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Trade Agreements and Bilateral Trade in Sub-Saharan Africa: Estimating the Trade Effects of the EU-ACP PTA and RTAs

By

Festus Ebo Turkson

Abstract

This paper on Trade Agreements within SSA, is an assessment of the ex post bilateral trade effect of the European Union-African Caribbean Pacific Preferential Trade Agreement (EU-ACP PTA) and sub-regional regional trade agreements (RTAs) on bilateral trade involving SSA countries. The main objective is to find out if EU trade preferences and regional trade agreements within SSA had increased trade flows. Estimating a gravity model augmented with measures of trade agreements, the paper made use of bilateral trade flows and key gravity covariates from CEPII database on 73 countries (48 SSA and 25 EU countries) over the period 1960-2006.

After controlling for the endogeneity of the trade agreement dummy, accounting for multilateral price resistance and zero-valued trade flows, the findings indicate that the EU-ACP PTA and RTAs within ECOWAS and SADC have a positive and significant impact on bilateral trade involving SSA countries. In some cases the relative impact of the sub-regional RTAs was found to be stronger than the EU-ACP non-reciprocal PTA. The results therefore indicate the need for developing countries especially within SSA to focus on expanding and integrating regional markets in order to significantly improve trade performance.

JEL Classification: F10, F13, F14, O55, O57

Keywords: Trade Costs, Gravity Model, Bilateral Exports, International Trade, Domestic Trade, Developing Countries, Sub-Saharan Africa

Centre for Research in Economic Development and International Trade, University of Nottingham

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Outline

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1. Introduction and Motivation

Regional Trade Agreements (RTAs) mainly in the form of Free Trade Agreements (FTAs) and to a lesser extent preferential trade agreements (PTAs) and custom unions have been a major facet of the global multilateral trading system and trade relations among economies for well over fifty years. However since the early 1990s there has been a proliferation of RTAs and substantial research effort and empirical analysis has been devoted at assessing their economic impact, especially the North American Free Trade Agreement (NAFTA) (Haufbauer and Schott, 1992 and 1993; Krueger, 1999 and 2000; Helliwell, 1998 and 1999).

As at 31 July 2010, the World Trade Organisation (WTO) and the General Agreement on Trade and Tariffs (GATT) had been notified of 474 RTAs out of which 283 were in force. According to the WTO, FTAs accounted for 90% of the overall number of RTAs in force, while partial preferential agreements and customs unions account for 10%[1] . In spite of its popularity, the answer to the question of whether trade agreements increase bilateral trade flows among member countries has remained inconclusive ever since the seminal study by Tinbergen (1962). Using the gravity equation for international trade flows, Tinbergen (1962) sought to evaluate the effect of FTA dummy among other covariates on bilateral trade flows. The results from Tinbergen's study suggested that the average treatment effect of FTAs was economically insignificant in explaining bilateral trade flows among member countries of the British Commonwealth.

Following from Tinbergen (1962), the various studies that have attempted to estimate the ex post effects of FTAs have at best come up with mixed results. Bergstrand (1985), Harrigan (1993), Frankel, Stein and Wei (1995), Lee and Swagel (1997), Head and Mayer (2000), and Chen (2002) did not find statistically significant results. Aitken (1973), Brada and Mendez (1985), Trelfer (1993), Frankel (1997), Frankel, Stein and Wei (1998) and Baier and Bergstrand (2005) found FTAs to have a statistically significant impact on bilateral trade flows among member countries.

The inconclusiveness of the ex post treatment effect of FTAs was confirmed by Ghosh and Yamarik (2004) in one of the most extensive studies. The authors made use of the extreme-bound analysis to allow for the examination of a diverse set of FTA theories. Using cross-section data on the largest possible number of FTAs, Ghosh and Yamarik (2004) found no evidence of trade creation or trade diversion for any FTA, thereby concluding that the estimated average treatment effects of most FTAs are "fragile" (i.e. the estimates from various empirical analyses are sensitive to the exact set of regressors that are selected in each study).

An important issue that has arisen in quantitative estimates of the treatment effects of FTAs on international trade flows has been the issue of the exogeneity of the FTA dummy within the gravity framework. As indicated by Baier and Bergstrand (2007), the inability to find reliable ex-post estimates of the FTA average treatment effect could be attributed to the failure of most studies to address econometrically the endogeneity of FTAs. According to these authors FTA dummies are

[1] Source : http : //www.wto.org/english/tratop_e/region_e/region_e.htm

not exogenous random variables, rather, they should be treated as endogenous within the gravity framework because for reasons unobservable to the econometrician (such as political factors, nontariff barriers and domestic policies that inhibit bilateral trade), countries were more likely to select endogenously into FTAs.

After controlling for the endogeneity of the FTA variables, Baier and Bergstrand (2007) produced striking empirical results that indicated a significant effect of FTAs on trade flows; with trade between two FTA member countries approximately doubling 10 years after signing the FTA. An important contribution by Baier and Bergstrand (2007) was the use of treatment effects of FTAs to estimate the bilateral trade effects of trade policies. Until then, the econometric analysis of treatment effect had been applied mainly within the labour economics literature.

This paper follows Baier and Bergstrand (2007) by controlling for endogeneity of FTAs and in applying the treatment effect to estimate the ex post effect of RTAs and the EU-ACP PTA on bilateral trade flows involving 48 SSA countries using a panel of cross-sectional time series data from 1960 to 2006. This paper contributes to the trade literature on SSA and to the current debate on whether trade agreements involving SSA countries actually increase the trade flows of member countries. Recently, the potential contribution of trade agreements to trade flows within SSA has come up for debate. Theoretical and empirical arguments have been advanced to contest the potential positive ex post effect of RTAs within SSA. Theoretically it has been argued that given the similarities of comparative advantage and structural supply side characteristics, FTAs among SSA countries should not be expected to contribute significantly to bilateral trade flows of member countries. Empirically, the existence of institutional bottlenecks, the lack of political will and the nature of the complex web of overlapping RTA/PTA membership within SSA have been cited as factors that hamper SSA intra-regional trade thereby minimising the potential gains to trade that could have resulted in the absence of these factors.

The main reasons that have been assigned for the less than satisfactory trade performance of intra-Africa RTAs include lack of complementary products, high external trade barriers, the unwillingness of countries to import from high cost member countries when there are alternative lower cost non-member countries to import from, the unwillingness of governments to give up the sovereignty of their macroeconomic policies, lack of strong and sustained political commitment and the unwillingness of governments to accept unequal distribution of gains and losses arising from RTAs (Johnson, 1995, p 213; Lyakurwa et al, 1997, p 176). In spite of the inability of RTAs to increase bilateral trade among SSA countries, the increasing interest in RTAs has not waned. Currently some African-wide trade integration initiatives are in place with the intention to bring together intra-Africa RTAs and to establish regional trading blocs with Asia and America (e.g. South Africa establishing FTAs with China and India) and sign unto the Economic Partnership Agreement (EPA) to replace the non-reciprocal EU-ACP preferential trade agreement.

What motivates the increasing interest in RTAs in SSA if the trade enhancing impact of such RTAs has not been positive for SSA countries? Is it because SSA countries have realized from the experience of the EU, that the process of regional integration when properly managed enhances trade among members' more than cross-regional trade agreements?

2. Trade Agreements Within Sub-Saharan Africa

The global interest in economic integration and trade agreements has been generally driven by economic, political and security considerations. Economically, as argued by Crawford and Fiorentino (2005), the proliferation of trade agreements has been driven partly by the desire of many countries to gain access either bilaterally or multilaterally to larger markets in view of the unwillingness of WTO members to commit to further multilateral liberalisation. Thus, for those countries that consider trade agreements as a complement to MFN, participating in an RTA has served as a means to maintaining their market access opportunities where MFN-driven liberalisation has been absent. By their nature RTAs also promote trade liberalisation on multiple fronts by providing member countries with a competitive urge to liberalisation. In addition, as a vehicle to promoting regional integration, RTAs involve issues beyond goods trade and market access (dealt with multilaterally under the WTO) such as investment, competition, labour standards and the environment.

For developing economies, the proliferation of trade agreements since the 1990s has stemmed from the desire to implement domestic trade reforms aimed at opening up their economies at a sustainable pace to competitive liberalization, facilitating the integration of their economies into the world trading system (Crawford and Fiorentino, 2005). With respect to SSA, current efforts to put in place regional and sub-regional trade integration initiatives have been aimed at bringing together intra-Africa RTAs and to establish regional trading blocs with Asia and America.

2.1 Regional Trade Agreements within Sub-Saharan Africa

Theoretically Frankel, Stein and Wei (1995, 1996 and 1998) showed that in a world of identical countries (i.e. identical absolute and relative factor endowments), two countries close in distance (i.e. "natural trading partners") do benefit from an FTA more than two unnatural trading partners (i.e. "far apart"). Within SSA, RTAs have mainly involved countries belonging to a particular sub-region (i.e. "natural trading partners") although a few belong to more than one RTA, some of which are across sub-regions.

Most RTAs within SSA have been established mainly in line with the objectives underlying the founding of the five main Regional Economic Communities (RECs) that make up SSA. One of the main objectives that have underlined most regional integration efforts that have been championed by the RECs within SSA has been the need to achieve "collective self-sufficiency" for member

countries/states through the establishment of single large trading blocs in the form of free trade areas and/or custom unions. Without exception, all the main RECs in SSA namely the Economic Community of West African States (ECOWAS), the Economic Community of Central African States (ECCAS), the Southern Africa Development Corporation (SADC), the East African Community (EAC) and Intergovernmental Authority on Drought and Development (IGADD) have established RTAs in the form of free trade[2] .

Over the last decade, SSA has seen the emergence of cross-membership RTAs among countries belonging to different RECs in addition to the common markets that have been formed by two or more RECs. Yang and Gupta (2005) describe Sub-Saharan Africa (SSA) as a dense web of RTAs (both FTAs and PTAs), with many countries belonging to more than two RTAs. This has resulted in a complex web of overlapping RTA membership, and although it has created implementation problems for the countries involved there are efforts in place to establish more such agreements. The proliferation of cross-regional RTAs has also seen most SSA countries belonging to cross-continent trading blocs such as the EU-ACP and US African Growth Opportunity Act (AGOA).

