

**Impacts of Regional Trade Agreements on Trade in Agrifood Products:
Evidence from Eastern and Southern Africa**

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Abstract

The study analyzed the impacts of regional trade agreements on intra-trade in three selected agrifood products which are maize, rice and wheat in the three regional economic communities (RECs), namely the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC) and the Southern Africa Development Community (SADC for the period 2005 to 2010. The study relied on two methodologies: statistical analysis and the gravity trade model.

Changes in intra-regional trade shares shows that Namibia, Rwanda, Tanzania and Zimbabwe are the four countries whose intra-regional trade across the three products increased during the period reviewed. On the other hand, Burundi, Malawi and Sudan are the countries whose intra-regional trade in at least two of the three products has declined. The results from the gravity trade model show that all the tradition variables, that is, GDP for exporter and importer countries as well as distance have expected theoretical signs. The coefficients on all variables of interest, that is COMESA, EAC and SADC regional dummies, shows that, overall, the estimated coefficients for these regional dummies in all other RECs and commodities is positive and statistically significant; indicating that intra-regional trade in those regions and for such commodities is above the predicted level of the standard gravity model.

The coefficients of the COMESAO, EACO and SADCO dummy variables which provide information on the presence of trade diversion effects varies across regional blocs and also across the products. For instance the estimated coefficients of COMESAO across the three products is positive and statistically significant, suggesting that imports of these commodities into COMESA member states from non-member states in the rest of the world were higher than the gravity model would predict.

1 INTRODUCTION

Although the world has witnessed increased economic interdependence and a rapid increase in regionalism which has resulted in proliferation of regional trade agreements (RTAs), literature does not provide conclusive results of the welfare effects of these RTAs (Jayasinghe and Sarker, 2007) to both participating member countries and also to the world at large. One branch of literature considers RTAs, not only as reducing welfare to both participating countries and the world at large, but also as “stumbling blocks” to multilateral free trade (Bhagwati, 1998 and Panagaria, 2000). On the other hand, the other branch of literature supports RTAs as raising welfare for both member countries, and the world at large, thus acting as “building blocks” to multilateral free trade (Summers, 1991, and Etheir, 1998). This controversy on the impacts of RTAs is inherently an empirical issue and mainly a result of the fact that the net welfare effect will normally depend on the relative magnitudes of trade creation and trade diversion effects. Moreover, the net effect of trade creation and diversion may vary across commodities within the same RTA, between RTAs and over time (Jayasinghe and Sarker, 2007).

Trade in agrifoods at any level of cooperation, from bilateral, to regional, to inter-region and to multilateral remains complex than any other sector and varies across agreements (Aksoy, 2004). Thus, comparing trade in agrifoods and other sectors, it can be noted that even though negotiations at RTAs and WTO/GATT (World Trade Organization/General Agreement on Tariffs and Trade) have generally reduced existing tariffs on industrial products, tariffs on agrifoods are still relatively high, thus resulting in subdued trade in such products even within some RTAs. The situation is even made worse by agriculture protection which still exists (at WTO negotiation level), for instance, in the form of export subsidies, special safeguards, amber-box and blue-box provisions of the Uruguay Round Agreement on Agriculture (URAA). These provisions complicate liberalization in agricultural trade given that a number of countries rely on them. Thus, even countries that are members of a given RTA, average preferential tariffs for agricultural products are still high in most of these trade blocs.

Whilst a number of empirical studies have been done on the impacts of RTAs, most studies were done either at aggregate level or for manufacturing products (for instance, Clausing, 2001; and Krueger, 2000) with the effects of RTAs on trade in agrifood products still to be investigated rigorously, especially in the eastern and southern Africa region. This void motivates this study which focuses on the impacts of regional trade agreements on trade of major agrifood products deemed to be important for the region’s food security. The eastern and southern Africa region analysed in this study comprises of three regional economic communities (RECs), namely the Common Market for Easter and Southern Africa (COMESA), the East African Community (EAC) and the Southern African Development Community (SADC).

To achieve its objectives, the study’s investigation relies on both statistical trade related indices and an econometric gravity trade model. In both cases, disaggregated agrifood data level was used. The three major agrifood commodities analysed are: maize, rice and wheat. These commodities were selected mainly because of their importance in the food security basket of the region. Changes in three trade related indices, namely intra-trade index and production complementarity index to infer the extent of intra-regional trade in the above three

commodities in the three RECs¹. On the econometric side, an extended gravity model was employed to determine the extent of intraregional trade creation and trade diversion impacts for the three commodities separately.

1.1 Background to regional trade agreements in eastern and southern Africa

1.1.1 Common Market for Eastern and Southern Africa (COMESA)

The Common Market for Eastern and Southern Africa (COMESA)² started as a preferential trade area (PTA) in 1980 and later turned into a common market in 1993. The aim of COMESA is to promote sustainable economic and social development for all its member countries through enhanced cooperation leading to regional integration especially in the areas of trade, customs, infrastructures (transport and communications), science and technology, agriculture and natural resources. The main objectives of COMESA in the area of trade, among others include the creation of a free trade area; the establishment of a customs union and eventual establishment of a monetary union.

The COMESA free trade area (FTA) was launched in October 2000 with nine participating states, after 16 years of gradual reduction of tariffs on intra-COMESA trade.³ In November 2007, 13 countries were participating in the FTA; other member states had carried out tariff reductions of between 10 per cent and 80 per cent. The region launched its customs union (CU) in 2009, though with few members signing into the newly created CU.

COMESA cooperates with other regional organizations to liberalize trade. A Joint Task Force has been set up with the East African Community (EAC) and the Southern African Development Community (SADC) to harmonize their trade liberalization programmes and eventually form the COMESA-EAC-SADC tripartite FTA.

1.1.2 East African Community (EAC)

The East African Community (EAC) is the regional intergovernmental organisation of the Republics of Kenya, Uganda, the United Republic of Tanzania, Republic of Rwanda and Republic of Burundi. The Treaty for Establishment of the East African Community was signed on 30 November 1999 and entered into force on 7 July 2000 following its ratification by the original three Partner States – Kenya, Uganda and Tanzania. The Republic of Rwanda and the Republic of Burundi acceded to the EAC Treaty on 18 June 2007 and became full Members of the Community with effect from 1 July 2007.

¹ The analysis is ONLY limited to countries participating in COMESA and SADC FTAs, and the EAC customs union.

² The treaty establishing COMESA was signed on 5 November 1993 at Kampala (Uganda) and was ratified on 8 December 1994 at Lilongwe (Malawi). It has 19 member countries: Burundi, Comoros, DRC, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia and Zimbabwe.

³ COMESA was formed in 1994 as a successor to the Preferential Trade Area (PTA). Tariff reduction had started in 1984 within the framework of the PTA, but was accelerated with the formation of COMESA.

