Intra-Regional Agricultural Exports in the East African Community

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Abstract

This study investigated the causes of intra-EAC agricultural exports. Five Augmented gravity models were estimated using the Pseudo Poisson Maximum Likelihood (PPML) Approach. The study used panel data from UNCOMTRADE, International Financial Statistics and World Development Indicators for the period 2000 – 2012 on the five EAC members. The intra-EAC agricultural exports depended on various factors, including GDP of exporter, GDP of the importer, Exchange rate, distance between the economic centers, language similarities, adjacency and population of the exporter. EAC secretariat and respective governments in EAC should also reduce currency value disparities among the member states as a means of promoting intra-regional agricultural trade. The proposed monetary union and harmonization of currencies would significantly promote agricultural trade within the region. The EAC member states should also enhance border liberalization, as this will also promote intra-regional agricultural trade, among other measures.

Key words: Intra-regional trade, Agricultural exports, East African Community, Regional Integration

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1. Introduction

Growth in agriculture and agricultural trade has attracted greatest attention, especially in developing countries, due to its potential to reduce poverty levels. The significant paradigm shift towards structural transformation in agricultural sectors since the 1980s is due to the argument that agriculture is an "engine of growth" in countries that are in the early stages of development. This is because agriculture accounts for high proportion of the economic activities in less developed countries, and also plays important role even in the rest of the non-agricultural sectors of the economy (Byerlee, Diao and Jackson, 2005). In this paradigm, growth in agriculture and agricultural trade has significant implications for the welfare of the citizens, especially the welfare of rural livelihoods, since the sector is dominated by small and medium scale family farmers (Byerlee *et al*., 2005; Valenzuela, Ivanic and Ludena, 2005).

The role of agricultural sector in economic development and welfare improvement in East African Community (EAC) states and other developing countries cannot be over emphasized. According to COMTRADE data base, agricultural trade accounts for over 40 per cent of the total EAC intra-regional trade. This implies that improving agricultural activities in the region is likely to enhance significantly the rate of economic growth and development, and poverty reduction in the region. Additionally, given that 75 per cent of world women live in rural areas dominated by agricultural sector, improving agricultural trade will also contribute to women economic empowerment in the region.

International agricultural trade has the potential of transforming livelihoods in agricultural dependent economies since it presents opportunity for farmers to export their produce, thereby providing incomes and boosting agricultural production. It also affects households' access to adequate food through its impact on commodity prices, access to markets for producers and labour entitlements (Otieno and Ogalo, 2009). It is, therefore, clear that the dynamics and linkages between agricultural trade and rural livelihoods can occur in various phases. Firstly, rural households earn higher incomes from production and sale of agricultural goods to non-local markets, and thereby increasing their demand for consumer goods (not necessarily agricultural). Secondly, the higher aggregate demand leads to creation of non-farm jobs and employment diversification, especially in small towns close to agricultural production areas, which in turn (thirdly) absorbs the surplus rural labour, raises demand for agricultural produce, and boosts agricultural productivity and rural incomes (Evans, 1990).

Currently, agricultural activities contribute more than 33 per cent of the region's GDP (World Bank, 2009) and about two-thirds of the region's population depends on agriculture for food, income and employment. As shown in Table 1A (in the appendices), the majority of the region's populace lives in rural areas where agriculture is the main economic activity. The table shows the percentage of the EAC populace that live in rural areas that are doninated by agricultural activities, and the contribution of agriculture to the region's GDP. An average of 83 per cent of the population of 124 million people live in rural areas in EAC region while agriculture contributes on average, about 33 per cent of the region's GDP.

There has been growth in intra-regional trade as shown in Figure 1A in the appendices. The figure shows an upward trend in both intra-regional exports and imports for the period between the year 2000 and 2010, despite the fact that the countries share relatively similar economic stucture. The region's exports are mainly agricultural products. Other exports include handcrafts

and minerals. Tourism is another major pillar of the region's economy. Major imports are manufactured products, petroleum products and raw materials. The agricultural commodities of trade in the region include: Food and live animals, Beverages and tobacco, Animals and vegetable oil and fats, Oil-seeds and oleaginous fruits and Hides, skins and fur skins, undressed.