Although the proliferation of RTAs in Africa can be attributed mainly to the desire of SSA countries to establish FTAs or custom unions within sub-regions in order to increase trade and attract foreign direct investment (FDI), there is no evidence of increased intra-Africa trade relative to trade with the developed and other non-African developing countries mainly because most RTAs within the SSA are very shallow. SSA countries continue to trade more with the EU, US and more recently Asia more than they do with RTA member countries within the continent. Ever since the signing of the Lomé Convention in 1975 between the EU and ACP countries, the EU, and in recent years the US, in order to promote economic development in the developing world especially SSA, have also resorted to the use of RTAs in the form of preferential access. Though it's been contended that the real motive is self-interested market access without concessions to WTO, the expectation is that giving preferential market access to the poor countries in the developing world would speed up the integration of such countries in the global trading system.

2.2 Trade Agreements with Sub-Saharan Africa

Most trade agreements between SSA countries and non-African countries have been with developed countries especially the European Union (EU) and the United States (US). These developed countries have over the past 40 years provided SSA and other developing countries preferential market access in the form of unilateral trade preference schemes, bilateral free trade agreements or non-reciprocal agreements. As the two largest importers of goods from SSA, the EU and US have several schemes and/or agreements with SSA countries, most of which are mainly aimed at assisting SSA to benefit from the gains of international trade in furtherance to ensuring economic growth and poverty reduction. Some of the several arrangements in place with SSA

[2]See appendix table 1 for the list of countries in the various SSA RTAs and the year of joining the RTA.

include the EU and US generalised system of preferences (GSP), EU's Everything but Arms (EBA) initiative[3], EU-ACP non-reciprocal PTA under the EU's Cotonou Agreement[4] and the US's African Growth and Opportunity Act (AGOA)

EU-ACP Preferential Trade Agreement

The European Union (EU) over the years has used preferential trade agreements as a key strategy in assisting the developing world catch up with trends in global trade and to reduce poverty. For over 40 years preferential trade agreements have remained one of the main components of development assistance that the EU has been offering to developing countries. Currently the objective of the EU's preferential arrangement is to assist developing countries to generate revenue through international trade so as to be able to reduce poverty.

The genesis of the EU's trade partnership with SSA can be traced back to the signing of the Yaoundé Convention I in 1962 between the then European Economic Commission (EEC) member states and 17 SSA countries and Madagascar. Being the first partnership agreement in history, the Yaoundé Convention I granted preferential trade arrangements such as duty free access of specified goods from the 17 SSA countries and Madagascar into the European market. The agreement was renewed by the Yaoundé Convention II in 1969 and it lasted until 1975 when it was replaced by the Lomé Convention.

The Lomé Convention signed in the first quarter of 1975 was between 9 European Community (EC) member states and 46 developing countries from SSA, the Caribbean and the Pacific formally known as the ACP countries. It provided duty free access to the EC market for agricultural and mineral exports from the ACP countries. In addition, preferential access based on a quota system was agreed for products which were in competition with EC agriculture such as sugar and beef. With respect to aid and investment the EC committed ECU 3 billion to the ACP countries. The Lomé Convention which was renegotiated three times under the Lomé Conventions II, III and IV and which was in force for 25 years resulted in about ECU 30 billion of aid and investment to ACP countries apart from the trade preferences. By the time the Lomé Conventions were replaced in 2000 the number of ACP countries participating had increased from 46 under the Lomé I Convention to 70 countries. The signing of the Cotonou agreement between the then 15 EU member countries and 77 ACP countries[5] in 2000 was in response to the complexity and continuing incompatibility of the Lomé Conventions with GATT and WTO provisions, and the inability of the Lomé Conventions to produce the economic benefits that was expected.

[3]Formally the EBA is with the UN's 50 least developed countries, the majority of which are SSA countries. Few SSA countries export to the EU under EBA because the ACP PTA provides better terms of access

[4] Under Lomé Agreements since the 1970s and expected to be replaced by the reciprocal WTO-compatible EU-ACP Economic Partnership Agreement (EPA)

[5] Made up of 48 SSA countries, 14 Caribbean countries or states and 15 Pacific countries or states. Cuba a member of the 78 ACP countries and a candidate to the agreement was unable to sign.

The Cotonou agreement, a transformation of the previous convention into a system of trade and cooperation pacts with individual nations from 2000 to 2020 was aimed at assisting the ACP countries to reduce and eventually eradicate poverty and to gradually integrate into the world economy. One of the major changes that were introduced by the Cotonou agreement was the replacement of the non-reciprocal trade preferences that existed under the previous agreements with a reciprocal trade arrangement under the Economic Partnership Agreements (EPAs).

Under the EPAs which were expected to be in effect in 2008, the duty-free access to EU markets for ACP exports was to be reciprocated by ACP countries also providing duty-free access to their markets for EU exports. This implied that under the Cotonou agreement, the ACP countries were to continue enjoying the non-reciprocal duty free access to the EU market over the first 7 years (i.e. from 2000/2001 to 2007/2008) and then from 2008 to 2020 sign onto the EPA. The replacement of the Cotonou agreement with the EPAs was to ensure that the PTA between the EU and ACP countries become "WTO compliant".

To ensure "fairness" the EU intended to allow the poorer ACP countries to continue to enjoy virtually free access to the European markets as per the Lomé convention IV or the EBA while better-off non-LDC ACP countries were expected to establish free trade agreements with the EU. The non-LDC ACP countries were expected to either enter into an EPA or transfer into the EU's Generalized System of Preferences (GSP), or the Special Incentive arrangement for Sustainable Development and Good Governance (GSP+). With regards to SSA, the 47 countries were expected to negotiate in five groups made up of West Africa (ECOWAS plus Mauritania), SADC, EAC, Eastern and Southern Africa (COMESA related) and CEMAC (ECCAS related). This excludes South Africa, initially part of the 48 SSA countries who signed the Cotonou agreement. The Trade, Development and Cooperation agreement between the EU and South Africa takes precedence over the Cotonou agreement[6], thereby making it difficult to agree an EU-SADC EPA.

3. Literature Review

The literature, theoretical and empirical, on trade agreements and bilateral trade flows has been extensive and varied, but inconclusive with regards to the ex post effect of trade agreements on bilateral trade flows. The various theoretical models and/or arguments only pointed to the potential important effects and causal channels through which trade agreements can impact on bilateral trade flows without coming up with conclusions. The broader picture that has emerged from the empirical literature has only confirmed the inconclusive nature of the theoretical debate.

The main theoretical argument advanced by those who are pessimistic about the impact of trade agreements on bilateral trade flows is grounded on the traditional Heckscher-Ohlin model. The key insights of Heckscher-Ohlin model were that factor endowment differences could be a basis for

[6] South Africa however has an ACP "observer" status.

trade, and that trade could lead to factor price convergence between trading partners. According to the Heckscher-Ohlin model, countries should export products that utilise their abundant factor endowments and import products that utilise the countries' scarce factor endowments. This implies that a capital-abundant country will export products from its' capital-intensive industries to labour-abundant countries, and the labour-abundant countries by importing capital-intensive goods will in return export labour-intensive products to the capital-abundant countries.

For developing countries, especially SSA countries endowed with abundant natural resources, the Heckscher-Ohlin model implies specialization in the production and export of natural resource-based (i.e. primary) products to capital-abundant developed countries. Thus, based on the Heckscher-Ohlin model SSA countries will be expected to trade more with developed countries or other capital-abundant developing countries (i.e. North-South trade) than among themselves (South-South trade). Granted that Heckscher-Ohlin model explains the pattern of trade flows, regional trade agreements are not expected to contribute significantly to bilateral trade within SSA as compared to trade agreements with developed and/or capital-abundant developing countries (North-South trade).

The basis for the trade creation versus trade diversion argument against trade agreements is grounded in the seminal work by Viner (1950). In his analysis of the immediate static effect of PTAs, Viner (1950) argued that a trade agreement in the form of a PTA does not necessarily improve the welfare of a member country because it may lead to trade diversion (i.e. imports shifting away from the most efficient world supplier to an inefficient member country) significantly higher than the trade created from the PTA. Viner (1950) argued that a trade agreement only improves the welfare of its members if the benefits obtained from the trade created dominates the losses from trade diversion.

While trade diversion can be viewed as a negative consequence of a trade agreement for both members and non-members, trade creation can be associated with gains from free trade. Thus for the sceptics, in so far as trade diversion outweighs trade creation, a trade agreement will be harmful to both member and non-member countries. For developing countries, Hine (1994) argues that the risk that trade diversion outweighs trade creation is high because developing countries tend to have less efficient production methods.

Within the trade literature, the three main factors that have been found to be responsible for substantial trade creation and welfare gains are geographical proximity, intra-industry and inter industry trade determinants. As found by Wonnacott and Lutz (1989) and Krugman (1991), a sizeable amount of trade creation results from trade agreements between geographically close countries because of lower transportation costs (i.e. the concept of "natural trading partners"). Substantial trade creation also results from economies of scale in the presence of differentiated products when the two countries signing the trade agreement are large and of similar economic

size. In addition, in situations where there are significant differences in factor endowment ratios comparative advantage ensures that there are potential significant gains from trade creation.

Although studies such as Frankel and Wei (1997) and Frankel, Stein and Wei (1998) have produced evidence that free trade agreements and customs unions reduce trade barriers and therefore increase trade flows, it is unclear which elements of these trade agreements play a significant role. Questions have been raised on whether reductions in tariffs or reductions in NTBs or regulatory issues account for the significant impact of free trade agreements and custom unions on trade flows? Seeking answers to these questions has become crucial because of the inability of studies (such as Harrigan, 1993; Head and Mayer, 2000; Chen, 2002; and Lee and Swagel, 1997) to identify significant effects of NTBs on aggregate trade flows.

