

Modelling Trade Flows between Three Southern and Eastern African Regional Trade Agreements: A Case Study

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1. Introduction

Regional integration remains the key strategy that will enable African governments to accelerate the transformation of their fragmented small economies, expand their markets, widen the region's economic space, and reap the benefits of economies of scale for production and trade, thereby maximizing the welfare of their nations. Regional integration increases competition in global trade and improves access to foreign technology, investment and ideas. African leaders thus consider it an important path to broad-based development and a continental economic community, in accordance with the treaty establishing the African Economic Community (1991) and the Constitutive Act of the African Union (2000).

However, while many countries have benefited from increased trade and regional integration, Africa has generally been left behind. International trade statistics indicate that its share in world trade has declined from around 6% 25 years ago to about 2%; less than 1% if South Africa is excluded (UNECA, 2008). This trend points to the continent's increased marginalization in the context of world trade. The situation is no different, if not worse, with regard to intra-Africa trade which has consistently remained minimal compared with its intercontinental trade. The pattern of African exports continues to be heavily influenced by historical links with the rest of the world. More than 80% of exports from African countries are still destined for markets outside the continent, with the European Union (EU) and the United States accounting for more than 50% of this total. On average, over the past decades only about 10% to 12% of African trade has taken place among African nations. This is not an encouraging trend, especially when compared with other world regions.

The implications of low intra-African trade are many and far reaching. Many opportunities are lost for using trade within the continent to enhance the prospects of specialization between African countries and accelerated development and integration. Intra-African trade can generate development and dynamic integration among African sub-regions and is a powerful driver of African growth and economic maturity. The main question therefore is how to reverse the situation so that African countries can benefit from improved intra-regional trade. It is against this backdrop that this study aims to investigate the impact of regional trade agreements (RTAs) on trade flows, using three RTAs: the Southern African Development Community (SADC), the Common Market for Eastern and Southern Africa (COMESA) and the East African Community (EAC). Such a study is deemed even more important in view of the tripartite arrangements between the three RTAs due to be operational in 2016. As such, the findings from this study should provide a priori intuitive information on the trade enhancing potential of

these RTAs individually from which one could gauge whether merging these RTAs will potentially provide long-standing trade benefits.

Since the historic Summit of Heads of State and Government in October 2008 in Uganda, member states of the three RTAs under review have made significant progress towards realizing the objective of opening up borders to literally half of the continent, spanning the entire Southern and Eastern regions of Africa. Africa's long-standing vision since 1963 at the formation of the Organization of African Unity (OAU), now the African Union, is to have a united and integrated region. Once operational, this tripartite free trade area (FTA) is expected to become a new benchmark for deeper regional and continental integration in Africa even more so since there is clear recognition that COMESA–EAC–SADC is founded on a strong and clear agenda, despite the challenges that the three regional communities may face. According to the Tripartite FTA, all negotiations should have been completed by June 2014. Thereafter, COMESA–EAC–SADC is expected to launch a single FTA by 2016, building on the FTAs that are already in place. Such an arrangement is also expected to resolve the long-standing conundrum of overlapping membership, which has presented barriers for the three communities in their quest for integration. Additionally, the arrangement is expected to promote the movement of goods and services across borders and allow member countries to harmonize regional trade policies to promote equal competition. Furthermore, the arrangement is expected to remove trade barriers such as huge export and import fees. This should enable countries to increase their earnings, penetrate new markets and contribute towards their national development.

However, like any other trade arrangement, the tripartite FTA will bring its own challenges that need to be addressed. For example, the less prepared nations are at risk of being swallowed economically by more powerful nations, as their local industries would suffer from the stiff trade competition from more rival firms in an open market. This competition may subsequently allow the more organized and developed nations to push weaker local firms out of business.

As such, we focus on three regional trading groups, namely EAC, COMESA and SADC and examine whether their effects on African trade differ. Our methodology is based on the gravity model applied to many observations from 37 countries within EAC, COMESA and SADC from 1996 to 2009, to model whether the three regional initiatives have had an impact on the trade flows between member nations of the three RTAs. The study is structured as follows: Section 2 reviews the theoretical and empirical literature on RTAs and their implication on trade flows among member nations in the three RTAs. This section also includes literature on gravity modelling and reviews the work undertaken on RTAs and studies using the gravity model. The econometric analysis on the selected RTA performance is discussed in Section 3 via the application of the gravity model and the findings are subsequently explained and analysed. We conclude in Section 4.

2. Literature review

The last two decades have witnessed renewed interest in RTAs. These agreements have played a central role in modern economy. Recognized as a catalyst for globalization, RTAs are permitted by the World Trade Organization (WTO) as long as they are consistent with Article XXIV of the General Agreement on Tariffs and Trade (GATT) and Article V of the General Agreement on Trade in Services (GATS). However, policy makers have been questioning the impact RTAs have on member and third countries. A particular distinction in this debate is drawn between RTAs involving developing countries only (South–South RTAs) and those between developed and developing countries (North–South RTAs). Regional cooperation schemes among developing countries have been encouraged by international organizations as a means of fostering regional stability and development. In this context, some argue that regionalism could serve as an elite-socialization process and as a lock-in mechanism for domestic political and economic reforms in the less developed RTA members (Whalley, 1996a).

