0.21	-0.56	-0.21	-0.55
	(0.31)	(0.37)	(0.31)	(0.37)	(0.32)	(0.34)	(0.32)	(0.35)
***LdcImp_DvgExp_bothin*$_{ijt}$**	**1.46*** **	**0.37** **	**1.41*** **	**0.36** **	**0.66*** **	**-0.19**	**0.65*** **	**-0.19**
	(0.30)	**(0.17)**	**(0.27)**	**(0.17)**	**(0.25)**	**(0.23)**	**(0.24)**	**(0.23)**
***LdcImp_LdcExp_bothin*$_{ijt}$**	**2.09*** **	**0.57** **	**2.17*** **	**0.58*** **	**1.40*** **	**0.30**	**1.42*** **	**0.30**
	(0.29)	**(0.23)**	**(0.29)**	**(0.23)**	**(0.34)**	**(0.36)**	**(0.34)**	**(0.36)**
Dev'tImp_LdcExp_onein$_{ijt}$	1.18*	0.83***						
	(0.62)	(0.31)						
DvgImp_DvgExp_ onein$_{ijt}$	0.31	-0.47			0.95	-0.78		
	(0.71)	(0.84)			(1.30)	(1.48)		
DvgImp_LdcExp_ onein$_{ijt}$	0.10	-0.23			0.61	3.65***		
	(0.55)	(0.51)			(0.99)	(1.27)		
LdcImp_DvgExp_onein$_{ijt}$	-0.34	-0.98***			-0.08	-1.05***		
	(0.59)	(0.38)			(0.71)	(0.40)		
LdcImp_LdcExp_ onein$_{ijt}$	2.67***	-0.24			1.62	0.43		
	(1.02)	(0.51)			(1.24)	(0.85)		

Table continued next page.

	1.		*2.*		*3.*		*4.*	
Separating Onein	**AG**	**NONAG**	**AG**	**NONAG**	**AG**	**NONAG**	**AG**	**NONAG**
Dev'tImp_LdcExp_Impin$_{ijt}$			1.21*	0.83***				
			(0.62)	(0.31)				
***Dev'tImp_LdcExp_Expin*$_{ijt}$**			**-5.17*** **	**-4.39*** **				
			(0.92)	**(0.61)**				
DvgImp_DvgExp_ Impin$_{ijt}$			0.34	-0.08			-0.72	-0.64
			(0.72)	(0.90)			(1.31)	(1.43)
DvgImp_DvgExp_ Expin$_{ijt}$			0.87	-1.84			0.28	-1.77
			(1.01)	(1.21)			(1.78)	(1.61)
***DvgImp_LdcExp_ Impin*$_{ijt}$**			**0.14**	**0.58**			**0.60**	**3.80*** **
			(0.60)	**(0.81)**			**(0.92)**	**(1.15)**
DvgImp_LdcExp_ Expin$_{ijt}$			0.08	-0.29			0.05	-0.52
			(0.55)	(0.51)			(0.98)	(5.32)
***LdcImp_DvgExp_ Impin*$_{ijt}$**			**2.59*** **	**0.45**			**2.28** **	**-0.94***
			(0.79)	**(0.49)**			**(0.97)**	**(0.49)**
LdcImp_DvgExp_ Expin$_{ijt}$			-2.11**	-1.92**			-3.47***	-2.57**
			(0.97)	(0.83)			(1.10)	(1.06)
***LdcImp_LdcExp_ Impin*$_{ijt}$**			**3.18*** **	**-0.20**			**1.80**	**0.47**
			(1.06)	**(0.63)**			**(1.13)**	**(0.92)**
LdcImp_LdcExp_ Expin$_{ijt}$			0.78	-0.22			-0.51	0.30
			(0.68)	(0.54)			(0.46)	(0.55)
No. Of Observations	**72725**	**93043**	**72725**	**93043**	**19131**	**24836**	**19131**	**24836**
R Squared	**0.91**	**0.52**	**0.91**	**0.88**	**0.85**	**0.71**	**0.85**	**0.77**
RESET TEST (chi2(1))	***= 0.02***	***=0.15***	***= 2.26***	***= 0.37***	***= 0.02***	***= 1.88***	***= 0.16***	***= 1.64***
Prob > chi2	***= 0.89***	***=0.69***	***= 0.13***	***=0.54***	***= 0.89***	***= 0.17***	***=0.69***	***=0.20***

Note: Note: In all estimations, the dependent variable is bilateral trade in levels. In all estimations include $GDP_{it\,(jt),}$ CU_{ijt}, RTA_{ijt}, and GSP_{ijt} but their coefficient estimated are not reported to save space. All estimations include year dummies and time invariant country pair fixed effects and are estimated using xtqml. *, **, *** denotes the level of significance at 10 %, 5% and 1% respectively. The values in parentheses are robust standard errors.