Results from studies that attempted to find out if these insignificant results may be explained by failure to control for the endogeneity of NTBs were mixed. Trefler (1993) shows that by controlling for the endogeneity of NTBs, NTBs have a significant impact on U.S. trade with the rest of the world. Using a similar approach for a set of both rich and poor countries, Lee and Swagel (1997) estimated jointly an equation relating sectoral imports to trade barriers and an equation relating sectoral NTBs to political economy factors. After appropriately controlling for industry and country dummies in the trade regression, they found no evidence of NTBs affecting trade flows. According to Andersen and van Wincoop (2004), the difference between Lee and Swagel (1997) and Trefler (1993) may partly reflect differences across countries which were not controlled for and partly the richer set of political economy variables which Trefler deployed.

Findings from studies conducted on the trade effect of FTAs in SSA within the trade literature have confirmed the fragility of the estimated effect of the FTA treatment on trade flows. The findings from the studies on SSA such as Johnson (1995), Lyakurwa et al (1997), Gunning (2001), ECA (2004), Yang and Gupta (2005) and Chacha (2008) confirmed the conventional belief that RTAs in SSA have not enhanced trade among member countries as a result of lack of complementary products, high external trade barriers, inadequate trade facilitation infrastructure, less product differentiation, unwillingness to import from high cost members, small market size and lack of strong and sustained political commitment.

On the contrary, other studies such as Deme (1995),Elbadawi (1997), Cernat (2001), Carrere (2004), Coulibaly (2007), EAC (2008), and Afersorgbor and Bergeijk (2011) found RTAs within SSA to have significantly increased trade flows among member countries suggesting that SSA RTAs have been trade-creating. For instance, Deme (1995), using a panel of ECOWAS countries from 1975-1991 estimated the ex post effect of the ECOWAS FTA. Applying different estimation procedures, Deme (1995) found ECOWAS members to have traded between 0.5 to 1.7 times more than non-ECOWAS members. Elbadawi (1997) found the presence of SSA RTAs to have increased intraregional imports by 31 percent on average without causing any trade diversion.

Cernat (2001), using a pooled cross section of members within ECOWAS, SADC and COMESA for the years 1994, 1996 and 1998 found a strong case of increased trade among ECOWAS (compared to non-ECOWAS members) and SADC members (as compared to non-SADC members). Cernat (2001) attributed the positive trade impact of ECOWAS and SADC RTAs to the greater trade facilitation that existed amongst members. This finding was confirmed by Carrere (2004) using a panel of 150 countries trade with ECOWAS, SADC, WAEMU and COMESA between 1962 and 1996. After controlling for possible endogeneity, Carrere found RTAs in ECOWAS and SADC to have contributed to increased intra-regional trade flows by a factor of 0.2 and 2.7 times respectively.

In a more recent study, Afersorgbor and Bergeijk (2011) using a gravity model of 35 countries between 1995 and 2006, estimated the relative impact of ECOWAS and SADC RTAs on bilateral trade compared to the EU-ACP PTA. The authors found ECOWAS and SADC membership to have significantly increased bilateral trade flows more than the EU PTA. They also found SADC membership to have a stronger impact compared to ECOWAS. On the trade impact of having a multi-membership Afersorgbor and Bergeijk (2011) argued that it depended critically on the characteristics of the overlapping RTA.

Although Afersorgbor and Bergeijk (2011) attempted to control for some econometric concerns normally related with using the gravity model to assess the impact of RTAs, the authors treated the RTA dummy as exogenous thereby failing to control for the potential endogeneity of the RTA dummy. The authors argued that membership of SSA RTAs were by and large determined by geographical factors rather than trade and therefore the possibility that SSA countries which trade more intensively were more likely to form an RTA was very unlikely. If in a world of identical countries, two countries who are "natural trading partners" do benefit from an FTA more than two unnatural trading partners (Frankel, Stein and Wei, 1995; 1996 and 1998) then it is more likely that such SSA countries would form an RTA. Thus the RTA treatment in Afersorgbor and Bergeijk (2011) does not correct for the bias introduced by most SSA countries self-selection into the respective RTAs.

4. Methodology

The standard approach to identify the ex post effect of trade agreements on trade flows since the pioneering study by Tinbergen (1962) has been to estimate the gravity model of trade. One main critique that has been made against most studies that have employed the gravity model to assess the impact of trade agreements (preferential or regional) on bilateral trade flows has been with respect to the assumption made about the agreement dummy.

Most studies have assumed an exogenous RHS dummy variable to represent the effect of belonging to a trade agreement. As noted by Trefler (1993) and Baier and Bergstrand (2005), in reality trade agreement dummies are not exogenous because for unobservable reasons countries can endogenously select into a trade agreement. According to Baier and Bergstrand (2007), the

potential endogeneity of the trade agreement (either RTA or PTA) dummy could be attributed to omitted variables and sample selection bias as well as measurement errors.

Caporale et al (2009) argue that the probability that two countries will sign a trade agreement could be attributed to geographic factors, intra-industry and inter industry trade determinants. This is so because two countries are more likely to be in a trade agreement the closer they are geographically, the more similar they are in economic size and the more they differ in factor endowment. Caporale et al (2009) therefore treated free trade agreement as endogenous and found a positive and significant impact on trade volumes between the European Union (EU-15) and the Central and Eastern European countries. Magee (2003) also treated trade agreement as endogeneous in estimating the effects of preferential trade agreement on trade volumes using a system of simultaneous equations. The findings from Magee (2003) indicated that most likely two countries will sign an agreement the closer they are geographically, the more similar their economic size and the more democratic both countries are.

If trade agreements are endogenous, then it might explain why previous studies which assumed trade agreements to be exogenous have not been able to reach a consensus on its impact on bilateral trade flows. The results from these studies have either under or over-estimated the effect on trade. Recently, many studies such as Matyas (1997), Egger (2000, 2002), Egger and Pfaffermayr (2003, 2004), Plumper and Troeger (2004) and Baier and Bergstrand (2007) have come up with various ways in which the endogeneity bias can be dealt with.

According to Egger (2000) panel data methods that incorporate bilateral specific effects are most appropriate for dealing with issues of endogeneity bias and allow for heterogeneity when estimating the gravity model. This is so because panel data methods allow for disentangling country specific effects from time invariant effects thereby correcting for omission bias and allowing for heterogeneity. Egger and Pfaffermayr (2003) indicate that an estimator that can control for bilateral specific effects as in a fixed effect model can be used because it allows for incorporating unobserved factors that simultaneously explain bilateral trade between the two countries thereby leading to unbiased and efficient results.

Another method which has been proposed for dealing with the endogeneity bias is the Hausman-Taylor panel method. According to Egger and Pfaffermayr (2004), this method incorporates time invariant variables that are correlated with bilateral specific effects in the estimation. Based on instrumental variables, the Hausman-Taylor panel estimators, originally proposed by Hausman and Taylor (1981) and Amemiya and MaCurdy (1986), assumes that some of the explanatory variables are correlated with the individual-level random effects (η_i) but none are correlated with the idiosyncratic error (ε_{it}). The Hausman-Taylor estimator thus uses the average values of the time varying exogenous variables and the deviations from these averages as instruments for the time invariant endogenous variables.

In a more recent study, Caporale et al (2009) made use of the fixed effects vector decomposition (FEVD) technique to analyse the effect of free trade agreement on bilateral trade between the EU-

15 and CEEC-4 countries. The FEVD method has been proposed by Plumper and Troeger (2004) as a more efficient method to accommodate time-invariant variables in the gravity framework. Compared with the FEM, and REM, Plumper and Troeger (2004) argued that the FEVD was more superior in situations where both time-invariant and other variables are correlated with the bilateral specific effects. In addition they argued that it was a more efficient method at isolating and eliminating the potential endogeneity bias of the trade agreement variable.

According to Caporale et al (2009), the FEVD by Plumper and Troeger (2004) involves three stages, namely: estimation of the unit fixed effects by the FEM excluding the time-invariant regressors; regression of the fixed effect vector on the time-invariant regressors of the original model by OLS and the re-estimation of the original model by POLS (Pooled OLS), including all time-variant regressors, time-invariant regressors and the unexplained part of the fixed effects vector (this is done to control for multicollinearity). As noted by Plumper and Troeger (2004), theoretically the FEVD offers three advantages over the random and fixed effect estimators. The FEVD estimator does not require prior knowledge of the correlation between unit specific effects and time-variant explanatory variables, it relies on the robustness of the within transformation and therefore no need to meet the orthogonal assumptions for time-variant variables as in the case of the random effect, and as a more preferred estimator maintains the efficiency of pooled OLS.

4.1 Empirical Strategy

This paper estimates a multiplicative gravity equation using a panel of bilateral trade flows and standard gravity covariates. To correct for omitted variables and selection bias arising from the endogeneity of the preferential and regional trade agreement dummies (included to capture the impact of the various intra-SSA RTAs, and the EU-ACP trade agreements), this paper will adopt the Hausman-Taylor panel technique to estimate the gravity equation of the form;

$$X_{ijt} = \varphi_0 . Y_{it}^{\varphi_1} . Y_{jt}^{\varphi_2} . d_{ij}^{\gamma} . Z_{ijt}^{\alpha_k} . BLOC_{ijt}^{\beta} . \eta_{ij} . \upsilon_t . \epsilon_{ij} \qquad (\mathbf{1})$$

Two models of equation (1) will be estimated using the Random effects, Fixed effects and Hausman-Taylor estimations. In more specific form, the first model will capture the effects of non-reciprocal preferential trade agreement between SSA and the EU (*SSAEU PTA* - the EU− ACP PTA should affect SSA exports to the EU as they benefit from preferences) and EU to SSA (*EUSSA* does not measure the impact of the PTA on EU exports to SSA because the PTA was not reciprocal) on bilateral exports. The econometric specification in logs is of the form;

$$\ln(X_{ijt}) = \varphi_0 + \varphi_1 ln(Y_{it}) + \varphi_2 ln(Y_{jt}) + \gamma \ln(d_{ij}) + \alpha_1 \ln(Pop_{it})\, \alpha_2\, ln(Pop_{jt}) + \alpha_3\, ln(Area_{it}) + \alpha_4\, ln(Area_{jt}) + \alpha_5 ADJ_{ij} + \alpha_6 COLO_{ij} + \alpha_7 Comcur_{ijt} + \alpha_8 LANG_{ij} + \alpha_9 LLK_{ij} + \alpha_{10} REMOTE_{ijt} + \beta_1 EUSSA + \beta_2 SSAEU\ PTA_{ijt} + \phi_t + \epsilon_{ij} \quad (\mathbf{2})$$

As noted in equations (1) and (2), bilateral exports, X_{ij} at time *t*, is specified to be a function of GDP (*Y*), the distance between countries (d_{ij}), a vector Z of controls thought to proxy for other aspects of bilateral and country characteristics (Z_{ij}) such as population (*POP*), area, common language (*LANG*), sharing of common border (*ADJ*), number of landlocked countries (*LLK*) , colonial link (*COLO*), common currency (*Comcur*), Remoteness (to capture multilateral resistance), trade agreement dummies, time dummies (φ_t) and a well-behaved error term (ε_{ij}). Dummy variables for trade agreement(s) with reference to EU and SSA are included as $EUSSA_{ijt}$, (to capture the effect of the non-reciprocal part of the PTA), and $SSAEU\ PTA_{ijt}$ (preferential treatment offered to exports from SSA to the EU). The reference category refers to bilateral country pairs that do not belong to the EU-ACP PTA at time *t*. Subscripts *i* and *j* refer to exporting and importing countries respectively, *k* is the number of control variables in the vector *Z*.