Initially, regional cooperation schemes among countries were encouraged by international organizations to foster regional stability and development. Countries are now increasingly making RTAs a central objective of their trade policy (Brown, 2005). This combination of regional, sub-regional and multilateral negotiations has encouraged governments to accept a more open system for cross-border economic transactions. However, another school of thought argues that RTAs are an impediment rather than a stepping stone to multilateralism and globalization. Countries are increasingly prioritizing RTAs over multilateral trade objectives in their trade policy. The effect of RTAs on trade depends on their design and implementation (Global Economic Prospects, 2005). The broader policy context in which an RTA is designed and implemented is crucial.

The determining factor for RTA is low trade barriers with all global partners. Brown (2005) explains that successful regional integration is premised on several preconditions: domestic peace/security in countries; political and civic commitment and mutual trust among countries; minimum threshold of macro-economic stability; good financial management in countries; and sufficiently broad national reforms to open markets. Successful regional agreements should complement rather than inhibit multilateral negotiations.

The reasons for and benefits of forming RTAs have largely been defined in economic terms. Frankel (1997) identifies traditional gains from trade; strengthening domestic policy reform; increased multilateral bargaining power; guarantees of access; strategic linkages; and multilateral and regional interplay. Other reasons for forming RTAs may include the dissatisfaction with the multilateral approach, particularly the slow

progress of the Doha Round or the negotiating skills developed during the process by less experienced countries. Other reasons could be the “bandwagon effect” of smaller countries following the policies of larger countries in joining RTAs (Bhagwati, 1993), and the fear of being left out of major RTAs. There are also benefits of credibility, signalling and insurance, and benefits as a mechanism for coordination (Fernandez and Portes, 1997).

RTAs can fail in multiple dimensions. In economic terms, the negative results can include trade diversion, reduction of quality, increasing consumer prices and lowering global competitiveness for a country (Yeats, 1998). Investment, economic growth, government tax revenue and employment may also fall. In social terms, the flow on effects may be reduced wealth and income distribution, and living standards may fall (Woolcock, 2001). In the political sphere, stability and cooperation may decline, and conflict may increase. In cultural terms, the homogenization of culture may rapidly increase; changing the unique culture of smaller countries, and social cohesion may diminish. In terms of sustainability, it is not always coincident with economic expansion (Barbier, 2003).

The effect of RTAs on trade is thus still an open question. The European experience, it may be argued, has been one where trade was fostered whilst several regional agreements between developing countries, mainly African countries, have been mainly trade diverting. Hence, this paper aims to provide answers to some questions on whether RTAs really increase trade among members, thereby furthering trade liberalization and whether they harm non-member countries, by exploring the effects on intra- and on extra-bloc trade.

Empirical review

We can divide the existing studies estimating changes in trade patterns due to regionalism in two distinct ways. First, ex-post studies which examine trade flows after the RTA has been implemented and compare the actual levels of trade with a prediction of trade in the absence of the RTA. Second, conducting ex ante studies using trade patterns and estimated elasticities or computable general equilibrium models before the agreement to calculate the predicted effect of eliminating trade barriers with a partner country. Ex ante and ex post methods as currently implemented, however, are subject to criticism.

Based on the traditional concept of the gravity model, bilateral trade can be explained by gross domestic product (GDP) and GDP per capita, and both trade impediment (distance) and preference factors (common border, common language, etc.). Various studies have investigated whether RTAs are trade-enhancing or trade-diverting. Most research uses the gravity model to test for the trade effects of RTAs. By estimating various forms of gravity model equations, researchers have reached the consensus that RTAs are trade-enhancing. As Burfisher et al. (2001: p.139) put it, “whether or not a regional trade agreement benefits its members will depend on parameter values and initial economic structure—it is essentially an empirical issue that must be settled by data analysis.” Further, the measurement of success or failure of RTAs has been examined in economic terms, mainly in terms of whether they increase or reduce trade

flows, but little work has been done examining the political, socio-cultural and other environmental dimensions (Woolcock, 2001).