The EAC aims at widening and deepening co-operation among the Partner States in, among others, political, economic and social fields for their mutual benefit. To this extent the EAC countries established a Customs Union in 2005 and a Common Market in 2010. The next phase of the integration will see the bloc enter into a Monetary Union (whose negotiations started in 2011) and ultimately become a Political Federation of the East African States.

1.1.3 The Southern African Development Community (SADC)

The Southern African Development Community (SADC)⁴ (hereafter called the Community) has been in existence since 1980, where it was formed as a loose alliance of nine majority-ruled States in Southern Africa known as the Southern African Development Coordination Conference (SADCC), with the main aim of coordinating development projects in order to lessen economic dependence on the then apartheid South Africa. The transformation of the organization from a Coordinating Conference into a Development Community (SADC) took place on August 17, 1992 in Windhoek, Namibia when the Declaration and Treaty was signed. The Community vision is that of a common future, a future within a regional community that will ensure economic well-being, improvement of the standards of living and quality of life, freedom and social justice and peace and security for the people of Southern Africa.

The region's Protocol on Trade mainly deals with all the trade issues of the Community. The specific objective of this Protocol which directly deals with intra-trade as stated in Article 2 is "To further liberalize intra-regional trade in goods and services on the basis of fair, mutually equitable and beneficial trade arrangements, complimented by Protocols in other areas".

The region has been trading as a preferential trade area (PTA)⁵ since its inception in 1980. However, based on the implementation of the agreed tariff phase down commitments between 2000 and 2007, SADC attained the Free Trade Area (FTA)⁶ as of January 2008, though the formal FTA launch was done at a regional Heads of State Summit, which was held in Johannesburg, South Africa from 16 to 17 August 2008. The creation of an FTA in 2008, in principle, saw up to 85 percent of intra-SADC trade flows duty free, with the remaining 15 percent consisting of sensitive products to be liberalized by 2012 (SADC Secretariat, 2003). According to the region's Regional Indicative Strategic Development Plan's (RISDP) roadmap, SADC FTA is followed by a Customs Union (CU) (which was supposed to have been into effect since 2010, but has been delayed), Common Market (CM) in 2015, Monetary Union (MU) in 2016 and finally, Economic Union (EU), in 2018.

⁴ The current SADC Member States are: Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.

⁵ It is the loosest form of economic integration, which liberates trade among member countries by *lowering* of trade barriers against imports from other member countries while trade barriers against non-member countries are maintained. As such, PTAs place non-member countries at a competitive disadvantage, and divert trade from them towards member countries. This is because the duty free (even with high production costs) imports from within members may become cheaper than duty-paid (but with lower production costs) imports from non-members.

⁶ In this group, member countries *remove* both tariff and non-tariff barriers when trading with each member state. Nevertheless, each member country retains its own set of trade barriers (including customs duties) against non-member countries; and these trade barriers normally vary from one member to another. Similarly, a member may retain a separate set of barriers against imports from different non-member countries.

2 OBJECTIVES

Given the brief introduction and background, the main question that the study will seek to answer is: Has regional trade agreements in the three RECs promoted intra-regional agrifood trade? The study's objective will be to analyze the impacts of regional trade agreements on intra-trade in three selected agrifood products in the three RECs. The empirical analyses have been done for the years 2005 to 2010 across the three RECs.

3 LITERATURE REVIEW

Empirical studies analyzing the impacts of RTAs have employed a range of techniques, ranging from simple descriptive and statistical approaches to complex computable general equilibrium (CGE) modelling, with econometric approaches in-between. Since this study employs statistical and econometric approaches, empirical review will therefore be limited to these two approaches. Furthermore, given that econometric approach dominant most studies, this section will review more studies which employed econometric techniques than those which employed statistical methodologies.

The main objective of Sunde et al's (2009) study was to investigate the determinants of intra industry trade between Zimbabwe and its Southern African Development Community (SADC) regional trade partners. To achieve its objectives, the paper employed a modified gravity model equation which included intra-industry trade (IIT) index as one of the explanatory variable. After employing ordinary least squares (OLS) technique, the paper found per capita income, trade intensity, distance, exchange rate and gross domestic product as the main reasons which explained IIT between Zimbabwe and its SADC trading partners. The research also found that most countries in SADC traded more or less the same goods and this, according to the study, was mainly a function of past development that these countries were subjected to during the colonial era which resulted in the establishment of similar economic structures and per capita incomes that were more or less the same.

Using statistical analysis approach, Kalaba and Tsedu (2008) evaluated the performance of intra-SADC trade since the implementation of the Trade Protocol covering the period 2000 to 2006 mainly at aggregate level. Specifically, the paper assessed performance of intra-SADC trade by zeroing in on intra-SADC export share, comparing intra-SADC share with other regional blocs and intra-country trade share. The research's results showed that, irrespective of remarkable growth in total exports between 2000 and 2006, intra-SADC trade remained weaker. Comparing SADC intra-trade with other regional blocs, the study concluded that SADC was lagging behind most regions. In fact, during the implementation period, statistical figures showed that SADC's growth of extra-regional trade was even greater than with fellow members. Lastly, the study found out that more than two thirds of total trade within the region was conducted via South Africa.

Jayasinghe and Sarker (2007) employed an extended gravity model to investigate the effects of NAFTA on trade in six agrifood commodities (red meat, grains, vegetables, fruits, sugar, and oilseeds) for the period 1985–2000. The study's results suggested that intra-trade in red meat, vegetables, grains, and sugar significantly increased among the NAFTA members during the study period, with accelerated increases in the first two products, that is, red meat and vegetables. Overall, the study revealed that NAFTA countries traded more with each other than they traded with non-member countries mainly as a result of one of the following

two reasons: either because the reduction of intra-NAFTA tariffs has created new trade or because trade has been diverted from the rest of the world to intra-NAFTA channels.

Karim and Ismail's (2007) study quantified the potentials of intra-regional agricultural trade in the COMESA region using Sudan, Egypt and Kenya as case studies. The paper employed a plethora of trade related indices including instability index, production similarity index, comparative production performance index, export similarity index and revealed comparative advantage. The study found that there was scope for potential trade in agricultural trade among the regional members. Specifically, the instability indices of production in cereals, pulses, and roots and tubers were more stable at regional level than at national level. The results of production similarity index indicated differences in production patterns of the three countries. Export similarity indices results showed that countries were dissimilar in their export patterns. Revealed comparative advantage indices for each country were generally higher for dominant export products. As dominant products differ among the countries the pattern of specialization differs considerably among these countries, and therefore, there is a potential for expanding intra-regional trade in the region. The paper concluded that the government policies of COMESA member countries, especially Sudan, should pay more emphasis to encourage integrating their markets regionally to benefits from potential trade and comparative advantage existing in the region.