To isolate the impact of RTAs on trade within sub-regions in SSA, this paper will estimate a second model (a version of equation 4.2) to include regional trade agreements within SSA. This model will seek to capture the effect of ECOWAS, EAC, SADC, ECCAS, and IGADD RTAs on bilateral exports. The reference category in this case refers to bilateral country pairs that do not belong to the same RTA or are not members of any RTA (i.e. No RTA) at time *t*. The econometric specification of model 2 in logs is of the form:

$$\ln(X_{ijt}) = \varphi_0 + \varphi_1 ln(Y_{it}) + \varphi_2 ln(Y_{jt}) + \gamma \ln(d_{ij}) + \alpha_1 \ln(Pop_{it})\, \alpha_2\, ln(Pop_{jt}) + \alpha_3\, ln(Area_{it}) + \alpha_4\, ln(Area_{jt}) + \alpha_5 ADJ_{ij} + \alpha_6 COLO_{ij} + \alpha_7 Comcur_{ijt} + \alpha_8 LANG_{ij} + \alpha_9 LLK_{ij} + \alpha_{10} REMOTE_{ijt} + \beta_1 ECOWAS_{ijt} + \beta_2 EAC_{ijt} + \beta_3 SADC_{ijt} + \beta_4 ECCAS_{ijt} + \beta_5 IGADD_{ijt} + \phi_t + \epsilon_{ij} \quad (\mathbf{3})$$

Although the use of a panel of bilateral trade flows, standard gravity covariates as well as variables for bilateral trade agreements (i.e. RTA/FTA or PTA dummy) estimated with the fixed versus the random effects have been identified by Baier and Bergstrand (2007) and Egger (2000) as the techniques to address the issue of omitted variables and selection bias arising from the endogeneity of the RTA[7] there are econometric issues that have to be resolved to make the parameter estimates of these two techniques unbiased and consistent.

[7] The other alternative is by differencing the data and using OLS.

In the presence of correlation of unobserved characteristics with some explanatory variables the random effect estimator produces biased and inconsistent estimates of the parameters. As an alternative (i.e. that eliminates the correlation) the within estimator or the fixed effect estimator is used. The fixed effects estimator consists of transforming the data into deviations from their means so that even in the presence of correlation of unobserved characteristics with some explanatory variables, the estimator yields unbiased and consistent estimates of the parameters. Transforming the data into deviations from their means as is the case with the fixed effect estimator will eliminate the time-invariant variables making it impossible to obtain parameter estimates for such variables. In addition, the fixed effect estimator does not control for variations across countries.

The choice of the Hausman-Taylor over the random effect model (REM) and fixed effect model (FEM) is to allow for controlling the variations across countries, while at the same time incorporating time invariant variables that are correlated with bilateral specific effects in the estimation. By making use of instrumental variables that are uncorrelated to unobservable characteristics, the Hausman-Taylor panel technique has proven to be more efficient than the REM and FEM techniques.

The Hausman-Taylor panel technique also allows for the correction of the endogeneity bias from the trade agreement dummy within the gravity framework. As noted by Baier and Bergstrand (2007), trade agreement dummy coefficients have been underestimated because generally the dummy within the gravity framework is correlated negatively with the error term leading to the classical "attenuation bias" of the FTA coefficient towards zero. Although the FEVD technique also provides solutions to the econometric concerns raised against the REM and FEM, the choice of Hausman-Taylor over the FEVD is premised on the evidence that the FEVD is generally not well-suited for large samples[8].

5. Data Analysis and Discussion of Results

5.1 Data Analysis

5.1.1 Data

Data for our analysis is obtained from the "square" gravity dataset for all world pairs of countries, for the period 1960 to 2006 by CEPII[9]. The main variables relating to the standard gravity covariates were obtained from the CEPII distance datasets and this was merged with the matrix of

[8] Plumper and Troeger (2004) after carrying out Monte Carlo simulations to compare the FEVD with the random effect, fixed effect and Hausman-Taylor estimators arrived at the conclusion that the FEVD is the most reliable technique for small samples.

[9] Centre d'Etudes Prospectives et d'Informations Internationales (Institute for Research on the International Economy). Data was generated and used by Head, Mayer and Ries, (2010): "The erosion of colonial trade linkages after independence" Journal of International Economics, 81(1):1-14.

bilateral trade flows using standard ISO codes for countries and for any year between 1948 and 2006. Data on GDP and population were obtained from the World Development Indicators database published by the World Bank. The dataset also contains information on an EU−ACP variable which refers to a sequence of agreements conferring preferential treatment of imports from former colonies and some other developing countries. The EU−ACP dummy is coded as one when an ACP country is included in the PTA and zero if otherwise.

In order to focus our analyses on SSA and the EU, we concentrate mainly on bilateral trade relations involving SSA and 25 EU countries from 1960 to 2006. This leaves us with a panel of observations of 247,032 bilateral country-years involving 73 countries (25 EU member countries and 48 SSA countries) over 47 years. The dataset also contains information on bilateral trade agreements that allows us to divide the bilateral country-years into different economic blocs or regions making it easier to identify the differences in the impact blocs or sub-regions.

Bilateral Exports (X_{ij} and X_{ji}): The data on bilateral trade as contained in the dataset used by Head, Mayer and Ries (2010) was sourced from the International Monetary Fund's Direction of Trade Statistics (DOTS). As is often the case the DOTS reports two values for the same trade flow from country of origin *i* to destination *j*. This is because country *j* may report its imports from *i* and country *i* reports its exports to *j*. According to Head, Mayer and Ries (2010) because import reports are more reliable than export reports[10] the value of bilateral trade flow captured in the data is gross imports (C.I.F) valued at the destination and denominated in millions of US dollars. In situations where the importing country did not make a report or reported a zero, this was replaced using C.I.F adjusted export value reported by the exporter[11]. After dropping the missing trade flow values the panel observations reduced to 165,022 bi-lateral country-years, making the panel unbalanced (as if often the case with bilateral trade datasets). Positive bilateral trade flows occurs for 116,335 (about 71%) of the observations while the remaining 48,687 (about 29%) observations were zero-valued flows.

Trade Intensity Index: The trade intensity index gives an indication of the intensity of the trade relationship between the bilateral countries involved. It is the ratio of the total trade share of destination in total exports of the origin country to the share of the destination in the total exports of the world. That is;

[10] Governments track imports closely because they are subject to customs duties and other customs clearance procedures

[11] Exports are reported FOB while imports are reported C.I.F. To ensure consistency, Head, Mayer and Reis (2010) adjusted the exporter values upwards by 10% (i.e. the actual mean margin revealed by countries reporting imports in both C.I.F and F.O.B values)

$$Trade\ Intensity\ Index = \frac{\sum X_{ij} / \sum X_{iw}}{\sum X_{wj} / \sum X_{w}}$$

Where *i* is the country of export origin, *j* destination of export, and *w* is total exports to the world. The index valued between 0 and ∞. Normally the implementation of a RTA or PTA between countries is expected to intensify the trade relation amongst the countries and thus the trade intensity index would be expected to be higher. The trade intensity index does not suffer from size bias and thus is comparable across country pairs and overtime making it suitable for panel analysis. The trade intensity index gives an indication of the intensity of the trade relationship between the bilateral countries involved.

Measures of Economic size (GDP): GDP measured at current US dollars is used to measure economic size. The data was sourced from the World Development indicators. In addition each country's share of world GDP was calculated by dividing its average GDP by the measure of average World GDP (also sourced from WDI) from 1960 to 2006. This was to help in the construction of each country's remoteness index.

Measures of Distance and other Country Characteristics: The measure of bilateral distance used in this paper captures the weighted distance measure using city-level data to assess the geographic distribution of population inside each country. The idea is to calculate distance between two countries based on bilateral distances between the largest cities of those two countries, those inter-city distances being weighted by the share of the city in the overall country's population. A general formula developed by Head and Mayer (2002) is used by CEPII for calculating the weighted distance between countries *i* and *j*. Control variables such as country's area in square km and dummies indicating whether the two countries are contiguous (share a common border), share a common language, have had a common colonizer after 1945, have ever had a colonial link, have had a colonial relationship after 1945, are currently in a colonial relationship are also sourced from CEPII. There are two common languages dummies, one based on whether two countries share a common official language and the other if an ethnic language is spoken by at least 9% of the population in both countries. Colonization is used generally to describe a relationship between two countries, independently of their level of development, in which one has governed the other over a long period of time and has therefore contributed to the current state of institutions in the colonized country.

Remoteness of Country Pair: To include multilateral resistance to trade, a proxy variable "remoteness" of the country pair *i* and *j*, following Baier and Bergstrand (2007) is included in the gravity equation. The approach of including a remoteness variable for the country pair is to allow for the estimation of the effects of the resistance to trade posed by all the trading partners of the pair which is not captured in the vector Z. There are several ways of measuring remoteness;

however a good measure is one that considers both the average distance of the country pair from all their trading partners and the level of economic activity taking place in each other country. Following Brun et al. (2005) and Baier and Bergstrand (2002), we calculate average remoteness by taking a simple average of the weighted mean of the distance of countries *i* and *j* to all their trading partners, where the weights are the proportions of world GDP held by the trading partners.