Venables (1999) examined the way in which the benefits and costs of a Free Trade Area (FTA) were divided between member countries using a generalized Heckscher-Ohlin trade model. This model assumed all countries had the same technology but different endowments of two factors, referred to as skilled and unskilled labour, and these differences were the basis of their comparative advantage. The author found that FTAs between low income countries tend to lead to divergence of member country incomes, while agreements between high income countries caused convergence. These results suggested that developing countries were likely to be better served by “North–South” than by “South–South” FTAs. However, Soloaga and Winters (2001) found convincing evidence of trade diversion for EU and European Free Trade Association (EFTA) as EU’s and EFTA’s propensity to import were significantly lower in 1995–96 than in 1980–82. The authors used annual non-fuel imports data for 58 countries from 1980 to 1996 from the United Nations Commodity Trade Statistics (UN-COMTRADE) database. In addition, Coulibaly (2006) compared six developing RTAs covering sub-Saharan Africa (the Economic Community of West African States (ECOWAS) and SADC), Association of Southeast Asian Nations (ASEAN) FTA and Central American Common Market (CACM), Andean Community (CAN) and Southern Common Market (MERCOSUR) over the period 1960–1996, with two developed ones [the European Union (EU) and North American Free Trade Agreement (NAFTA)] to estimate their trade and welfare impacts. A gravity model was combined with kernel and bootstrap estimation techniques to investigate the trade and welfare profile along with the number of years their members participated over the period 1960–1996. “Younger” RTAs (EFTA, CAN, MERCOSUR, NAFTA and SADC) appeared to have positive welfare effects during first years of their existence, while “older” RTAs (CACM, ECOWAS and EU) depicted more volatile welfare effects. The author also found that the trade and welfare impacts of developing and developed RTAs evolved non-monotonically over time. Similarly, Urata and Okabe (2013), who investigated the impact of trade liberalization under AFTA on intra-ASEAN trade, found that trade creation effects were mainly identified due to the tariff elimination on a wide range of products and that increased trade flows in the case of new ASEAN members were less important than for older members.

Muhammad and Yucer (2010) investigated the effects of RTAs in the Western Hemisphere. Annual data from 38 countries covering six RTAs in for 1986 to 2005 were used. The regression estimates for the effects of the different RTAs varied remarkably. All RTAs were found to foster greater trade and so were welfare enhancing except the Latin American Integration Association (LAIA) and NAFTA. While LAIA, NAFTA and MERCOSUR showed a significant trade diversion effect, the Andean Community (ANDEAN) and CACM had a positive significant trade diversion coefficient. This indicated that these RTAs were not only helping boost the trade within the region but also contributing to overall world trade.

Cernat (2001) explains that in a simple partial equilibrium model under perfect competition RTAs may have a positive impact on the level of trade between members at the expense of less efficient domestic producers but also of more efficient third countries

(trade diversion). The net effect of RTA on trade thus depends on the relative size of these two effects. Esteban and Anesa (2007) postulate that RTAs are in line with the principles of multilateral trade as long as they are trade creating. These arguments are based on the theory of comparative advantage; free trade motivates the operation of the principle of comparative advantage by curbing the discrimination between the existing sources of supply. Contrarily RTAs shift the discrimination between the existing sources of supply among trading partners by granting preferential market access to its signatory members. Cernat (2001) found a strong case of trade creation between African RTAs which he attributed to greater trade facilitation amongst members of RTAs. This is an evident indication that RTAs in Africa stand a good chance of being trade-creating, especially in light of the sum of the welfare effects on all RTA members.

Furthermore, in a study estimating the trade effects associated with EAC, Buigut (2012) argued that intra-EAC exports and imports have increased in the member countries of the Customs Union. Similarly, in an attempt to assess the effect of preferential tariffs granted to agreement partners on trade, Bureau and Jean (2013) used trade and tariff data at a detailed product level for 78 agreements from 1998 to 2009. They found that a 1% preferential margin would increase trade by 2% on average. Finally, Yang and Martinez-Zarzoso (2013), who investigated the impact of the ASEAN-China Free Trade Agreement on exports using a sample of 31 countries with export data from 1995 to 2010, found a positive trade effect. This implies that the reduction and waiving of trade barriers promoted total trade volume for both intra-bloc and extra-bloc countries.

However, Urata and Okabe (2010), in a study examining the impacts of RTAs on commodity trade mostly in terms of trade creation and diversion, identified partial scope RTAs and RTAs among developing countries as more prone to trade diversion effects. Further, by incorporating tariff rates in their analysis trade diversion was found to be caused by the remaining tariffs on extra-bloc imports.

Brown (2005) further argues that, as the EU shows, trade agreements can also signify deep and profound economic, social and political changes. Imports become cheaper and exports more valuable, promoting foreign direct investment (FDI); improving economic growth; improving a countries' balance of payments position; and opening access to new skills and technology. While economic self-interest is generally the principal motivation of RTA growth, such agreements are also increasingly being directed by political, strategic and security concerns. ASEAN was initially created as a response to the perceived spread of communism in the region in the 1960s. Regional blocs are a powerful tool to negotiate common interests both within and outside WTO. In the case of Latin America, regional integration has been used to counter the negotiating power of the United States.