The study by Rojid (2006) focused mainly on investigating two important issues regarding regional integration, firstly the extent to which COMESA was a building or stumbling bloc and secondly, estimation of trade potentials within the COMESA region for COMESA members. The paper employed a gravity trade model using a Tobit estimation technique. The results of the study led the author to conclude that, for the 21 year-period (1980 to 2001), COMESA was a building bloc and that the region liberalized trade more internally than have diverted trade from the rest of the world. On the issue of export trade potential, the results suggested that trade potential within the region was limited given that most member states of the group were overtrading within the region.

Molinari (2003) employed a gravity trade model for eight broad EU trade sectors with the main objective of investigating the level and trends of sectoral integration effects within the economic bloc's member countries since the 1970s. Among other determinants of sectoral trade within the region, trade integration effects in the form of preferential trade arrangements such as European Union (EU), European Free Trade Area (EFTA) and North American Free Trade Area (NAFTA) were found to be positively related to trade.

The study by Chauvin and Gaulier (2002) was motivated by SADC's launch of the regional tariff schedule phase down as part of the implementation of the regional Trade Protocol. The main objective of the paper was to analyze the potential benefits of this liberalization initiative and the potential of increasing intra SADC to member states especially given that the economic structure existing among its participating members were more or less the same. The study employed both statistical and econometric approaches. The statistical approach was mainly calculation of three trade related indices: export diversification indices, revealed comparative advantages and trade complementarity indices. On the other hand, the econometric approach utilized the gravity trade model. Given that SADC countries had concentrated and similar comparative advantages, the research's statistical and econometric analyses suggested that the room for further trade within SADC was limited.

4 METHODOLOGY

4.1 Conceptual framework

The impacts of regional trade agreements on trade on agrifood products can be analyzed within the Vinerian framework, among others. Following Jacob Viner (1950), whenever countries form an RTA, there are basically two possible consequences. First, costly produced products within the RTA union may displace similar lower cost produced products from countries outside the union, thus divert trade from more efficient producers. This is the negative trade diversion (TD) effect. The second possibility is that lower-cost imports from another member may displace domestic production in one member country, resulting in creation of new trade among members. This is the positive impact called trade creation (TC). Additionally, establishment of an RTA may alter the relative prices of members' imports, leading to an expansion of consumption in the domestic market. Thus, trade creation can be considered as having two composite effects: a production effect and a consumption effect.

Generally, following the Vinerian contribution in the 1950s, trade creation and trade diversion effects have been investigated in a static framework (Jayasinghe and Sarker, 2007). Table 1 provides a summary of the general effects of RTA in the form of both TC and TD. The table summarizes the spectrum of potential benefits and costs of regional trade integration, from an FTA to higher dimension of regionalism above customs union (CU).

Table 1: Potential benefits and costs of regional trade integration

Potential benefits: Advantages	Potential loss/costs: Disadvantages
Trade Creation	
<i>Trade creation and trade diversion for home country conditional on elasticities of demand and supply; changes in tariffs; elasticities of substitution</i>	
<ul style="list-style-type: none"> ▪ Lower price imports from partner ▪ Higher consumer surplus ▪ Greater variety of goods 	<ul style="list-style-type: none"> ▪ Local producers of similar goods may be competed out (or temporarily dislocated) – a negative production effect and loss of employment
<ul style="list-style-type: none"> ▪ Saving on real resources 	<ul style="list-style-type: none"> ▪ Loss of tariff revenue from positive to zero tariff
<ul style="list-style-type: none"> ▪ Users of imported inputs may expand business (positive production effect) 	<ul style="list-style-type: none"> ▪ Cost of enforcing rules of origin (FTA)
<ul style="list-style-type: none"> ▪ Possible increase in exports to partners 	
<ul style="list-style-type: none"> ▪ Reduced cost of trading due to preferential access (reduced NTBs) 	
<ul style="list-style-type: none"> ▪ Increased FDI if opportunities arise due to-harmonized, credible policy environment over a larger market. 	
Trade Diversion	
Note: Some industries/ sectors may reap some benefits outlined above, <i>but costs are dominant</i>	<ul style="list-style-type: none"> ▪ Higher price imports from partner countries, loss of consumer surplus (reduced welfare)
	<ul style="list-style-type: none"> ▪ Local producers under pressure
	<ul style="list-style-type: none"> ▪ Loss of FDI if trade diversion arises (specific areas)

	<ul style="list-style-type: none"> ▪ Loss of tariff revenue from positive to zero tariff
	<ul style="list-style-type: none"> ▪ Cost of enforcing rules of origin (FTA)
Trade and development (intra-union specialization) <i>Dynamic gains, especially CU and higher</i>	
<ul style="list-style-type: none"> ▪ Increased competition (competitiveness on price and quality counts) 	Situational and most likely short-term dislocation of local private business/employment for some industries/sectors.
<ul style="list-style-type: none"> ▪ Economies of scale due to larger market, lower unit costs. 	
<ul style="list-style-type: none"> ▪ Spill-over effects e.g. transfer of know-how 	
<ul style="list-style-type: none"> ▪ Pooling of investment resources for basic "hard" regional infrastructure (education and research in identified areas) 	
<ul style="list-style-type: none"> ▪ Harmonized commercial policies, incentives, macroeconomic policies to lead to: 	
<ul style="list-style-type: none"> ▪ Accelerated intra-regional trade if intra-regional comparative advantages are developed into complementarities is supply and demand at regional level. 	
<ul style="list-style-type: none"> ▪ Credibility and certainty attracting FDI. 	
<ul style="list-style-type: none"> ▪ Bargaining power for bloc in global trading system. 	
<ul style="list-style-type: none"> ▪ Employment generation. 	
<ul style="list-style-type: none"> ▪ Increased productivity and exports to region and other areas. 	

Source: Lyakurwa, et al (1997).

4.2 Analytical framework

The study used two methodologies to achieve its objectives. Firstly, the paper employed statistical analysis in which two trade related indices were calculated to see the annual and/or range changes in intra-trade among member states of the three RECs under study. Secondly, the research employed an extended gravity trade model mainly to see whether the COMESA and SADC free trade areas (FTAs), and the EAC customs union (CU either created trade or diverted trade among the participating member countries.

4.2.1 Trade related indices

4.2.1.1 Changes in intra-regional agrifood trade

This statistical index traces changes in movements in intra-regional agrifood trend and intra-regional trade relative to total trade. Since the study analysis a five year period, 2005 was used as a base year while 2010 was used to gauge the degree to which intra-regional trade in agriculture has changed over the years.

4.2.1.2 Product complementarities

The degree to which eastern and southern Africa member countries' imports from other member states complement domestic production/consumption (from the point of view of importing member countries) provides a barometer of the extent to which intra-regional trade will be beneficial to all member countries, and hence promoted. In a situation where there is high trade complementarity in agricultural product trade within the region, it follows that more trade will be expected to increase especially when the region becomes a fully functional FTA. As pointed by Khandelwal (2005:13), "product complementarities between countries are an important indicator of the potential for expansion of intraregional trade".