Trade Agreement Variables: The trade agreement variables in the estimating equations are the main interest and focus of this paper. The dummies for each regional trading agreement or bloc are shown in Appendix A1.

5.1.2 Summary Statistics

Table 1 presents descriptive statistics for average bilateral exports, trade intensity and economic size (as measured by GDP) for the different blocs or RTAs within SSA and for the EU. As is evident from the summary statistics, there is a large deviation in the incidence of bilateral trade flows, trade intensity index and GDP across regions. SSA countries on average had lower GDP and export values, but higher trade intensity index than members of the EU.

Over the period 1960 to 2006, average exports from SSA countries to the EU were significantly higher than imports from the EU. This gives an indication of the trade enhancing effect of the non-reciprocal EU-ACP PTA. Compared to trade amongst member countries within an RTA, without exception average exports to the EU under the EU-PTA was significantly higher. For instance while SSA exports to the EU averaged US$57.4 million over the period, average trade amongst SADC members (the highest within SSA) averaged US$37.6 million. ECCAS exports amongst members (the lowest within SSA) were on average US$5.1 million, less than a tenth of the average of SSA to the EU. A comparison with exports from the EU to SSA (EU exports do not enjoy preferential access) shows a similar trend.

Within SSA, except for ECCAS, members belonging to the same RTA on average exported at least twice more (as in the case of ECOWAS) within their respective blocs than non-member (i.e. No RTA). As shown in Table 1, while non-member country pairs exported on average US$6 million, exports amongst members of ECOWAS, SADC, EAC and IGADD averaged US$14.9 million, US$37.6 million, US$26.2 million and US$32.1 million respectively between 1960 and 2006. The relatively lower average exports amongst ECCAS members (about US$5.1 million) could be attributed to the long periods of ECCAS inactivity of due to financial difficulties and the several conflicts that took place within the Great lakes area between 1985 when the ECCAS was formally established and 1999 when it became fully functional.

The evidence in Table 1 also supports the positive relation posited between GDP and bilateral trade flows. The average GDP within blocs is closely related to the average bilateral exports within the bloc. Larger blocs in SSA (in terms of economic size as measured by average GDP) exported more

within than with non-members. For instance, SADC with an average GDP of US$13 billion (largest bloc in SSA) exported on average US$37.6 million, while ECCAS with a an average GDP of US$5.3 billion exported on average the least in SSA to member countries. The average exports among members within ECCAS are lower than the average exports of pairs of SSA countries that do not belong to the same RTA.

Table 1: Summary Statistics

Region/Bloc	Exports Millions (US$)		Trade Intensity Index		GDP Billions (US$)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
SSA	8.4	51.2	38.2	294.0	8.4	23.0
EU	6379	11662.3	1.97	2.9	513.1	645.4
SSA-EU	57.4	239.2	1.4	3.8	n.a	n.a
EU-SSA	51.3	236.1	1.4	5.3	n.a	n.a
ECOWAS	14.9	62.4	50.3	153.4	6.3	12.9
SADC	37.6	133.1	53.4	134.3	13.6	37.47
EAC	26.2	81.2	197.3	339.1	3.7	4.8
ECCAS	5.1	10.5	83.1	247.6	5.3	5.1
IGADD	32.1	84.5	706.6	2314.9	6.4	5.2
No RTA (SSA)	6.0	35.4	35.4	310.0	8.2	22.6

Std. Dev. Refers to standard deviation; n.a. refers to not applicable

A striking feature observed in in Table 1 is the correlation between the trade intensity index and trade flows within blocs. Trade intensity index is significantly higher for country pairs within an RTA than for country pairs belonging to the EU-SSA PTA. For instance on average the trade intensity index of pair of countries that belong to ECOWAS is 50.3 and this is over 30 times the trade intensity index of a pair belonging to the EU-ACP PTA. A similar trend is observed for SADC, EAC, IGADD and ECCAS. Interestingly SSA countries on average exported more to the EU than they exported to member countries within each RTA in the sub-region.

Generally the correlation between the trade intensity and trade flows observed confirms evidence from other studies indicating that countries implementing an RTA tend to have higher trade intensity index. Within SSA there are two reasons for this trend. Countries within SSA on average export less to trading partners as compared to countries from the rest of the world. This implies that countries that belong to the same RTA within SSA will have a higher trade intensity index than with the rest of the world because of their low shares of world exports. The low trade intensity index between a member belonging to a SSA RTA and a member belonging to the EU also indicates that though a greater proportion of SSA exports are to the EU, because the EU's share in world exports are relatively higher, the trade intensity index will be lower.

5.2 Discussion of Results

The results as shown in Table 2 and Appendix Table A2 are obtained from estimating the gravity equation (2) using the random effect, fixed effect and Hausman-Taylor estimators. The results obtained confirm the robustness to using the alternative estimators. The Hausman test result shown in Table A2 rejects the null hypothesis that the regressors and individual effects (heterogeneity) are not correlated[12]. This indicates the presence of correlation between individual heterogeneity and the covariates of the estimated gravity model, implying the inappropriateness of the random effect model. Theoretically when unobserved time-invariant bilateral variables are likely correlated with the trade agreement dummy they are best controlled for using the bilateral "fixed effects" rather than the random effects which assumes zero correlation between the unobservables and the trade agreement dummy. The Hausman test results confirm similar findings by Egger (2000) and Baier and Bergstrand (2007). In line with this we concentrate on the parameter estimates obtained under the fixed effects and Hausman-Taylor estimators.

5.2.1 *EU-ACP PTA*

Table 2 shows alternative specifications under the Hausman-Taylor estimators controlling for time and bilateral fixed effects. The difference in the two specifications relates to the reference category, in this case the "untreated" country pairs. The "untreated" in specification (1) refers to any pair of which either country *i* or *j* at time *t* was a non-EU European country and thus not party to the EU-ACP PTA, while the "untreated" in specification (2) refers to any pair of which *i* is a SSA and *j* non-EU European country at time *t*.

The results in Table 2 show the parameter estimates for the average impact of the non-reciprocal EU-SSA PTA treating SSA as a bloc. The model performed satisfactorily as most of the core control variables in the gravity equation had significant coefficients with expected signs. Importer and exporter GDP, importer population size, common currency and language, colonial link and remoteness of the pair from all trading partners as expected exert a significant positive effect on bilateral exports.

The number of landlocked countries in the pair and the land area size of the exporter[13] exert a negative significant impact on bilateral trade confirming prior expectations. With regards to remoteness of the country pair from all trading partners, the results confirm expectations to the effect that the more remote the two trading partners are from the rest of their trading partners the more they trade (the coefficient is significant with the expected positive sign).

[12] $Chi^2(54)=681.34***$

[13] land size of the importer exert an insignificant impact on bilateral export

Table 2: Impact of EU-SSA PTA on Bilateral Exports from SSA

Variables	Dependent Variables: Log(Exports *ijt*)		
	Fixed Effects	**Hausman-Taylor**	
		(1)	**(2)**
Log of GDP *it*	0.761***	0.826***	0.786***
	(0.0586)	(0.0175)	(0.0187)
Log of GDP *jt*	0.671***	0.599***	0.633***
	(0.0429)	(0.0167)	(0.0176)
Log of Population *it*	-0.620***	-0.0177	-0.0772
	(0.211)	(0.0462)	(0.0472)
Log of Population *jt*	0.546***	0.820***	0.876***
	(0.204)	(0.046)	(0.0469)
Log of Distance *ij*		-0.341	-0.329
		(0.233)	(0.233)
Log of Area *i*		0.123***	0.202***
		(0.0467)	(0.0485)
Log of Area *j*		-0.327***	-0.404***
		(0.0465)	(0.0482)
Colonial Link *ij*		1.182***	1.179***
		(0.287)	(0.287)
Common Language *ij*		1.402***	1.397***
		(0.248)	(0.248)
Common Currency *ijt*	0.782***	0.795***	0.792***
	(0.122)	(0.0826)	(0.0826)
Number Landlocked *ij*		-0.818***	-0.812***
		(0.103)	(0.103)
Remoteness *ijt*	0.196**	0.0678**	0.0582**
	(0.0824)	(0.028)	(0.028)
SSA-EU PTA *ijt*	**0.0804**	**0.1339****	**0.1462****
	(0.0633)	(0.0157)	(0.0215)
EU to SSA *ijt*	**0.218*****	**0.265*****	**1.246*****
	(0.0433)	(0.0243)	(0.164)
Non-EU to SSA *ijt*			**0.993*****
			(0.164)
Constant Included	Yes	Yes	Yes
Controlled for Time Effect	Yes	Yes	Yes
Number of Observations	61,468	61,468	61,468
R-squared	0.252		
Number of bilateral pairs	2,273	2,273	2,273

Robust Standard errors in parentheses;*** p<0.01, ** p<0.05, * p<0.1; Time dummies are included but not reported for brevity. Country i and j refers to Exporter and Importer country respectively.

With regards to the average treatment effect of the presence of the PTA, the estimate obtained under specification (1) suggests that bilateral exports from SSA to the EU increased on average by 14 percent ($\exp^{0.134} = 1.14$) and imports by 30 percent ($\exp^{0.265} = 1.30$) compared to bilateral exports between pairs that were both not parties to the EU-ACP PTA (i.e. the "untreated"). The PTA coefficient estimates in specification (2) of 0.1462 (for exports from SSA to EU) and 1.246 (for imports to SSA from the EU) confirms that the presence of the EU-ACP PTA increased trade between SSA and the EU. The quantitative estimates obtained suggest that the average treatment

effect of the presence of the PTA increased bilateral export from SSA and the EU by 16 percent ($exp^{0.146} = 1.16$) and imports by about 250 percent ($exp^{1.25} = 3.49$).

Thus, by controlling for imports from other European countries (i.e. non-EU) as in specification (2), the average treatment effect of the non-reciprocal EU-ACP PTA increases substantially from 0.27 to 1.25. Estimates obtained from specification (2) also indicate that imports to SSA from Europe relative to exports to non-EU European countries was significantly higher for EU members than non-EU members suggesting the trade enhancing effect of the EU-ACP PTA, albeit its non-reciprocal nature.