The estimates from calculating the RTA effects using the gravity model are also sensitive to the sample of countries chosen for the analysis. Haveman and Hummels (1998) demonstrate that changing the country sample results in a different prediction of trade in the absence of the RTA, and thus the estimates of RTA effects vary considerably in their conclusions. Pomfret (1997) also mentions several incredible results in studies using the gravity model to measure the trade effects of RTAs and concludes that the approach is inadequate. More recently, Ghosh and Yamarik (2004) made a case that the gravity model results are very sensitive to the variables included in the regressions and

to prior beliefs of the researchers. The authors found a remarkable drop in the number of regional agreements that are trade-creating when they incorporated the researcher's prior beliefs into the estimation.

In addition, it could be argued that the empirical findings on the trade flow effects have produced mixed results at best (Ghosh and Yamarik, 2004; Baier and Bergstrand, 2007); with some studies finding positive and significant effects (Tinbergen, 1962; Aitken, 1973; Brada and Mendez, 1985), and others uncovering insignificant and, in some cases, negative trade flow effects (Frankel, 1997; Krueger, 1999). Such conflicting results are very often the outcomes of different sample selections coupled with different model specifications and at times due to the different approaches in methodology used.

Ghosh and Yamarik (2004) addressed this issue econometrically and showed that cross-sectional gravity equations yielded highly unstable results. Baier and Bergstrand (2007) found similarly unstable RTA effects in cross-section regressions. However, Baier and Bergstrand (2007) went a step further and showed that previous studies have produced biased results because countries select endogenously into RTAs. Using panel data methods to account for the endogeneity of RTA membership and a theoretically consistent gravity equation, Baier and Bergstrand (2007) found that RTAs approximately doubled members' trade using aggregate trade data. In this regard, our study follows that of Baier and Bergstrand (2007) and applies the panel data framework and focuses on trade within African RTAs.

3. An econometric framework to measure impact of selected African RTAs

Data set and data sources

This study used data from 41 countries (but focused on African RTAs). The study covers a time frame of 14 years, from 1996 to 2009. Bilateral trade data were obtained from the Center for Global Trade Analysis (GTAP) and is derived from the UN-COMTRADE database. Production and expenditure data (in U.S. dollars) were obtained from the World Bank Development Indicators database and the Financial Statistics Yearbook of the International Monetary Fund (IMF) will be used to supplement World Bank data for incomplete and missing data.

Trade flow data and production and expenditure for countries i and j will not be converted to real dollars for two reasons. First, Srinivasan (1995) showed that purchasing power parity rates are subject to large measurement error. Second, Frankel (1997) found little difference in the gravity equation results when using real data. Moreover, time fixed effects control for inflationary pressures and the growth in world trade over the sample period. Distance, contiguity, and common language indicators were taken from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). CEPII used the great circle formula to calculate the geographic distance between countries, referenced by latitudes and longitudes of the largest urban agglomerations in terms of population. The landlocked variable was constructed from the Central Intelligence Agency (CIA) World Fact Book (2008)

Methodological framework

Analysing the impact of RTA on trade flows can be addressed within the context of RTA-member and RTA non-member suppliers offering agricultural goods in the international market using an empirical model first developed by Balassa (1963). The gravity model has performed remarkably well as a tool for measuring the impacts of RTAs. Anderson (1979) provided the first theoretical foundation for the gravity model based on the constant elasticity of substitution (CES) expenditure system. Subsequent refinements were provided by Bergstrand (1985), Helpman and Krugman (1985), and

Deardorff (1997). Eichengreen and Irwin (1998, p.33) called the gravity model “the workhorse for empirical studies to the virtual exclusion of other approaches”.

In its most basic form, the gravity model states that bilateral trade flow (either export or sum of import and export) between two countries (i and j) is a function of GDP of each country (GDP), and geographical distance (D) between them. In a log-linear form it is written as follows:

$$\ln (X_{ij}) = a + \beta_1 \ln (GDP_i) + \beta_2 \ln (GDP_j) + \beta_3 \ln (D_{ij}) \quad 1$$

In the recent past, the basic gravity model has been augmented to include several other variables (like population and language similarity) in different forms as explanatory variables of trade. However, there has also been a large debate on variables used in the gravity models. Some researchers (e.g. Rahman, 2003; Sharma and Chua, 2000) use trade value (i.e. sum of imports and exports) as dependant variable, while others (e.g. Adams et al., 2003) use only exports value. Baldwin and Taglioni (2006) solve the dilemma of whether to use trade values or export values. They suggest the use of one-way trade and this is the model we follow in this study.