This study therefore calculated bilateral complementarity indices in agrifood trade for the three RECs' member states. Again, 2005 was used as a base year while 2010 was used to gauge the degree to which intra-regional trade in agriculture has changed over the years.

For two trading countries, i and j , the algebraic bilateral product complementarity index for the agricultural products, a , following Tsikata (1999), is give by:

$$C_{aij} = 100 - \sum_i \left(\left| M_{aij} - X_{aij} \right| \div 2 \right) \quad (1)$$

Where X_{aij} represents the share of agricultural good 'a' in the total exports of country i to country j , and M_{aij} represents the share of agricultural good 'a' in the total imports of country j from country i . The computed index values will vary between zero and 100, where zero implies no complementarity between countries i and j 's trade in agrifood products, while a value of 100 would imply perfect match between the exports and imports of the two trading countries. As pointed before, higher index values would imply high potential benefits in intra-regional agrifood trade during the implementation of the Protocol, with lower values implying low potential benefits.

4.2.2 Gravity trade model

The effects of the implementation of free trade area (FTA) or a customs union (CU) on trade on agrifood products can also be analyzed using a gravity trade model. Whilst the gravity model⁷ has been used in a number of fields of studies such as human migration and

⁷Frankel (1997) and Deardorff (1998), among others provide theoretical micro foundations of the gravity trade model and Frankel (1998, p. 2) pointed out that the gravity equation has recently "gone from an embarrassment of poverty of theoretical foundations to embarrassment of riches".

investment flows across countries, its application in international trade seems to dominate its overall use. In its trade application, Tinbergen (1962) and Poyhonem (1963) were the first to independently apply this methodology in their analysis of international trade flows. The gravity trade model borrows from Newton's (1687) "Law of Universal Gravitation"⁸. Newton's theory postulates that the force of attraction between two separate entities *i* and *j* is a positive function of the entities' respective masses and inversely related to the squared distance between the objects. In analyzing trade using the same gravity principle, the entities are replaced by a pair of countries, while the countries' masses are proxied by the respective gross domestic product (GDP) with distance replaced by a variable representing resistance (which in most cases is the actual distance between the pair of trading countries). Thus, in its original algebraic representation, and analogous to Newton's representation, the gravity model for agrifood trade can be depicted by equation (3):

$$trade_{ija} = A \frac{(GDP_i GDP_j)^b}{(distance_{ij})} \quad (3)$$

Where $trade_{ija}$ is the bilateral trade between country *i* and *j* in agriculture products, *a*; GDP_i and GDP_j are the countries' respective income, while $distance_{ij}$ is the distance between the two trading partners and A is a constant. Taking logarithms to gravity model equation (3) results in the following representation:

$$\ln(trade_{ijata}) = A + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln(distance_{ij}) + \beta_4 X_{ij} + \varepsilon_{ij} \quad (4)$$

In equation (4), A, β_1 , β_2 and β_3 are coefficients to be estimated, while ε_{ij} is the error term which captures other shocks and chance events which might influence agrifood bilateral trade between the two trading partners. In the above equation X_{ij} represent other possible variables used in international trade literature. Thus, equation (4) represent the basic gravity trade model where income is predicted to positively affect bilateral trade, while distance will be expected to have a negative effect on bilateral trade.

Whilst all trade researchers agree to the empirical model specification represented in equation (4), i.e., that trade is the dependent variable while GDPs and distance are the core explanatory variables; contention still exists on which other variables to be included in the extended gravity trade model. As a result of this contention, Ghosh and Yamarik (2004) provided a list

⁸Following Newton's (1687) "Law of Universal Gravitation", classical gravity theory states that the attractions force, F_{ij} , between two entities *i* and *j* is proportional to their respective masses m_i and m_j and inversely proportional to the squared distance d_{ij}^2 between these entities. This law is formalized as:

$$F_{ij} = G \frac{M_i M_j}{D_{ij}^2}$$

where F_{ij} = the attractive force.
 M_i and M_j = are the respective two countries' masses.
 D_{ij} = the distance between the two objects.
 G = a gravitational constant depending on the units of measurement for mass and force.

of 49 variables (one dependent and 48 independent variables) which have been used in literature to estimate the gravity trade model, though in various combinations. Among the multitudes of possible explanatory variables, a regional trade agreement (RTA) variable, in the form of a dummy has been one of such potential variables. According to Jayasinghe and Sarker (2007), the RTA dummies enable us to isolate the two distinct effects, trade creation and trade diversion that RTAs may exert on trade flows. Thus, a RTA variable has, among other things, been included to estimate the possible amount of trade creation and trade diversion emanating from RTA between participating member countries.

To this end, this study will follow Frankel and Wei (1995), and Jayasinghe and Sarker (2007) gravity model specifications, and estimate the following gravity model:

$$\ln(\text{trade}_{ijt}) = A + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln(\text{distance}_{ij}) + \beta_4 \ln P_{it} + \beta_5 \ln P_{jt} + \beta_6 \text{COMESA}_{ij} + \beta_7 \text{COMESA0}_{ij} + \beta_8 \text{EAC}_{ij} + \beta_9 \text{EAC0}_{ij} + \beta_{10} \text{SADC}_{ij} + \beta_{11} \text{SADCO}_{ij} + \beta_{12} \text{lan}_{ij} + \beta_{13} \text{border}_{ij} + \varepsilon_{ij} \quad (5),$$

and $i = 1, 2, 3; j = 1, \dots, n$

Where: $\text{COMESA}_{ij} = 1$ if j is a member of COMESA, 0 otherwise

$\text{COMESA0}_{ij} = 1$ if i is a net importer from a nonmember j , 0 otherwise.

$\text{EAC}_{ij} = 1$ if j is a member of EAC, 0 otherwise

$\text{EAC0}_{ij} = 1$ if i is a net importer from a nonmember j , 0 otherwise.

$\text{SADC}_{ij} = 1$ if j is a member of SADC, 0 otherwise

$\text{SADCO}_{ij} = 1$ if i is a net importer from a nonmember j , 0 otherwise.

In equation (5), trade_{ijt} is the current U.S. dollar value of total bilateral trade (exports plus imports) between country i and country j in year t in one of the six agrifood products. GDP_{it} and GDP_{jt} are nominal gross domestic products of country i and country j in year t in U.S. dollars. P_{it} and P_{jt} are country i and country j 's respective populations. lan_{ij} represents the countries' respective language(s), while border_{ij} indicates whether trade partners, country i and country j , share a common border or not. Variable distance_{ij} is the weighted distance (as opposed to the simplest measure of geo-distance which considers only the main city of the country) in kilometers between country i and country j . Weighted distance is used because the study considered that some capital cities are not populated enough to represent the "economic center" of the country. Thus, the weighted distance measures use city-level data to assess the geographic distribution of population inside each nation. 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 (<http://www.cepii.fr>).