V. Conclusion

This paper investigated the role of GATT/WTO in promoting trade among developing countries, least developed countries, and trade between developing and least developed countries, with a case of African. We use a panel of agricultural and nonagricultural import flows from 53 exporting African countries for the period 1990-2014 Following OLS framework similar to that in Grant and Boys (2011), we find that membership in the GATT/WTO does not impact intra African agricultural and nonagricultural trade at the intensive margin (table 3, column 3 & 4). The African country's exports have only gained from their membership by trading with non-African GATT/WTO members. Categorization of African countries per their levels trade liberalization in Agriculture has shown that, GATT/WTO has not impacted trade among countries within a tariff cluster and trade between countries in different clusters at the intensive margin of trade. sub-Saharan African agricultural and non-agricultural trade.

Going beyond the traditional log linear gravity model to incorporate zero trade flows, we used the Poisson Pseudo Maximum estimator to estimate trade benefits resulting from both the extensive and intensive margin of trade, and reduce the bias eminent in log linear gravity models by accounting for heteroscedasticity. We find that, on average, membership in the GATT/WTO increases trade in both agriculture and nonagricultural trade. These general results are not unique since several authors have had similar findings (i.e., Grant and Boys, 2011). The new finding our results research contribute to the existing literature on this topic is that membership in the GATT/WTO has no impact on African trade at the intensive margin (trade among already existing partners) but promotes African trade at the extensive margin of trade (trade resulting from new trading relationships). Thus, the growth in African AG and NONAG trade under the GATT/WTO

framework is 100 % driven by new trade relationships. Although not directly comparable, but on general terms, this results differs from the results reported by Liu (2009). Liu reports that GATT/WTO impact at the extensive margin dominated during the first five rounds of the GATT trade talks, while intensive margin dominates after 2005. Our results indicate the opposite, African trade under the GATT/WTO framework has thrived on new trading relationships with trading data for the period (1990-2014).

Further, our research has provided empirical estimates of the usually implicit assumption made by trade economists that developing and least developed countries may not have benefited from their membership as their developed country counterparts. Our results have shown that indeed, least developed countries export to developed countries have dropped among GATT/WTO members. Trade among developing countries and exports from least developed countries have had no change among GATT/WTO members, but exports of AG and NONAG products from developing to least developed countries have expanded. Most interesting is the finding that AG and NONAG trade among least developed countries has grown by 708.49% ((exp (2.09)-1) *100) and 76.83% ((exp (0.57)-1) *100) respectively.

Lastly, throughout our analysis, we find that the estimates for AG are consistently larger than the estimates for NONAG trade. These results are surprising because agriculture has not received that much liberation as NONAG trade. This trend is like the one reported in Grant and Boys (2011). The authors attribute this result to several factors: "first, *developing countries have progressively reduced their own agricultural export tariffs. Second, GATT/WTO establishes procedures that reduce uncertainty in international transactions, makes rules that exemplify transparency among members about their trade policies, and provided legal means to circumvent*

discriminatory actions. Third, GATT/WTO facilitates coordination and thus gives incentive to countries to invest in new trading relationships. However, the fact that GATT/WTO does not promote African trade in general and intra African trade at the intensive margin, is an indicator of more serious underlying problems. Several authors have highlighted that intra African trade flows are much lower than trade flows in other regions. These authors have attributed the low level of trade among African nations to the inadequate economic policies, infrastructure unavailability, and political instability.

The policy implication of these results is that, African countries that wish to increase their trade in AG and NONAG can benefit from seeking GATT/WTO membership. The strategy is to use the platform to create new relationships.

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Appendices