To analyse the impact of RTA on trade flows in the literature, RTA-specific dummies have been widely used in the literature. However, the number of dummies for each RTA differs between studies, and thereby the explanation of the estimated coefficients for these dummies differs. Some studies have used one dummy for each RTA to capture the intra trade-bloc effect of an RTA (e.g. Aitken, 1973); other studies have used two dummy variables for each RTA to separately capture the effects of intra-bloc and extra-bloc trade (e.g. Frankel, 1997); in yet other studies, three dummy variables have been added for each RTA to not only separately capture the effects of intra-bloc and extra-bloc trade, but also to distinguish between extra-bloc effects on imports and extra-bloc effects on exports (e.g. Soloaga and Winters, 2001; Rojid, 2006).²

A typical gravity equation (see Rojid, 2006; Baier and Bergstrand, 2007) to investigate the trade flow effects of RTAs includes variables related size (as measured by population), distance, geography and preference similarities, is as follows:

$$X_{ijt} = GDP_i + GDP_j + D_{ij} + ADJ_{ij} + POP_{ij} + POP_{jt} + LANG_{ij} + L_{ij} + t + RTA_{ijt} \quad 2$$

where:

X_{ij} is the value of trade from country i to country j (measured by export from country i to country j in \$ terms);

GDP_i and GDP_j is the gross domestic product of the exporting (importing) country as a proxy for economic size (measured as the GDP of the respective countries in \$ terms);

D_{ij} is the distance between countries i and j used to proxy for transportation costs;

POP_{ij} is population size of the exporting country in year t;

POP_{jt} is population size of the importing country in year t; and

T is the time factor element.

Dummy variables

ADJ_{ij} whether the two countries share a common border;

$LANG_{ij}$ whether these two countries share a common language;

LL_{ij} whether one of these two countries is landlocked (it takes a value of unity if either of the countries is landlocked);

RTA_{ij} is a dummy variable indicating the existence of a regional trade agreement between countries i and j . Since this study focuses on three African RTAs, namely SADC, COMESA and EAC, we included a dummy for each of these RTAs (denoted by $RTACOMESA$, $RTASADC$ and $RTAEAC$ respectively). We also added an additional dummy for the 'rest of RTA' (that is for those RTAs other than the three under study) in the sample ($RTAREST$)

Given the multiplicative nature of the gravity equation, the standard procedure for estimating a gravity Equation 1 is simply to take the natural logarithms of all variables and obtain a log-linear equation that can be estimated by linear estimation methods. This yields the estimation equation hereunder:

$$\ln X_{ijt} = \alpha + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 D_j + \beta_4 ADJ_j \quad 3$$

$$+ \beta_5 \ln POP_i + \beta_6 \ln POP_j + \beta_7 LANG_j + \beta_8 L_j + \beta_9 RTA_{ijt} + \beta_{10} t + \varepsilon_{ijt}$$

In addition, the above specification implies that the estimated parameters are in elasticities terms. For instance, the estimated parameter for the GDP in a gravity equation estimated in logarithms is the elasticity of trade to GDP, indicating the percentage variation in trade following a 1% increase in GDP.

The regression Equation 2 is estimated using a panel fixed effect model in the first instance (column 2 in tables 3.1 and 3.2). To choose between random versus fixed effect specification, a spatial Hausmann test was performed. This test highlights the strong preference for the fixed effect model. Our results underwent and passed further tests particularly related to the presence of spatial effects and spatial autocorrelation (Spatial Lagrange Multiplier).

Dealing with zero flows¹

The gravity model predicts that countries have positive trade in both directions, even if such predicted trade may be small. Moreover, the conventional log-linear formulation of the gravity model cannot include zero-valued bilateral trade flows, because the logarithm of zero is undefined. However, in our data set of bilateral trade, some of the trade flows are recorded as zero or missing. At the aggregate level, zero flows mostly occur for trade between small or distant countries, which are expected to trade little (Frankel, 1997). However, disregarding zero flows can bias the empirical results, if they do not occur randomly. Specifically, if geographic distance, low levels of national income, and a lack of cultural or historical links reduce trade, omitting zero flows from the analysis tends to result in an underestimation of the effects of these variables on trade (see Rauch, 1999). Omitting zero-flow observations also implies that