The Intra-EAC agricultural exports have shown a mixed trend in the past decade, but with a general rising path. According to UNCOMTRADE 2012 data, intra-EAC agricultural exports remain low at an average of 13.09 per cent of the total EAC agricultural exports. Figure 2A (in the appendices) shows the intra-EAC agricultural exports for the respective member states. The figure shows agricultural exports of the EAC member states to the region. Kenya has the leading agricultural exports to the region for the period between 2006 and 2010, followed closely by Uganda, then Tanzania and Rwanda, while Burundi's agricultural exports to the region remain below USD25 million throughout the period between 2000 and 2012.

Table 2A shows the intra-EAC agricultural exports as a proportion of the total EAC agricultural exports to the world. EAC accounts for 38.24 per cent of total Rwanda agricultural exports market, while only 1.03 per cent of Burundi agricultural exports go the EAC. Additionally, the proportion of intra-EAC to total EAC agricultural exports were also low in the cases of Kenya, Tanzania and Uganda, at 4.86 per cent, 8.39 per cent and 12.91 per cent, respectively. Generally, the intra-EAC agricultural exports are low, averaging about 13 per cent of the total EAC agricultural exports. This therfore motivates the need to analyze the effect of the regional agreement in promoting the regional agricultural exports.

Agricultural commodities are the major items of international trade within EAC, accounting for above 40 per cent of the total intra-regional trade in EAC. Table 3 shows the agricultural intra-EAC exports as a proportion of the total intra-EAC exports for all the five EAC countries. As shown in the table, up to 50 per cent of total intra-EAC exports from Uganda and Rwanda in 2012 was basically agricultural. The proportion of intra-EAC agricultural exports to intra-EAC total exports stood at 41.22 per cent and 39.53 per cent in 2012 for Burundi and Tanzania, respectively, and 21.15 per cent in 2010 for Kenya. This implies that, on average, 40.52 per cent of intra-EAC trade is agricultural, hence the need to analyze the role of the EAC agricultural trade in the regional economic growth, and the causes of the intra-EAC agricultural trade.

The objective of this study was therefore to establish the causes of intra-regional agricultural exports in East African Community using the gravity model. The rest of the paper is organized as follows: Litrature review is presented in chapter two; the materials and methodology of the study are discussed amd presented in chapter three; while the study findings and the policy implications are covered in chapter four.

2. Emprical Literature

Paas (2000) used gravity model approach to analyze trade between Estonia and its main trading partners. The gravity equation estimated included variables such as exports and imports (dependent variables), GDP, distance between the capitals and several dummies for various regions/groups or trading areas. Estimating export and import equations separately, Paas found

that the independent variables explained more than 70% of the variation in the dependent variables in both gravity equations. The GDP coefficients were positive and the distance coefficient was negative as expected. The coefficients signs of some dummies did not correspond to expectations, but all were found to be statistically significant. His GM results seemed to support the notion that the existing trade relations between Estonia and Baltic Sea region (one of the trade areas) countries were most favorable for developing Estonian foreign trade. That is, it tended to trade more with partners with high GDP, closer geographically, and belonging to the trade area.

Using 1993 data, Anderson and Wincoop (2003) sought to resolve the 'border puzzle' by estimating a general-equilibrium gravity model and conducting comparative static analysis on the effects of trade barriers on trade flows between United States, Canada and other industrialized countries. They argued that the estimation of the gravity equation that had been widely used to infer trade flow effects of institutions lacked theoretical foundation, and was therefore prone to problems of omitted variables and unfounded comparative analysis. They developed a consistent and efficient method of estimating the theoretical gravity equation by incorporating multilateral resistance measures. They found that the existence of a common border between United States and Canada reduced the bilateral trade by 44 per cent, while it reduced trade among other industrialized countries by 29 per cent. This approach can be easily applied to determine the effects of many other institutions on bilateral trade flows. However, Feenstra (2004), among other studies, noted that Anderson and Wincoop's ideas had not been widely adopted in the empirical studies because of the difficulties in implementation, especially in calculation of price indices/multilateral resistance variables.

In Africa, the available evidence on the effectiveness of RTAs in promoting intra-African trade is equally mixed. Elbadawi (1997) used gravity model on 1980-84 data and found that the presence of African RTAs increased intra-regional imports by about 31 per cent, on average, without causing trade diversion. However, these arrangements performed worse in the second half of the 1980s, with most of them leading to substantial trade diversion and even reductions in intra-bloc and external overall trade.