Following studies by both Frankel and Wei (1995), and Jayasinghe and Sarker (2007), this paper defines two dummy variables: (i) regional bloc dummy and (ii) an openness dummy. Thus, COMESA_{ij} represents the existence of a regional trade agreement between country i and country j in equation (5). In interpreting the effect of this dummy, a positive and statistically significant estimated coefficient of the regional bloc in a particular product equation and estimation period implies that the intra-regional trade has been stimulated by the implementation of COMESA FTA. In this case, the estimated coefficient will be indicating

the amount of additional trade, beyond the level their economic and geographic characteristics would allow, that had taken place among COMESA countries as a result of the implementation of the region's FTA. This, according to Aitken (1973) and Endoh (1999), the coefficient will be interpreted to reflect trade creation effects of COMESA FTA implementation. The coefficients of EAC_{ij} and $SADC_{ij}$ are interpreted the same.

$SADCO_{ij}$ dummy on the other hand captures the degree of openness of SADC members' imports from the rest of the world. The dummy takes a value of one if a member is a net importer from the rest of the world (the importer is a member of SADC while the exporter is not in SADC) and zero otherwise. This dummy variable reflects any trade diversion occurring in the respective SADC states' import structure. The estimated coefficient of this variable indicates the degree to which SADC countries under- or over-imported from the rest of the world relative to the predictions of the standard gravity model. As such, in the case where the coefficient of this variable is negative and statistically significant, it indicates the extent to which SADC countries are under-importing from the rest of the world. More generally, it implies that an RTA member has reduced its net imports from the rest of the world relative to its net exports to the rest of the world (Eichengreen and Irwin, 1998; and Frankel, 1997). Thus by focusing on the effects of the two dummy variables, a separation of the cases where SADC is trade creating only (i.e., it caused intra-regional trade to increase above average levels without changes in openness to non-members' trade) from those where SADC's increase in intra-region trade comes at the expense of nonmembers' exports to the bloc countries can be done. The latter effect can be identified as trade diversion. The coefficients of $COMESA0_{ij}$ and $EAC0_{ij}$ are interpreted the same.

In interpreting the estimated coefficients, given the double-logarithmic specification of the estimated function, the parameter estimates on the GDP_i , GDP_j , P_i , P_j , and distance variable can be interpreted as elasticities. For instance, in Equation (3), β_2 shows the percentage change in $trade_{ijat}$ induced by a 1% change in GDP_j , ceteris paribus. Given that the two RTA dummies cannot be expressed in log form, the parameter estimates of β_6 and β_7 (from Equation (3)) need to be interpreted with care. The percentage effect of the dummy variable is calculated following Halvorsen and Palmquist (1980)⁹. Thus for illustrative purpose, if the coefficient estimate of the SADC dummy variable in Equation (3) is β_6 , this will indicate that two SADC members traded an extra $\{\exp(\beta_6)-1\}\times 100\%$ relative to the amount they traded with a non-SADC state. In other words, this will imply that the mean (or average) trade between two SADC members is higher than their mean trade with the rest of the world by $\{\exp(\beta_6)-1\}\times 100\%$. It is however important to note that the benchmark is when a member country trades with a nonmember country. Likewise, the SADCO parameters (β_7) need to be interpreted with care. For instance, if the estimated coefficient, β_7 , is negative, total trade for a given product at disaggregated level of a SADC member (where the SADC member is a net importer) with a non-SADC partner is $\{\exp(-\beta_7)-1\}\times 100\%$ less than its net exports to non-members.

With regards to factors and variables that determine exports in the gravity trade model framework, there is a pool of potential variables, besides the three core variables of importer GDP, exporter GDP and distance, which explain direction of exports. As pointed before, Ghosh and Yamarik (2004) indicate that there are around 48 factors that have been used in

⁹ Following Halvorsen and Palmquist (1980), if the estimated coefficient is say β_6 , change if the value of a given total product trade at disaggregated level (i.e., $trade_{ijat}$) can be calculated for change of dummy variable from zero to one using the following formula: $(trade_{ijat(1)} - trade_{ijat(0)}) / trade_{ijat(0)} = e^{\beta_6} - 1$.

gravity trade model literature which seek to explain the direction of exports¹⁰. Table 2 therefore present some of the determinants found in literature and especially those that will be used to explain Botswana's sectoral exports.

Table 2: Gravity model explanatory variables

Variable	Expected sign	Theoretical intuition
Exporter GDP	+	Measures production capacity, more production means more exports
Importer GDP	+	Measures absorption capacity, higher GDP, means higher import demand
Distance	-	Imposes trade costs, greater distance means more costs, hence less trade
Population	?	<ul style="list-style-type: none"> - Larger population means more diversification and self-sufficient (negative sign) - Larger population allows economies of scale resulting in more exports (positive sign)
Importer/Exporter Inflation	?	<ul style="list-style-type: none"> - higher inflation means citizens try to avoid it by importing (positive sign) - higher inflation means consumers scales down their purchases including imports (negative sign)
Common language	+	Common language reduces communication problems, thus boosting trade
Common border	+	Proximity means reduced transport costs, thus boosting trade
Regional dummies (COMESA, EAC and SADC)	+	Countries enter into RTAs with the objective of increasing trade

Source: Author compilation

4.4 Data description

The study concentrated on agrifood trade for the period covering 2005 to 2010. This period was selected as it covers the time when all the three RECs were roughly trading at least as FTAs (COMESA became FTA in 2000, EAC became a customs union on 1st January 2005, while SADC was implementing its Trade Protocol's tariff phase downs since 2000 and eventually became FTA in 2008). GDP and population figures used in this study are taken from the IMF database. The weighted distance between countries' major economic cities, as well as information partners' languages and border are all taken from (<http://www.cepii.fr>). The yearly statistical trade figures for each country's agrifood exports by destination and imports by source (up to HS6 digit level) are taken from World Bank's World Integrated

¹⁰ This study has experimented with a number of possible variables in each of the six product gravity models and the ones presented in this section are the most significant ones.

Trade Solutions (WITS) database. The database classifies statistical data according to the Harmonized Commodity Description and Coding (HS) System.

The agrifood commodities analyzed in this study are classified under three different categories according to HS codes as contained in WITS database. They are maize, rice, and wheat. Table 3 provides a complete description of the six commodities, with respective HS codes.