we lose information on the causes of low trade. Several approaches have been applied or suggested in the literature to address the problem of zero flows (e.g. Frankel, 1997; Bikker, 1982). The most common solution in the literature confines the sample to non-zero observations to avoid the estimation problems related to zero flows. Alternatively, zero values may be substituted by a small constant, so that the double-log model can be estimated without throwing these country pairs out of the sample (Linnemann, 1966, Van Bergeijk and Oldersma, 1990; Wang and Winters, 1991; Raballand, 2003). Substituting small values prevents omission of observations from the sample, but is essentially ad hoc. The inserted value is, however, arbitrary and does not necessarily reflect the underlying expected value and does not provide any formal guarantee that the resulting estimates of the gravity equation are consistent. Both approaches are hence generally unsatisfactory. Dealing properly with zero flows requires that the information provided by these flows is taken into account, without using ad hoc methods. The censored regression model (Tobit model) is often employed to analyse data sets in which a substantial fraction of the observations cluster at zero (e.g. Rose, 2004; Soloaga and Winters, 2001; Anderson and Marcouiller, 2002). However, the Tobit model has often been criticized as being inappropriate for explaining why some trade flows are missing (Maddala, 1992). Sigelman and Zeng (1999) argued that zero flows result from binary decision making rather than censoring and thus the appropriate way to proceed is: “to model the decisions that produce the zero observations rather than use the Tobit model mechanically” (Maddala, 1992, cf. Sigelman and Zeng, 1999, p.170). This can be done by modelling the decision whether or not to trade as a Probit model. The outcome of that decision determines whether or not we observe actual trade flows in the sample. The size of potential trade is determined by the gravity model. This structure has been framed in the sample selection model (see, e.g. Greene, 2000; Verbeek, 2000), a model which we adopted in our study of African RTAs (as a solution to the problems associated with zero flows in a gravity model context). In fact, when the zero values are thrown away, we face the so called “selection problem”. Such a selection problem can be handled through a Heckman two-steps procedure² (Heckman, 1979) which treats zero trade so that countries which have a positive trade will still make up the selected sample. The sample selection model allows us to account for the unobserved selection criterion that leads to positive trade in the current time period. In fact, the Heckit estimator combines Probit analysis of zero trade flows with Ordinary Least Squares (OLS) analysis of trade volumes (Helpman et al., 2006). We thus present the results with the Heckman estimates (in column 3) which take into account zero trade flows.

Gravity model results

Table 1: Gravity model—African RTAs

Dependent variable: Ln Exports; time period 1996–2009 (14 years)

Variables	Fixed effects estimates (1)	Heckman estimates (2)	Fixed effects estimates (3)	Heckman estimates (4)
	Coef.(T-ratio)	Coef.(T-ratio)	Coef.(T-ratio)	Coef.(T-ratio)
			Accounting for intensity of RTA	
Ln GDP exporting country	0.337(2.51)***	0.353(2.52)***	0.332(2.55)***	0.316(2.26)***
Ln GDP importing country	0.431(2.21)**	0.367(2.77)***	0.434(2.25)**	0.31(2.24)***
Ln population size of exporting country	0.174(1.97*)	0.141(1.85)*	0.176(1.95*)	0.132(1.81)*
Ln population size of importing country	0.245(1.85*)	0.125(1.88)*	0.234(1.93*)	0.117(1.85)*
Ln distance	-0.23(3.02)***	-0.247(2.56)***	-0.229(3.15)***	-0.223(2.31)***
Border	0.136(2.15)**	0.153(2.16)**	0.147(2.25)**	0.15(2.14)**
Linguistic similarity	0.114(2.06)**	0.111(2.12)**	0.123(2.12)**	0.121(2.11)**
RTACOMESA	0.031(1.89)*	.036(2.06)*		
RTACOMESA1			0.0377(1.95)*	0.043(2.01)*
RTASADC	0.023(1.25)	0.017(1.24)		
RTASADC1			0.03(1.42)	0.026(1.27)
RTAEAC	0.058(1.93)*	0.045(2.12)*		
RTAEAC1			0.063(1.93)*	0.051(2.16)*
RTAREST	0.13(1.97)*	0.12(1.94)*		
RTAREST1			0.15(1.94)*	0.14(1.96)*
Constant	-11.23(3.07)***	-13.43(2.52)***	-9.11(3.07)***	-8.12(2.43)***
LR χ^2 (chi ²)	101653	143345	102365	133234
R2	0.47	0.47	0.47	0.45
Hausmann test	Prob>Chi ² = 0.05	Prob > F = 0.00	Prob>Chi ² = 0.04	Prob > F = 0.00
No. of observations	23,534	23,534	23,534	23,534

it gives an indication on the rich dataset; The small letters denote variables in natural logarithmic and t values are in parentheses (robust to heteroskedasticity).

Note: *significant at 10%; ** significant at 5%; ***significant at 1%.

Source: Authors' calculation

The coefficients of the conventional variables on the observable effects determining bilateral trade, are as expected and highly significant. The size of economies, GDP and population, act as a proxy measure for the level of demand in the importing country and level of supply in the exporting country. A high output (GDP) level in the exporting and importing countries provides a higher export potential for the countries. Therefore we expect export of country *i* to vary positively with the size of GDP of both importing and exporting countries. The estimated coefficients for the log of GDP for the exporting and importing countries imply that a 10% increase in these variables would increase trade by an average of 3.5% to 4% respectively.

As expected, trade is positively related to the level of population as well. Bilateral trade, however, is negatively related to distance due to two reasons. First, the larger the distance between two countries, the higher the transportation costs. Second, the larger the distance, the more time involved in delivering the goods and concerns about possibilities for goods to perish. Bilateral trade is positively related to countries sharing a common border and language familiarity. Similarly, a common land border or linguistic similarity increases trade whereas distance is negatively related to trade among countries. This is consistent using both sets of estimates (i.e. fixed effect model and Heckman approach).