Musonda (1997) investigated intra-industry trade in the PTA/COMESA sub-region using cross-sectional data for several years by statistical inferences and regression analysis based on Grubel-Lloyd index. Musonda concluded that the countries belonging to the sub-region engaged in intra-industry trade, especially with their immediate neighbours and those that were relatively more advanced in terms of their manufacturing sectors. In agreement with Musonda's findings, Ng'ang'a (2006) studied the effects of the New East African Community on trade, welfare and productive activities in East Africa. In his analysis, he observed that the movement towards intra-industry trade for the EAC members, which are small, developing economies, was quite interesting and could bear macroeconomic significance. While Kenya still had a comparative advantage in the manufacturing sectors, the other EAC countries were undergoing changes to their productive activities and orienting themselves towards the manufacturing sector. This is an indication of a possibility of continued rise in general IIT within EAC. However, these studies did not consider the IIT in agricultural sector, which is the largest sector in EAC, independently. Ng'ang'a estimated regression model with IIT as the dependent variable ranging between 0 and 100 per cent depending on the level of the intra-industry trade between the countries. To deal

with extreme values and zero observations, Ng'ang'a followed Balassa (1986) and Balassa and Bauwens (1987) by employing a logistic function, and a non-linear least squares method, hence finding that there was evidence of presence of intra-industry trade in EAC.

Vinaye (2009) examined the intra-SADC's agricultural trade using panel data set of 68 exporting and 222 importing countries (both SADC members and non-member trading partners) for the period 2000 – 2007. Vinaye computed several trade indices and estimated the gravity equation using Pseudo Poisson Maximum Likelihood (PPML) technique. The study revealed limited trade complementarity among SADC economies, which implied low potential for intra-regional agricultural trade. This methodology was a significant deviation from the norm where researchers would transform the gravity equation into logarithm form and apply the usual estimation techniques such as OLS or Tobit. Silva and Tenreyro (2006) argued that the use of OLS or Tobit in estimating gravity model would constitute a misuse of Jensen's inequality, that is, log-linearizing economic relationships in the presence of heteroskedasticity in the data could lead to biased and inconsistent estimates. They suggested the use of PPML technique as an alternative estimation procedure, which would maintain the gravity equation in its multiplicative form and still yield consistent estimates.

Trivic and Klimczak (2015) analysed the determinants of intra-regional trade in the Western Balkans. The objective of the study was to identify factors that have an influence on bilateral trade among the Western Balkan countries for the period from 1995 to 2012. The study variables included geographical, economic or political factors. It included factors constituting cultural, communicational and historical types of the so-called "distance" between countries. In order to assess their influence on trade values, an augmented version of the gravity model was employed. The study estimated the augmented gravity model as pooled data by OLS, as a random effects model and as a fixed effects model with an additional estimation of time-invariant variables. The results showed the strongest influence on trade values were exhibited by variables representing ease of a direct communication and similarity of religious structures. Different types of distance (Communicational, cultural and historical) had significant effect on the intra-regional trade. In addition, war and one-year-post-war effect showed a strong and statistically important influence. Thus, the study concluded that non-economic factors in the region of the Western Balkans play the most important role in determining trade values between countries.

Mukiibi (2016) investigated the determinants of intra-regional trade flows between Uganda and her East African Community State Partners. Using macro-economic panel time-series (monthly) data from 1980 to 2013, the study specified gravity model included variables such GDP, GDP per capita, population, circle distances between state capitals and Dummy variables representing membership to trade agreements, adjacency and land lockedness of a country. Regression results showed that according to *a priori* expectations, the following variables were positively related to Uganda's bilateral trade flows and were statistically significant; GDP, GDP per capita, population, absolute difference between Uganda's GDP per capita and partners and circle distance, while Partner's population, GDP per capita and Uganda's GDP were not found to be statistically significant, and the GDP per capita of partners was negative and statistically significant. The study concluded that Economies of EAC countries are expected to grow (GDP and GDP per capita) increasing Uganda's bilateral trade flows with EAC partners. Regional

integration has promoted Uganda's bilateral trade. Integration efforts have boosted bilateral trade while longer destination markets impede trade due to increased transportation costs.