Table 3: Description of commodities

Commodity	HS Codes and Description
Maize	1005: Maize corn
Rice	1006: Rice
Wheat	1001: Wheat and meslin

Source: Harmonized Commodity Description and Coding System (HS) classification

5 ESTIMATED RESULTS AND INFERENCES

5.1 Computed changes in intra-regional agriculture trade

Table 4 shows the shares of each reporting COMESA or EAC or SADC member countries trade to respective regional bloc. The table reports shares for countries that have reported data between 2005 and 2010. Across the rows are reporting country's average trade (export plus imports divided by 2) of which the share of what is traded with respective regional bloc(s) in question is calculated. Along the columns are the three products for which the analysis is done. Each cell in the table at the intersection of a country and a product contains two numbers. The top number shows the share of average trade of a given product of the reporting trading country (on the corresponding row) to respective regional bloc(s) (e.g., COMESA, EAC or SADC (SACU) in the total average trade of that exporting country for the year 2005. The second number, in parenthesis, is the share in the year 2010. In some cells there are arrows pointing downwards or upwards. These arrows indicate the direction of change in shares between 2005 and 2010. In a cell where there is no arrow, it implies that the share in the two periods was the same. Lastly, n/a implies that the exporting country did not export the particular product in the year in question, with a cell figure of zero (0, 0) implying that the exporting country did not export to the respective region(s) it is a member, though it exported to other non- regional trade partners.

The tabulated results show that, for example, in 2005, Zimbabwe's maize average trade which was destined to both COMESA and SADC regions accounted for 92% of its total trade. In 2010 its share destined towards these two trading blocs had gone up to 98%. Thus, Zimbabwe's intra-COMESA and intra-SADC trade in maize during the period under review, based on this indicator increased.

Namibia, Rwanda, Tanzania and Zimbabwe are the three countries whose intra-regional trade across the three products increased during the period reviewed. These are the countries which

have integrated the most as they managed to increase intra-regional trade amongst their respective regional trade blocs for all the three agrifoods products than other countries. For instance, in 2005, Namibia traded 71 percent and 28 percent of total rice and wheat with SADC and SACU regions (the two regional blocs to which it is a member), respectively, but as of 2010, the respective shares have increased 90 percent and 47 percent.

Table 4: Changes in Intra-regional trade share 2005 and 2010

	Country/Product	Regional bloc(s)	%ge destined for respective regional blocs		
			Maize	Rice	Wheat
1	Botswana	SADC/SACU	100 (100)	99 ↓ (97)	100 (100)
2	Burundi	COMESA/EAC	100 ↓ (98)	99 ↓ (17)	100 ↓ (7)
3	Comoros	COMESA/SADC	71 ↓ (16)	0.3 ↑ (26)	0.0 (0.0)
4	Kenya	COMESA/EAC	42 ↓ (29)	20 ↓ (11)	0.3 ↑ (1.0)
5	Madagascar	COMESA/SADC	98 ↓ (78)	0.04↑ (2.6)	0.0 ↑ (0.9)
6	Malawi	COMESA/SADC	100 (100)	14 ↓ (69)	16 ↓ (2.0)
7	Mauritius	COMESA/SADC	0.4 ↑ (12)	0.2 (0.2)	0.0 (0.0)
8	Mozambique	SADC	94 ↑ (99)	0.8 ↑ (4)	1.0 ↑ (1.1)
9	Namibia	SADC/SACU	95 ↑ (97)	71 ↑ (90)	28 ↑ (47)
10	Rwanda	COMESA/EAC	8 ↑ (100)	44 ↑ (78)	0.0 ↑ (12)
11	South Africa	SADC/SACU	73 ↓ (17)	1.2 ↑ (2.8)	3.0 ↑ (2.0)
12	Sudan	COMESA	0.4 ↓ (0.3)	89 ↓ (60)	0.0 (0.0)
13	Swaziland	COMESA/SADC/SACU	100 (100)	100 (100)	100 (100)
14	Tanzania	SADC/EAC	83 ↑ (94)	11 ↑ (96)	25 ↓ (4)
15	Uganda	COMESA/EAC	69 ↑ (93)	10 ↑ (96)	7.0 ↓ (3.0)
16	Zambia	COMESA/SADC	89 ↑ (98)	57 ↓ (36)	78 ↑ (100)
17	Zimbabwe	COMESA/SADC	92 ↑ (98)	22 ↑ (32)	20 ↑ (26)

Source: Author

On the other hand, Burundi, Malawi and Sudan are the countries whose intra-regional trade in at least two of the three products has declined. For instance, in 2005, Burundi traded 100 percent and 99 percent of total maize and rice to COMESA and EAC regions (the two regional blocs to which it is a member), respectively, but as of 2010, the respective shares

have declined to 98 percent and 17 percent. This implicitly implies that, despite the fact that the country is a member of COMESA FTA and EAC CU, the country's trade with members in these regions in maize and rice declined. In other words, Burundi' integration into these regions for these two products, based on this indicator has declined between 2005 and 2010.

For Swaziland, being a member for the three RECS, namely COMESA, SADC and SACU did not have any new effect given that the country had already been trading 100 percent of all the three agrifood products with members from these three regions. The country's performance integration in these three products may however be mainly due to the SACU integration effect, as a larger proportion of the country's three agrifood products were traded with the SACU region.

5.2 Product complementarities

Table 5 presents product complementarity indices (PCI) for countries from the three RECs for which data was readily available. These indices are calculated to individual countries and also an average index is provided. Given the paucity of data at product level, especially at HS4 or HS6, the section calculated the PCI for agricultural commodities as a whole.

For almost all tabulated countries, the average PCI were concentrated between 40 and 50. However, when one considers the individual reporter countries' indices, the picture becomes very varied. For instance, Botswana and Rwanda's PCI values were relatively high, and were above 50 for 19 and 20 countries, respectively, out of the 26 countries trading partners, signifying that the countries these two countries' trade in agriculture commodities complimented (in consumption) with other trading partners from the three regional blocs in 2010.

Given that regional staple food comprises mainly of the three commodities analyzed in this paper, it follows that higher PCI presented in Table 4 are thus signifying complementarity in consumption as opposed to complementarity in production. These higher PCI also indicates that the region has even higher potential for intra-regional in these agrifood.