5.2.2 *RTAs within SSA*

To measure the ex post trade effect of RTAs in SSA, estimates were obtained for gravity equation (3). The results in Table 3 confirm expectations with specific reference to the core control variables in the gravity equation. The Hausman test in Table A3 confirms the presence of correlation between the unobserved time-invariant bilateral variables and the covariates of the estimated gravity model, hence our concentration on estimates obtained under the fixed effects and especially Hausman-Taylor estimators. The alternative specifications under the Hausman-Taylor estimators relate to the average treatment effect of RTA membership in SSA and the effect of belonging to a particular RTA, shown as specifications (1) and (2) respectively.

Exporter GDP, exporter and importer population size, contiguity, common currency and language, colonial link and remoteness of the pair from all trading partners as expected exert a significant positive effect on bilateral exports. The estimates obtained for contiguity across specifications in Table 3 suggest that sharing a common border in SSA increases trade by almost three times[14]. With regards to distance and the number of landlocked countries in the pair, the coefficient estimates obtained (significant and negative across specifications) support the argument that within SSA because high transport costs resulting from trading over longer distance and with landlocked countries impose significant trade costs, trade will be diverted from landlocked and longer distance partners. Estimates obtained for the average treatment effect of the presence of an RTA within SSA (shown in specification (2) of Table 3) indicate that trade between country pairs belonging to the same RTA increased on average by 30 percent ($exp^{0.264} = 1.30$). This implies that within SSA, trading with an RTA member country was more beneficial than with other non-member SSA countries. This partly explains current efforts to form common markets among RTAs (such as COMESA). With regards to specification (3) the estimates obtained reveal interesting asymmetries.

[14] ($exp^{1.313}$=3.72) and ($exp^{1.331}$=3.78) in specifications (1) and (2) respectively.

Table 3: Impact of SSA RTAs on Bilateral Exports

Variables	Dependent Variable: Log(Exports *ijt*)		
	Fixed Effects	Hausman-Taylor	
		(1)	(2)
Log of GDP it	0.422***	0.427***	0.423***
	(0.116)	(0.046)	(0.046)
Log of GDP jt	0.0867	0.0744*	0.0740*
	(0.108)	(0.044)	(0.044)
Log of Population it	0.896**	0.284***	0.358***
	(0.454)	(0.091)	(0.093)
Log of Population jt	0.660	0.298***	0.367***
	(0.415)	(0.091)	(0.093)
Log of Distance ij		-1.387***	-1.313***
		(0.151)	(0.156)
Log of Area i		-0.0944	-0.132*
		(0.073)	(0.075)
Log of Area j		-0.0611	-0.0994
		(0.073)	(0.076)
Colonial Link ij		0.553**	0.568**
		(0.221)	(0.228)
Contiguity ij		1.313***	1.331***
		(0.378)	(0.390)
Common Language ij		0.550**	0.552**
		(0.220)	(0.227)
Number Landlocked ij		-0.568***	-0.573***
		(0.146)	(0.150)
Common Currency ijt	0.357**	0.396***	0.366***
	(0.175)	(0.071)	(0.072)
Remoteness ijt	0.342*	0.386***	0.395***
	(0.176)	(0.071)	(0.071)
RTA ijt		0.246***	
		(0.047)	
ECOWAS ijt	0.492***		0.490***
	(0.153)		(0.063)
EAC ijt	0.0332		0.0232
	(0.254)		(0.129)
SADC ijt	0.798***		0.785***
	(0.151)		(0.074)
ECCAS ijt	-0.169		-0.175*
	(0.248)		(0.096)
IGADD ijt	-0.567		-0.542***
	(0.362)		(0.170)
Constant Included	Yes	Yes	Yes
Controlled for Time Effect	Yes	Yes	Yes
Number of Observations	27,993	27,993	27,993
R-squared	0.118		
Number of bilateral pairs	1,670	1,670	1,670

Robust Standard errors in parentheses;*** p<0.01, ** p<0.05, * p<0.1; Time dummies are included but not reported for brevity. Country i and j refers to Exporter and Importer country respectively.

While the presence of an RTA within SADC and ECOWAS increased trade among members, the estimates for ECCAS and IGADD suggest that on average member countries traded less relative to pairs that do not belong to the same RTA. Interestingly the presence of the RTA in EAC had no

effect on trade among members relative to non-members. This might be due to the long period of inactivity within the EAC.

Comparatively SADC seemed to have done better in terms of intra-regional trade than ECOWAS. While the presence of the RTA in SADC increased trade among member countries by about 120 percent ($\exp^{0.785} = 2.19$), belonging to ECOWAS increased trade among members by about 63 percent ($\exp^{0.490} = 1.63$) compared to non-members. The stronger average treatment effect of SADC is due to the inclusion of South Africa, SADC export of more diversified products and the extension of tariff-free access to both primary and industrial products among member countries. The sheer size of the trade involving South Africa has resulted in South Africa being the only country within SSA having a different PTA with the EU outside the EU-ACP PTA.

From the evidence shown by the results in Tables 2 and 3, regional trade agreements have increased trade among members within the different sub-regions in SSA, more than with the EU under the non-reciprocal PTA. The results also indicate that although member countries within the sub-regions are more inclined to trade among themselves than with other countries that are not part of their respective RTAs, the EU-SSA PTA has offered the member countries within the sub-region a larger market to import from compared to what other non-member EU countries have offered. This could be as a result of the strong colonial link between most SSA and leading EU countries, especially France Britain, and Portugal.

5.2.3 *Zero-Valued Trade Flows*

As a result of the existence of zero-valued trade flows in the sample, this paper performs sensitivity analysis to assess the treatment effect of the trade agreement variables when the zero-valued trade flows are included in the estimation. We estimate equations (2) and (3) using the negative binomial pseudo maximum likelihood estimator (NBPML)[15].

The use of the NBPML allows for the inclusion of zero-valued trade flows and for controlling for the unobserved heterogeneity between countries. This will enable us to pick up the effects, if any, that the trade agreement variable has in explaining why countries do not trade. Table 4 shows the results of the estimates obtained from the NBPML estimator. The significance of the over-dispersion parameter confirms the presence of unobserved heterogeneity not accounted for in the conditional mean when the zero-valued trade flows are accounted for in the estimation. This gives legitimacy to the use of the NBPML estimator rather than the PPML estimator. Compared to the results obtained in obtained in Tables 2 and 3, the inclusion of the zero-valued trade flows decreased marginally the estimated parameters for the standard covariates of the gravity equation while maintaining the level of significance and sign.

[15] NBPML belongs to the "family" of Poisson Pseudo-Maximum Likelihood estimators.

Table 4: Impact of EU-SSA PTA and SSA RTAs: Controlling for Zero Valued Flows

Variables	Dependent Variable: Log(Exports *ijt*)			
	EU-SSA PTA		SSA RTAs	
	(1)	(2)	(3)	(4)
Log of GDP *it*	0.525***	0.484***	0.180***	0.130***
	(0.008)	(0.009)	(0.022)	(0.021)
Log of GDP *jt*	0.351***	0.385***	0.217***	0.183***
	(0.007)	(0.008)	(0.020)	(0.020)
Log of Population *it*	-0.139***	-0.132***	0.057***	0.104***
	(0.010)	(0.010)	(0.020)	(0.019)
Log of Population *jt*	-0.068***	-0.059***	-0.177***	-0.137***
	(0.011)	(0.011)	(0.020)	(0.020)
Log of Distance *ij*	-0.757***	-0.756***	-0.133***	-0.164***
	(0.029)	(0.029)	(0.023)	(0.022)
Log of Area *i*	-0.141***	-0.113***	-0.096***	-0.109***
	(0.007)	(0.008)	(0.015)	(0.015)
Log of Area *j*	-0.081***	-0.111***	-0.041***	-0.062***
	(0.007)	(0.008)	(0.015)	(0.014)
Colonial Link *ij*	0.336***	0.339***	0.446***	0.484***
	(0.032)	(0.032)	(0.038)	(0.038)
Common Currency *ijt*	0.556***	0.554***	0.037	0.041
	(0.052)	(0.052)	(0.038)	(0.037)
Common Language *ij*	0.111***	0.104***	0.107***	0.047
	(0.029)	(0.029)	(0.032)	(0.032)
Contiguity (Adjacency) *ij*			0.093**	0.070*
			(0.042)	(0.042)
Number Landlocked *ij*	-0.065***	-0.065***	-0.214***	-0.182***
	(0.009)	(0.009)	(0.027)	(0.027)
Remoteness *ijt*	0.148***	0.147***	0.288***	0.294***
	(0.016)	(0.016)	(0.026)	(0.025)
SSA-EU PTA *ijt*	**0.212*** **	**0.196*** **		
	(0.016)	(0.017)		
EU to SSA *ijt*	**0.361*** **	**0.767*** **		
	(0.014)	(0.041)		
Non-EU to SSA *ijt*		**0.395** **		
		(0.038)		
ECOWAS RTA *ijt*			**0.352*** **	
			(0.036)	
EAC RTA *ijt*			**0.225*** **	
			(0.062)	
SADC RTA *ijt*			**0.245*** **	
			(0.038)	
ECCAS RTA *ijt*			**-0.421*** **	
			(0.056)	
IGADD RTA *ijt*			**0.068**	
			(0.087)	
SSA RTA *ijt*				**0.040**
				(0.026)
Constant Included	Yes	Yes	Yes	Yes
Bilateral Fixed Effects	Yes	Yes	Yes	Yes
Controlled for Time Effect	Yes	Yes	Yes	Yes
Over-dispersion (ln r)	-0.294***	-0.294***	-0.214***	-0.214***
Over-dispersion (ln s)	-0.332***	-0.334***	-0.604***	-0.600***
Number of Observations	76,912	76,912	58,659	58,659
Number of bilateral pairs	2,288	2,288	1,785	1,785

Robust Standard errors in parentheses;*** p<0.01, ** p<0.05, * p<0.1; Time dummies are included but not reported for brevity. Country i and j refers to Exporter and Importer country respectively.