Our primary interest is in the impact of RTAs on explaining trade effects. This is captured by the dummy RTA. It is a dummy variable which takes a value of one if both exporting and importing countries are members of the same RTA in the underlying year of study; zero otherwise. A positive and significant estimate on the intra-bloc membership implies that a pair of countries that join an RTA experiences an increase in bilateral trade.

In the RTA model, the coefficient for the variable RTA is only significant for COMESA and EAC, although with a very small coefficient. This implies a relatively small impact on trade within the RTAs (below of the expectations of the RTA objectives probably). The RTAREST dummy yields more encouraging results, but a further decomposition of these RTAs could give a better picture and more insightful comparative analysis.

The possible underpinnings for explaining such a small impact of trade flows may be related to the underlying problems and challenges which African RTAs suffer from and face. These may include a lack of political will to implement decisions agreed upon; similarity in exports products; the mitigating impact of the substantial number of NTMs; and possibly the element of multiple memberships. The mitigating impact or otherwise of multiple memberships is tackled later in this paper.

Accounting for the expansion of RTA and degree of RTA intensity

Since RTAs have been evolving over the course of their existence, the intensity of the RTA may matter in intra trading. As the level of integration increases, one can posit that the intra trade between member countries will be higher. In addition, it is important to know whether the setting up of these regional agreements has led to an increase of the trade volume between the countries at different stages of their integration and

liberalization process. To account for the intensity or level of integration, we used an alternative measure of integration and in fact included RTA intensity between trading partners on a scale of 0–3. Zero would represent that partners are not integrated at all; 1 would represent integration through a preferential trade agreement (PTA) or FTA; 2 would represent integration through a commodity market; and 3 is the highest level of integration, being in a common market.

The PTA between a subset of countries is initially designed to significantly reduce or remove trade barriers within member countries. Gradually the complete removal of trade barriers among the member countries enables the trading bloc to move to a higher dimension, that is, a Free Trade Area (FTA), but where each member remains responsible for determining its trade policy vis-à-vis non-member countries. The next step is establishing a customs union, with liberalized intra-bloc trade, as well as the adoption of an external tariff structure and trade barriers towards outsiders common to all members of the customs union; and finally a common market, which entails a customs union with deeper integration between its members (such as free movements of goods, services and factors of production and common economic policies among others.).

In particular, the motivation behind the inclusion of the scale criterion into the gravity model is to verify if the intensity of the respective trade agreements are associated with higher trade flows in the Balassa (1967) sense. Our results (in columns 3 and 4 in Table 1) show that higher intensity appears to be associated with slightly higher intra trade as compared with previous results and this indicates that the level of integration may matter. We also report in general more or less similar results as far as the other explanatory gravity variables are concerned.

Including the dynamic trade dimension in gravity modelling of the RTAs

In the analysis so far, we have assumed that trade is a static concept, that is, trade in this year does not depend on last year's trade. However, there are numerous economic arguments suggesting that trade is a dynamic process; thus a problem of endogeneity often arises. For countries that traded a lot in the past, businesses may have set up distribution and service networks in the partner country, which may lead to entrance and exit barriers due to sunk costs. In addition, consumers may have grown accustomed to the partner country's products (habit formation). It is, therefore, likely that current bilateral trade between those countries is also high (Eichengreen and Irwin, 1998). Hence, lagged trade affects current trade. Moreover, RTAs are also unlikely to be purely exogenous and countries are likely to form RTAs with partners with whom they already trade a lot (following the “natural trading partners” hypothesis). If this is the case, the RTA dummy on the right-hand side of the gravity equation is correlated with the error term because unobserved characteristics of some pairs of countries explain why they trade a lot which increases the probability that they would form a RTA. Reverse causality apart, endogeneity issues may arise because of omitted variable bias. That is, it may be that RTAs are signed by countries that have other characteristics omitted in the regression (peaceful relationship, common legal origin, etc.) that facilitate trade.

Ignoring the above to some extent, may lead to incorrect inferences (Bun and Klaassen, 2002). Arguments in favour of dynamism in trade and endogeneity issues have not received due attention in the literature and it is believed that an analysis encompassing the above within a dynamic framework would yield important insights in the debate. Recently, several studies have brought dynamics into the analysis of trade (Eichengreen and Irwin, 1998; De Grauwe and Skudelny, 2000). To overcome the problem of endogeneity, use of the generalized method of moments (GMM) estimators³ (Arellano and Bond, 1991; Arellano and Bover, 1995) is thus made. The first step GMM estimator is used as it has been shown to result in more reliable inferences (Blundell and Bond, 1998). The results using the first step GMM estimator are presented in Table 2. The various estimated equations pass all diagnosis tests related to Sargan Test of Over-identifying restrictions and the Arellano-Bond test of 1st order and 2nd autocorrelation. Since the lagged exports variable (i.e. lag of the dependant) is positive and significant, we can conclude that indeed dynamism exists in trade between partner countries. Given that the coefficients are in difference terms, it means that we are dealing in terms of short-run parameters. This is the reason why the coefficients are smaller than previous ones, that is, it takes some time to adjust to the long-run effects. The explanatory variables have the same effects as the ones discussed above. Results in Table 2 confirm the previous results (with trade being dynamic), even in the short run and after accounting for dynamics.