Table 5: Product complementarity indices

Country	Code	A G O	B W A	B D I	C O M	Z A R	D J I	E G Y	E R I	E T H	K E N	L S O	L B Y	M D G	M W I	M U S	M O Z	N A M	R W A	S Y C	Z A F	S D N	S W Z	T Z A	U G A	Z M B	Z W E	Ave
Botswana	BWA	48	-	54	62	25	63	52	62	67	53	60	58	53	56	24	59	24	56	58	18	54	57	55	56	48	46	50
Burundi	BDI	53	74	-	59	50	50	45	52	84	39	79	49	56	50	43	50	55	51	50	43	52	47	45	49	48	51	53
Djibouti	DJI	43	61	48	55	40	-	46	45	51	42	64	42	48	43	51	43	46	41	52	46	44	57	43	39	43	40	47
Egypt	EGY	31	53	29	49	35	38	-	50	42	37	62	39	37	28	41	39	35	42	40	34	29	48	41	31	26	31	38
Ethiopia	ETH	28	45	39	47	29	34	30	55	-	30	79	27	31	32	26	31	40	48	40	30	33	50	32	29	31	33	38
Kenya	KEN	28	30	35	53	31	36	29	39	34	-	39	27	47	32	31	34	42	44	33	27	29	32	33	36	27	30	34
Madagascar	MDG	34	54	43	56	36	47	41	51	46	36	48	36	-	34	36	39	54	50	40	36	38	51	39	34	30	38	42
Malawi	MWI	38	38	45	40	30	33	34	63	47	31	49	29	35	-	58	30	28	50	38	27	30	49	29	27	22	32	37
Mauritius	MUS	21	25	29	33	26	35	29	36	33	26	48	26	28	27	-	28	36	35	24	25	29	33	27	24	26	25	29
Mozambique	MOZ	35	61	41	66	27	47	34	75	46	29	80	28	72	37	39	-	67	37	43	32	37	45	31	36	26	32	44
Rwanda	RWA	57	68	51	68	52	58	40	59	72	50	76	54	64	55	54	51	60	-	60	33	58	45	33	49	53	38	54
South Africa	ZAF	42	40	43	53	33	49	33	57	52	37	44	42	49	41	39	42	47	51	52	-	39	56	43	48	38	36	44
Sudan	SDN	37	40	44	89	39	47	39	83	84	41	92	41	86	42	75	43	47	43	34	45	-	88	41	44	42	42	53
Tanzania	TZA	44	43	49	59	36	53	32	56	54	34	57	38	48	39	30	37	44	49	46	27	43	51	-	39	29	36	43
Uganda	UGA	35	49	42	51	36	41	36	36	44	35	58	35	40	31	38	36	46	46	43	31	32	45	35	-	28	34	39
Zambia	ZMB	42	69	46	64	24	47	24	66	54	23	67	45	54	53	47	27	46	60	60	19	56	62	47	50	-	27	46
Zimbabwe	ZWE	48	49	49	65	46	56	42	65	55	46	64	49	48	48	48	47	42	50	56	31	54	40	48	48	36	-	49

Source: Author calculations

Key: AGO = Angola; COM = Comoros; ZAR = Democratic Republic of Congo (DRC); ERI = Eritrea; LSO = Lesotho; LBY = Libya; NAM = Namibia; SYC = Seychelles; SWZ = Swaziland;

5.2 Gravity trade model result estimations

The study estimated a pooled time-series, cross-sectional regression for the whole period 2005 to 2010. Although the paper employed panel data approach, measuring fixed or random effects is problematic under the current approach given that the study's main objective is to measure the intra-regional trade and openness to trade¹¹. This view or approach is supported by Jayasinghe and Sarker (2007).

Table 6 contain the estimated gravity results for the three commodities traded by countries from COMESA, EAC and SADC regional blocs. Coefficients of the estimated standard gravity model are discussed first followed by a discussion of intra-region and extra-region impacts of the three RECs' respective free trade areas (FTAs) and/or customs union (in the case of EAC). The adjusted R² ranges from 0.41 for maize to 0.49 for rice. The estimated importer's GDP and exporter's GDP coefficients generally have the expected positive sign in most equations and are, in most equations, significant at the 1% level. For instance, a unit percent increase in importer GDP will result in increased maize trade by 0.22%, while the same percentage rise will cause a 0.40% increase in trade of wheat. Across all the tabulated results, the estimated coefficients range from 0.22 to 0.41; and 0.40 to 0.95 for importer and exporter GDPs, respectively.

Table 6: Gravity regression results of SADC trade in six commodities (2005 – 2010)

Variable/Prod	Maize	Rice	Wheat
GDP Importer	0.22 (1.9)**	0.41 (4.7)***	0.25 (1.5)
GDP Exporter	0.95 (6.8)***	0.61 (8.2)***	0.40 (1.9)**
Pop Importer	0.32 (2.3)**	0.67 (7.7)***	-----
Pop Exporter	-0.11 (2.70)***	-----	0.80 (3.29)***
Inflation Importer	0.18 (2.5)**	0.09 (1.3)	-----
Inflation exporter	-----	-0.06 (-1.5)	-0.50 (-4.9)***
Distance	-0.18 (-2.9)**	-0.49 (-2.1)**	-0.83 (-5.4)***
Common border	1.1 (2.5)**	-----	3.27 (3.42)***
COMESA (Regional dummy)	7.2 (5.4)***	1.89 (1.6)*	0.27 (1.0)
COMESAO (openness dummy)	5.4 (3.9)***	2.17 (2.0)**	1.34 (1.4)
EAC (Regional dummy)	2.2 (2.9)***	-----	-18.9 (-4.2)***
EACO (openness dummy)	-----	-0.99 (-1.4)	-24.1 (-4.8)***
SADC (Regional dummy)	0.51 (0.4)	3.37 (1.9)*	8.56 (4.02)***
SADCO (openness dummy)	-2.6 (-2.3)**	3.0 (1.5)	3.78 (2.0)**
R ²	0.44	0.49	0.41
No. of Obs	1 182	1 404	756

Notes: [***], [**], [*] significant at 1%, 5%, 10% level respectively
: t-statistics in parenthesis

¹¹ Fixed/random effects estimations do not allow inclusion of dummy variables (such as COMESA, EAC and SADC dummy).

Thus, the result shows that there is a statistically significant positive relationship between bilateral trade and incomes of partners. Generally, these results are consistent with the findings of other studies such as Makocheke et al (2010), Jayasinghe and Sarker (2007), Frankel and Wei (2001), and Gilbert, Scollay, and Bora (2001), to mention but just a few.

The parameter estimates of both importer and export populations for the model are in most cases positive and statistically significant for the three products under study. Thus, for maize, and rice, larger population size in the importer countries encourage more trade between partners, with larger population for the importing country meaning increased consumption, hence increased imports. On the other hand, in the case of maize, large population size in the exporting country reduced exports as local demand was given first priority. The estimated coefficients for P_i and P_j can thus take either a positive or a negative sign and such findings were also reported in previous studies such as Eita and Jordaan (2007).

The effect of importer inflation is positive on maize, indicating that inflation in importing countries will stimulate consumers to try to avoid domestic inflation by substituting local goods with imports. Thus, in this scenario, a one percent rise in the inflation rate in importer countries increasing demand of maize imports by 0.18%. On the other hand, inflation rate of the exporting countries have a negative impact on the trade of wheat, with a one percent increase causing a decline in wheat trade by 0.50%.