In terms of the estimates of the average treatment effect of the RTA dummies, though the results obtained indicate a relatively higher effect for the EU-ACP PTA and a lower effect for the SSA RTAs compared to the results obtained in the case of positive valued trade flows, generally the results confirm the positive impact of EU-ACP PTA, ECOWAS and SADC RTAs on trade flows. For instance in case of the EU-ACP PTA the average effect on SSA exports to the EU under the PTA was higher at an increase of 24% compared to 14% obtained for positive valued flows.

After controlling for non-EU exports to SSA, the results in column 2 of Table 4 indicate an increase of 22% (($\exp^{0.196} = 1.22$)) compared to 16%. In terms of the ECOWAS and SADC RTAs the inclusion of zero-valued trade flows reduces the impact of the respective RTAs on trade flows from 63% and 120% to 42% ($\exp^{0.352} = 1.42$) and 28% ($\exp^{0.245} = 1.28$) respectively. In addition, the impact of the EAC RTA is found to have significantly increased trade flows of member countries by 25% ($\exp^{0.225} = 1.25$) compared to the zero impact obtained in Table 3. Across specifications the ECCAS RTA is found to have decreased trade of member countries by 14% to 44% with regards to positive and the inclusion of zero-valued flows respectively.

6. Conclusion

In order to estimate a gravity model augmented with measures of trade agreements, the paper made use of bilateral trade flows and key gravity covariates from CEPII database on 73 countries (48 SSA and 25 EU countries) over the period 1960-2006. Using different estimation techniques, we find RTAs within ECOWAS and SADC has having a positive and significant impact on intra-RTA bilateral trade, while ECCAS RTA had a negative impact, The results on the EAC and IGADD RTAs was inconclusive .

In some cases the relative impact of the treatment effect of RTA was found to have increased trade flows higher than the non-reciprocal EU-ACP PTA. The results therefore indicate the need for developing countries especially within SSA to focus on expanding and integrating regional markets in order to significantly improve trade performance. The regional markets could be seen as a "nursery market" where the member countries could learn to improve efficiency and competitiveness in order to be able to favourably compete within the global trading system.

We make a contribution to the literature on the potential impact of trade agreements on trade flows within sub-Saharan Africa in many ways. Our use of a panel data with bilateral fixed and time effects allowed for controlling the endogeneity of the trade agreement variable unlike most previous studies on SSA. In addition we accounted for multilateral price resistance by the inclusion of the bilateral remoteness indicator (as in Frankel and Wei, 2008). We also explicitly deal with the zero-valued flows using the NBPML estimator.

References

Afesorgbor, S.K. and P.A.G van Bergeijk (2011), 'Multi-membership and the Effectiveness of Regional Trade Agreements in Western and Southern SSA: A Comparative study of ECOWAS and SADC', *ISS Working Paper Series vol. 520*, The Hague: Institute of Social Studies (ISS).

Alesina, A., R. J. Barro and S. Tenreyro (2002), 'Optimal Currency Areas', NBER Macroeconomics Annual 2002, Vol. 17, M. Gertler and K. Rogoff (editors), Cambridge, MA: MIT Press, pp. 301-345

Amemiya, T and T.E. MaCurdy (1986), 'Instrumental Variables Estimation of an Error Components Model', *Econometrica* 54 (4), 869-880

Anderson, J. E. and D. Marcouiller (2002), 'Insecurity and the Pattern of Trade: An Empirical Investigation', *Review of Economics and Statistics*, 84 (2), 345-352.

Anderson, J.E. and E. van Wincoop (2003), 'Gravity with Gravitas: A Solution to the Border Puzzle', *American Economic Review*, 93 (1), 170-192.

Anderson, J.E. and E. van Wincoop (2004), 'Trade Costs', *Journal of Economic Literature*, 42(3), 691-751

Aitken, N. D. (1973), 'The Effect of the EEC and EFTA on European Trade: A Temporal Cross-Section Analysis', *American Economic Review* 5, 881-892.

Barro, R. J. and S. Tenreyro (2007), 'Economic Effects of Currency Unions', *Economic Inquiry* 45(1), 1-23

Baier, S. L., and J. H. Bergstrand (2005), 'Do Free Trade Agreements Actually Increase Members' International Trade?', *Federal Reserve Bank of Atlanta Working Paper Series (3)*

Baier, S. L., and J. H. Bergstrand (2007), 'Do Free Trade Agreements Actually Increase Members' International Trade?', *Journal of International Economics*, 71(1), 72-95.

Bergstrand, J. (1985), 'The Gravity Equation in International Trade. Some Microeconomic Foundations and Empirical Evidence', *Review of Economics and Statistics* 67(4), 474-481

Brada, J.C. and J.A. Mendez (1985), 'Economic Integration among Developed, Developing and Centrally Planned Economies: A Comparative Analysis', *Review of Economics and Statistics* 67(4), 549-556.

Brun, J.F., C. Carrere, P. Guillaumont, and J. de Melo (2005), 'Has Distance Died?: Evidence from a Panel Gravity Model', *World Bank Economic Review*, 19(1), 99-120.

Caporale, G., C. Rault, R. Sova and A. Sova (2009), 'On the Bilateral Trade Effects of Free Trade Agreements between the EU-15 and the CEEC-4 Countries,' *Review of World Economics, Springer*, vol. 145(2), 189-206.

Carrere, C. (2004), 'African Regional Economics: Impact on Trade with or without Currency Unions', *Journal of African Economics* 13 (2), 199-239.

Cernat, L (2001), 'Assessing Regional Trade Arrangements: Are South to South RTAs more trade diverting?' *Policy Issues in International Trade and Commodities, Study series no 16.* UNCTAD, Geneva.

Chen, N. A. (2002), 'Intra-national versus International Trade in the European Union: Why Do National Borders Matter?' *CEPR Discussion Papers*, 3402

Coulibaly, S. (2007), 'Evaluating the Trade Effect of Developing Regional Trade Agreements: A Semi-Parametric Approach', *World Bank Working Paper* No. WPS 4220, Washington D.C.

Crawford, J. and R. V. Fiorentino (2005), 'The Changing Landscape of Regional Trade Agreements', *World Trade Organisation Discussion Paper* No.8

Deme, M. (1995), 'The Impact of ECOWAS on Intraregional Trade Flows: An Empirical Investigation', *the Review of Black Political Economy* (Winter 1995), 113-129.

East Africa Community (2008), 'Trade Report, 2007', EAC Arusha, Tanzania

ECA (2004), 'Assessing Regional Integration in Africa', Addis Ababa, Economic Commission for Africa

Egger, P. (2000), 'A Note on the Proper Econometric Specification of the Gravity Equation,' *Economics Letters*, 66(1), 25-31.

Egger, P. (2002), 'An Econometric View on the Estimation of Gravity Models and the Calculation of Trade Potentials,' *The World Economy*, 25(2), 297-312.

Egger, P. and M. Pfaffermayr (2003), 'The Proper Panel Econometric Specification of the Gravity Equation: A Three-way Model with Bilateral Interaction Effects,' *Empirical Economics*, 28(3), 571-580.

Egger, P. and M. Pfaffermayr (2004), 'Distance, Trade and FDI: A Hausman-Taylor SUR approach,' *Journal of Applied Econometrics*, 19(2), 227-246.

Eichengreen, B. and D. A. Irwin (1995), 'Trade Blocs, Currency Blocs and the Reorientation of World Trade in the 1930s', *Journal of International Economics*, 38(1-2), 1-24.

Elbadawi, Ibrahim A., (1997), 'The Impact of Regional Trade and Monetary Schemes on Intra-Sub-Saharan Africa trade', in Ademola Oyejide, Ibrahim Elbadawi and Paul Collier (eds.), Regional Integration and Trade Liberalization in Sub-Saharan Africa (London: Macmillan Press Ltd.).

Frankel, J. (1997), Regional Trading Blocs in the World Economic System, Institute for International Economics, Washington D.C.

Frankel, J. A., E. Stein and S. Wei (1995), 'Trading Blocs and the Americas: The Natural, the Unnatural, and the Super-Natural', *Journal of Development Economics*,47(1), 61-95.

Frankel, J. A., E. Stein and S. Wei (1996), 'Regional Trade Agreements: Natural or Super-Natural', *NBER Working Paper* 5431, Cambridge MA.

Frankel, J. A., and S. Wei (1997), 'ASEAN in a Regional Perspective,' in Macroeconomic Issues Facing ASEAN Countries, J. Hicklin, D. Robinson and A. Singh, eds. IMF, Washington, DC.

Frankel, J., E. Stein and S. Wei (1998), 'Continental Trading Blocs: Are They Natural or Supernatural?' in The Regionalization of the World Economy. J.A. Frankel, ed. Chicago, U. Chicago Press, pp. 91-113.

Ghosh, S., and S. Yamarik (2004), 'Are Preferential Trade Agreements Trade Creating? An Application of Extreme Bounds Analysis', *Journal of International Economics*, 63, 369-395.

Gould, D. M. (1994), 'Immigrant Links to the Home Country: Empirical Implications for US Bilateral Trade Flows,' *Review of Economics and Statistics*, 76(2), 302-16.

Gunning, J. (2001), 'Trade Blocs: Relevant for Africa?' *Journal of African Economies* 10(3), 311-335.

Harrigan, J. (1993), 'OECD Imports and Trade Barriers in 1983,' *Journal of International Economics*, 34,(1-2), 91-111.

Hausman, J.A and W.E. Taylor (1981), 'Panel Data and Unobservable Individual Effects,' Econometrica, 49(6), 1377-98

Head, K., and T. Mayer (2000), 'Non-Europe: The Magnitude and Causes of Market Fragmentation in the EU,' Weltwirtschaftliches Archive 136,2, pp. 285-314.

Head, K., T. Mayer and J. Ries (2010), The erosion of colonial trade linkages after independence, *Journal of International Economics*, 81(1), 1-14.

Helliwell, J.F., (1998), 'How much do national borders matter?' The Brookings Institution, Washington, DC

Helliwell, J.F., (1999), 'Effects of the Canada–United States Free Trade Agreement on Interprovincial Trade: Perspectives on North American Free Trade', *Paper 5, Industry Canada Research Publications Program*

Hine, R. (1994), 'International Economic Integration,' in D. Greenaway and A. Winters (eds) Surveys in International Trade, Blackwell Publishers, UK, pp. 234-269.