Table 2: Gravity model — GMM estimates (African RTA)

Dependent variable: dLn Exports; time period 1996–2009

Variables		
	<i>GMM estimates</i>	<i>GMM (accounting for intensity of RTA)</i>
	<i>Coef. (T-ratio)</i>	<i>Coef. (T-ratio)</i>
dLn Exports (lagged)	0.213(2.24)**	0.216(2.04)*
dLn GDP exporting country	0.213(3.12)***	0.232(2.32)**
dLn GDP importing country	0.127(2.06)**	0.131(1.93)*
dLn population size of exporting country	0.083(1.44)	0.098(1.21)
dLn population size of importing country	0.063(1.89)*	0.057(1.94)*
dLn distance	-0.231(1.83*)	-0.186(1.84)*
Border	0.118(2.13)**	0.121(2.16)*
Linguistic similarity	0.102(2.06)**	0.127(1.96)*

Continued next page

Table 2: Continued

RTACOMESA	0.028(2.33)**	
RTACOMESA 1		0.037(2.10)*
RTASADC	0.015(1.36)	
RTASADC 1		0.015(1.51)
RTAEAC	0.033(1.97)*	
RTAEAC 1		0.042(2.04)*
RTAREST	0.084(2.01)*	
RTAREST 1		0.12(2.03)*
Sargan Test of Overidentifying restrictions	Prob>chi ² = 0.14	Prob>chi ² = 0.12
Arrelano-Bond Test of 1st order autocorrelation	Prob>chi ² = 0.33	Prob>chi ² = 0.37
Arrelano-Bond Test of 2nd order autocorrelation	<i>Prob>chi² = 0.13</i>	<i>Prob>chi² = 0.11</i>

*Significant at 10%; ** significant at 5%; ***significant at 1%.

The small letters denote variables in natural logarithmic; d denotes variables in first difference; and the heteroskedastic-robust z-values are in parentheses.

Source: Authors' calculations

Since the lagged exports variable (i.e. lag of the dependent) is positive and significant, we can conclude that, indeed, there exists dynamism in trade between partner countries. Given that the coefficients are in difference term, it means that we are dealing in terms of short-run parameters. This is the reason why the coefficients are smaller than the previous ones, that is, it takes some time to adjust to the long-run effects. The explanatory variables have the same effects as those discussed above. Results in Table 2 confirm that RTAs in Africa are no different from the other regions of the world, even in the short run and after accounting for dynamics.

4. Conclusion

The objectives of this study were to investigate the impact of three RTAs— EAC, COMESA and SADC—on trade flows. The results from the econometric modelling suggest in general that the African RTAs under study have not been performing up to expectations since the impact on trade flows was, at best, very small for EAC and COMESA.

In this regard, one could argue that the plausible explanations (extensively discussed in the existing literature) underpinning our findings may include the homogeneous nature of member countries' exports; the inability of governments to implement measures and decisions taken regionally at a national level; the existing weak infrastructural linkages and the relatively very high level of non tariff measures present in the region. In this regard, such results may cast serious doubts on the potential benefits which could be expected from the enlarged free trade area which was signed by member states in 2008 and which relates to the merging of the three RTAs under review unless some, if not all, of the above-mentioned impediments are properly addressed.

Notes

1. Most of these flows are recorded as missing in the source database (UN COMTRADE); some have explicitly been recorded as zero. We assume that all missing observations in principle indicate that bilateral exports are considered to be absent by the reporting country. Countries that do not report any trade statistics in the database have been omitted from our sample.
2. In the first stage, a Probit equation is used to estimate the extent of entry into an export market, which is an unobserved variable in the gravity equation. The second stage equation is a gravity model of positive trade values where the results of the first stage are used to correct for the sample selection bias introduced by omitting zero trade flows (the standard Heckman correction term, the Inverse of Mill's Ratio) and to estimate the unobserved trade flows.
3. As far as endogeneity issues in RTAs are concerned, no easy fix to the problem exists. Fixed effects help overcome part of the endogeneity problem due to the omitted variable bias, but time-varying omitted variables remain a problem. However, the instrumental variable (IV) approach may be useful but is limited by the usual problem of finding instruments that are correlated with the RTA dummy but not with trade. Alternatively, the GMM estimation, where lagged levels can be used as instruments for current differences and vice versa, can be employed to treat issues of endogeneity and this has been the technique used in the present study.

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