In all the tabulated results, bilateral distance has a negative effect on trade with the magnitude differing across the products and time. As theoretically expected, the parameter estimates of the distance variable are negative and statistically significant, at least, at 5% level during the study period irrespective of the products. For all products, results indicate that the volume of trade in each of the selected commodities diminishes as distance increases. For instance, a unity increase in distance will reduce trade by a magnitude of 0.18% for maize, 0.49% in the case of rice, and 0.83% for wheat. Thus, the coefficients for our distance variable seem to take a wide range for the three commodities. The estimated effects of distance on bilateral trade in agrifood commodities presented in this study confirm the findings of Bikker (1987), and Boisso and Ferrantino (1994) among others. This result is similar to the findings of Jayasinghe and Sarker (2007), among others.

The coefficients of common border are positive and statistically significant, at least at five percent level of significance, in case of maize and wheat in which they are reported. This, as said before, is according to theoretical expectations which assumes that countries which share the same language and also share a common border are more likely to trade with each other than countries which have different languages and which do not share a common border.

5.3 Regional dummy effects

Empirical results reported in Table 6 suggest that there is a significant positive effect of all the three regional blocs (CMESA, EAC and SADC) on trade in maize during the study period. The calculated percentage change of the estimated bloc and openness coefficients of the three respective RECs and for the selected commodities are reported in Table 7, panels A through to C.

The estimated coefficient COMESA regional dummy is positive (Table 3) across the three agriculture products, although it is not significant for the case of wheat. This positive sign suggests that COMESA FTA has resulted more the regional trade in both maize and rice being conducting with the region, than when it is compared to the rest of the world (RoW). Specifically, Panel A of Table 7 indicates that two COMESA member states traded 566% more than they traded with the rest of the world on an annual average between 2005 to 2010. The trade bias was even higher in the case of maize where there countries traded around 138,791% more than they traded with RoW. The fact that these regional members traded very much amongst themselves when compared to RoW is understandable given the nature of the product, maize, which is bulky in nature, hence relatively expensive to transport (higher per tonnage transportation costs) and thus most traders will prefer to buy from nearby regional countries.

With regards to estimated coefficient for EAC regional dummy, there dummy has a positive sign on maize and a negative sign on wheat, and these coefficients are both significant at one percent level. The calculated percentages for maize and wheat for EAC dummy are presented in Panel B of Table 7. In the case of maize, the tabulated percentage indicates that two EAC members traded 839% more among themselves than they traded with RoW. In the case of wheat, two EAC countries traded 100% less among themselves than they traded with the rest of the world during the period 2005 to 2010. The negative coefficients on wheat imply that trade in this product was generally below the expected level of trade especially in a dispensation of zero tariff reduction under the customs union (CU).

Panel C of Table 7 presents the calculated percentages for SADC regional dummy on maize, rice and wheat. All the SADC dummy coefficients are positive (See Table 6) and calculated percentages are also positive. For instance, two SADC countries traded 66% more than they traded with the rest of the world on an annual average during the period 2005 to 2010. The percentage of trade among SADC member states was even extremely higher in the case of wheat and this is understood given that most countries get a larger position of their wheat requirements from South Africa, which is a SADC FTA member country.

Table 7: Percentage changes in estimated bloc and openness coefficients of SADC

Panel A: COMESA

Variable	Maize	Rice	Wheat
COMESA	138,791	566	31
COMESA0	22,390	781	283

Panel B: EAC

Variable	Maize	Rice	Wheat
EAC	839	na	-100
EAC0	na	-63	-100

Panel C: SADC

Variable	Maize	Rice	Wheat
SADC	66	2,816	524,729
SADC0	-93	1,847	4,271

5.4 Trade diverting effects of RECs

Tracing the level of changes in the regional openness dummies (COMESA, EACO and SADC) can provide clues into the presence of trade diversion effects. This will provide us with information as to whether there were reductions in the level of imports by regional members in each of the three RECs from non-members relative to the level of exports by countries from each region to non-members over time. In this section, the study is interested in the level of the openness coefficient. As before, the relevant results are reported in Table 6 with Table 7 presenting the calculated percentage changes.

The estimated coefficients of COMESA openness dummy are positive on all the three products, although it is insignificant on wheat. These (positive sign) results suggest that the imports of these commodities into COMESA region from non-member states in the rest of the world were higher than the gravity model would predict. During the period under review, net imports of by a COMESA country from non-members was about 22,390%, 781% and 283% higher for maize, rice and wheat, respectively, than its net exports to non-members.

In the case of EAC the estimated openness coefficients are negative, although one (wheat) is statistically significant (Panel B, Table 7). The calculated percentages shows that COMESA member countries imported 63% and 100% less rice and wheat, respectively from the rest of the world during 2005 – 2010 period. There is clear evidence of trade diversion in these two products under COMESA regional integration.

The results on SADC openness dummy shows positive coefficients on rice and wheat and a negative sign on maize, although the coefficient on rice is not significant. The positive sign on wheat suggest that the imports of these commodities into SADC region from non-member states in the rest of the world were higher than the gravity model would predict. During the period under review, net imports of by a SADC country from non-members was about 4,271% higher for wheat than its net exports to non-members. The situation is however different in the case of maize trade. The calculated percentage shows that SADC member countries imported 93% less rice from the rest of the world during 2005 – 2010 periods.

6 CONCLUSION

The research paper analyzed the impact of free trade area (FTA) arrangements in three regional economic communities (RECs), namely the Common Market for Easter and Southern Africa (COMESA), the East African Community (EAC) and the Southern African Development Community (SADC) on trade in three agrifood products, namely maize, rice and wheat for the period covering 2005 to 2010. The study relied both on trade related indices and also on the gravity trade model.

Changes in intra-regional trade shares shows that Namibia, Rwanda, Tanzania and Zimbabwe are the three countries whose intra-regional trade across the three products increased during the period reviewed. On the other hand, Burundi, Malawi and Sudan are the countries whose intra-regional trade in at least two of the three products has declined.

The results from the gravity trade model show that all the tradition variables, that is, GDP for exporter and importer countries as well as distance have expected theoretical signs.

Population, which was an added variable, carries both positive and negative signs, as expected by theory. The coefficients on all variables of interest, that is COMESA, EAC and regional dummies, shows that, with the exception of wheat trade in EAC, the estimated coefficients for these regional dummies in all other RECs and commodities is positive and statistically significant; indicating that intra-regional trade in those regions and for such commodities is above the predicted level of the standard gravity model.

The coefficients of the COMESA, EACO and SADC dummy variables which provide information on the presence of trade diversion effects varies across regional blocs and also across the products. For instance the estimated coefficients of COMESA across the three products is positive and statistically significant, suggesting that imports of these commodities into COMESA member states from non-member states in the rest of the world were higher than the gravity model would predict.

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