Hufbauer, G. and J. Schott (1992), North American Free Trade: Issues and Recommendations, Washington, D.C., Institute for International Economics.

Hufbauer, G. and J. Schott (1993), NAFTA: An Assessment, Revised Edition, Washington, D.C., Institute for International Economics.

Johnson, O.E.G (1995), 'Regional Integration in Sub-Saharan Africa', *Journal of European Integration*, 18 (2/3), 201-234.

Krueger, A. (1999), 'Trade Creation and Trade Diversion under NAFTA', *NBER Working Paper no. 7429*, Cambridge, MA

Krueger, A. (2000), ' NAFTA Effects: A Preliminary Assessment', *World Economy*, 23, 761–775.

Krugman, P. (1991), Geography and Trade, MIT Press, Cambridge MA.

Lee, J., and P. Swagel (1997), 'Trade Barriers and Trade Flows across Countries and Industries,' *Review of Economics and Statistics*, 19(3), 372-82.

Lyakurwa, W., A, Mckay, N. Ng'eno and W. Kennes (1997), 'Regional Integration in Sub-Saharan Africa: A Review of Experiences and Issues', in Oyejide, Ademola, Elbadawi and Collier (eds.) Regional Integration and Trade Liberalisation in Sub-Saharan Africa. Volume 1: Framework, Issues and Methodological Perspectives, London Macmillan.

Magee, C.S. (2003), 'Endogenous Preferential Trade Agreements: An Empirical Analysis,' *The B.E. Journal of Economic Analysis Policy*, 2(1), Article 15.

Martinez-Zarzoso, I. (2003), 'Gravity Model: An Application to Trade between Regional Blocs,' *Atlantic Economic Journal*, 31(2), 174-187.

Matyas, L. (1997), 'Proper Econometric Specification of the Gravity Model,' *The World Economy*, 20(3), 363-368.

Portugal-Perez, A. and J. S. Wilson (2008), 'Trade Costs in Africa: Barriers and Opportunities for Reform' *World Bank Policy Research Working Paper* 4619, the World Bank

Plumper, T. and Troeger, V.E. (2004), 'The Estimation of Time-invariant Variables in Panel Analyses with Unit Fixed Effects', *Social Science Research Network, Working Paper*, August 2004

Tinbergen, J., (1962), 'An Analysis of World Trade Flows,' in Shaping the World Economy, Tinbergen, ed. New York, Twentieth Century Fund.

Trefler, D. (1993), 'Trade Liberalisation and the Theory of Endogeneous Protection: An Econometric Study of U.S. Import Policy' *Journal of Political Economy* 101(1), 138-160.

Trefler, D. (1995), 'The Case of the Missing Trade and Other Mysteries'. *American Economic Review 85*, 1029-1046.

Viner, J. (1950), 'The Customs Union Issue', Carnegie Endowment for International Peace, New York

Wei, S. (1996), 'Intra-national versus Inter-national Trade: How Stubborn Are Nations in Global Integration?' *NBER working paper* 5531, Cambridge, MA

Wilson, J.S., D. Njinkeu and B.P. Fosso (2008), 'Expanding Trade within Africa: The Impact of Trade Facilitation', *Policy Research Paper* 4790, the World Bank Development Research Group.

Wonnacott, P., and M. Lutz (1989), 'Is There a Case for Free Trade Areas?' In, JJ Schott, ed. Free Trade Areas and US Trade Policy, Institute for International Economics, AEI Press, Washington DC.

Wonnacott, P. and R. Wonnacott (1981), 'Is Unilateral Tariff Reduction Preferable to a Customs Union? The Curious Case of the Missing Foreign Tariffs,' *American Economic Review* 71(4), 704-714.

Wooldridge, J.M (2002), Econometric Analysis of Cross Section and Panel Data. 2nd Edition the MIT Press Cambridge

Yang, Y. and S. Gupta (2005), 'Regional Trade Arrangements in Africa: Past Performance and the Way Forward', *IMF Working Paper,* WP/05/36, Washington, DC, IMF.

Appendix

A1: RTA Dummies of Interest

SSA-EU PTA ijt :Dummy = 1 if i is a SSA country and j is a member of the European Union (EU), and at time t are in a PTA and therefore i enjoys preferential access to j and, 0 if otherwise

EU to SSA ijt :Dummy = 1 if i is a member of the European Union (EU) and j is a SSA country within the EU-PTA but since the PTA is non-reciprocal i does not enjoy preferential access to j and, 0 if otherwise

Non-EU to SSA ijt: Dummy = 1 if i is an European country and j is a SSA country but at time t the exporting European country i did not belong to the EU and, 0 if otherwise

NO RTA ijt: Dummy = 1 if i and j are SSA countries but at time did not belong to the same RTA and, 0 if otherwise

ECOWAS RTA ijt: Dummy = 1 if i and j are both members of the ECOWAS RTA at time t and, 0 if otherwise

SADC RTA ijt: Dummy = 1 if i and j are both members of the SADC RTA at time t and, 0 if otherwise

EAC RTA ijt: Dummy = 1 if i and j are both members of the EAC RTA at time t and, 0 if otherwise

ECCAS RTA ijt: Dummy = 1 if i and j are both members of the ECCAS RTA at time t and, 0 if otherwise

IGADD RTA ijt: Dummy = 1 if i and j are both members of the IGADD RTA at time t and, 0 if otherwise

Table A1: List of Countries and Year of Joining RTA

Sub-Saharan Africa				Europe	
ECOWAS (1975*)		**SADC (1980*)**		**EU-25 (1958*)**	
Ghana	1975	Angola	1980	Belgium	1958
Burkina Faso	1975	Botswana	1980	France	1958
Cape Verde	1976	Lesotho	1980	Italy	1958
Cote d'Ivoire	1975	Malawi	1980	Luxembourg	1958
Gambia	1975	Mozambique	1980	Netherlands	1958
Ghana	1975	Swaziland	1980	Germany	1958
Guinea	1975	Tanzania	1980	Denmark	1973
Guinea Bissau	1975	Zambia	1980	Ireland	1973
Liberia	1975	Zimbabwe	1980	United Kingdom	1973
Mali	1975	Namibia	1990	Greece	1981
Mauritania	1975-2000	South Africa	1994	Portugal	1986
Niger	1975	Mauritius	1995	Spain	1986
Nigeria	1975	Seychelles	1997-2005	Austria	1995
Senegal	1975	Madagascar	1980	Finland	1995
Sierra Leone	1975	Congo, DR	1997	Sweden	1995
Togo	1975			Cyprus	2004
		EAC (1967*, 2000*)		Czech. Rep.	2004
ECCAS (1985*)		Burundi	1967-78, 2000	Estonia	2004
Angola	1999	Kenya	1967-78, 2000	Hungry	2004
Cameroon	1985	Rwanda	1967-78, 2000	Latvia	2004
Central Africa Rep.	1985	Tanzania	1967-78, 2000	Lithuania	2004
Congo	1985	Uganda	1967-78, 2000	Malta	2004
Congo, DR	1985			Poland	2004
Gabon	1985	**IGADD (1986*)**		Slovakia	2004
Sao Tome and Principe	1985	Kenya	1986	Slovenia	2004
Chad	1985	Ethiopia	1986		
Eq. Guinea	1985	Eritrea	1993		
Burundi	1985	Somalia	1986		
Rwanda	1985	Djibouti	1986		
		Uganda	1986		

*Year in which RTA was founded

Table A2: Hausman Specification Test (EU-SSA PTA)

	Coefficients		Difference	Standard Errors
	Fixed Effects (b)	Random Effects (B)	(b-B)	Sprt(diag(Vb-V_B))
Log of GDP_{it}	.7613297	.8602154	-0.09888857	.0120787
Log of GDP_{jt}	.6714748	.5761428	.0953356	.0104685
Log of $Population_{it}$	.6197876	.1256401	-0.7454277	.0702667
Log of $Population_{jt}$	.5458605	.7530706	-0.2072101	.0707381
$Common\ Currency_{ijt}$	.7824545	.7858363	-0.0033818	
$Remoteness_{ijt}$	-.196277	.1015525	-0.2978259	.0227666
SSA-EU PTA_{ijt}	.0803829	.0139373	.0664457	.0072776
EU-SSA_{ijt}	.217536	.3011286	-.0835926	.0062976

b= consistent under H_0 and H_a; obtained from xtreg

B= inconsistent under H_a , efficient under H_0; obtained from xtreg

Test: H_0: difference in coefficients not systematic

$Chi^2(54)= (b – B)'[(V\mathbf{b} – \mathbf{VB})^{-1}](b – B)$ = **681.34*****

Therefore (Vb – VB is not positive definite)

Table A3: Hausman Specification Test (SSA RTAs)

	Coefficients		Difference	Standard Errors
	Fixed Effects (b)	Random Effects (B)	(b-B)	Sprt(diag(Vb-V_B))
Log of GDP_{it}	.4216959	.4079571	.0137388	.0237482
Log of GDP_{jt}	.0866542	.0424915	.0441626	.0224613
Log of $Population_{it}$	.8961346	.1271328	.7690018	.1716511
Log of $Population_{jt}$	.6599669	.2154105	.4445564	.1662763
$Common\ Currency_{ijt}$	.3569814	.3904329	-.0334515	.0249313
$Remoteness_{ijt}$	.342058	.5469315	-.2048735	.0457738
$ECOWAS_{ijt}$	.4921597	.4935025	-.0013428	.0190184
EAC_{ijt}	.0331556	.0719146	-.038759	.0136227
$SADC_{ijt}$	.7979274	.8294589	-.0315315	.02454
$ECCAS_{ijt}$	-.168562	-.1715823	.0030203	.0201517
$IGADD_{ijt}$	-.5670731	-.3699783	-.1970949	.0474016

b= consistent under H_0 and H_a; obtained from xtreg

B= inconsistent under H_a , efficient under H_0; obtained from xtreg

Test: H_0: difference in coefficients not systematic

$Chi^2(57)= (b – B)'[(V\mathbf{b} – \mathbf{VB})^{-1}](b – B)$ = **463.74*****

Therefore (Vb – VB is not positive definite)