3. Materials and Methods

3.1 Model Specification

The standard gravity equation tends to ignore many other variables that could have either positive or negative impact on trade volumes between the trading partners, which results to misspecification bias (Vinaye, 2009). To address this problem, the standard approach has been to specify an augmented gravity model (GM) by addition of relevant variables to the traditional model, most of which are inspired by theory and motivated by various testable hypotheses (Vinaye 2009). Most estimates of GM add a certain number of dummy variables to the original gravity equation that test for specific effects. These refer sharing of a common land border and commonality of language, among others. With inclusion of dummy variables of trade agreements, GM has broader implications in terms of the trade creation and trade diversion, which may have influence on the extent of IIT within the region. However, necessary caution must be taken since too many dummies may cause the problem of dummy trap in the data analysis. The augmented gravity equation can therefore be written as

$$EXP_{ij} = f(GDP_i, GDP_j, POP_i, POP_j, EXRT_{ij}, DIS_{ij}, CL_{ij}, AD_{ij}) \quad \text{.....(1)}$$

This study specified GM with several variables based on theory and literature reviewed, as in equation (2)

$$EXP_{ijt} = \alpha_0 GDP_{it}^{\alpha_1} GDP_{jt}^{\alpha_2} POP_{it}^{\alpha_3} POP_{jt}^{\alpha_4} EXRT_{ijt}^{\alpha_5} DIS_{ij}^{\alpha_6} CL_{ij}^{\alpha_7} AD_{ij}^{\alpha_8} \varepsilon_{ij} \quad \text{.....(2)}$$

Transforming equation (2) into log-linearized form and taking into account the time series, then

$$LogEXP_{ijt} = \alpha_0 + \alpha_1 LogGDP_{it} + \alpha_2 LogGDP_{jt} + \alpha_3 LogPOP_{it} + \alpha_4 LogPOP_{jt}$$

$$+ \alpha_5 LogEXRT_{ijt} + \alpha_6 LogDIS_{ij} + \alpha_7 CL_{ij} + \alpha_8 AD_{ij} + \varepsilon_{ijt} \quad \text{.....(3)}$$

where: *i* represents the exporter country; *j* represents the importer country; *t* represents the year*;* EXP_{ijt} represents the value of bilateral agricultural export from country *i* to country *j* in year t; GDP_{it} is the GDP level of the exporter country in year *t*; GDP_{jt} is the GDP level of the importer country in year *t*; POP_i is the population level of the exporter country in year *t*; POP_j is the population level of the importer country in year *t*; DIS_{ij} is the distance between the exporter and importer; CL_{ij} is the dummy for common language (taking value of 1 for common language, and 0 otherwise); AD_{ij} is a dummy representing adjacency between any pair of trading partners (taking value of 1 for common border, and 0 otherwise); and ε_{ijt} is an error term.

Pseudo Poisson Maximum Likelihood (PPML) methodology involves writing the conditional expectations of exports in the stochastic equation (3), hence giving equation (4) as follows;

$$E[\ EXP_{ijt} \mid \Omega_{ijt}\ ] = \exp[\ Log\alpha_0 + \alpha_1 LogGDP_{it} + \alpha_2 LogGDP_{jt} + \alpha_3 LogPOP_{it} +$$

$$\alpha_4 LogPOP_{jt} + \alpha_5 LogEXRT_{ijt} + \alpha_6 LogDIS_{ij} + \alpha_7 CL_{ij} + \alpha_8 AD_{ij}\ ] \text{.....(4)}$$

where it is assumed that $E[\varepsilon_{ij} \mid \Omega_{ij}] = 1$ and Ω_{ij} is the vector of explanatory variables. Assuming that each observation in equation (4) is associated with an error term $\eta_{ijt} = EXP_{ijt} - E[EXP_{ijt} \mid \Omega_{ijt}]$, the augmented gravity equation becomes;

$$EXP_{ijt} = \exp[\ Log\alpha_0 + \alpha_1 LogGDP_{it} + \alpha_2 LogGDP_{jt} + \alpha_3 LogPOP_{it} + \alpha_4 LogPOP_{jt}$$

$$+ \alpha_5 LogEXRT_{ijt} + \alpha_6 LogDIS_{ij} + \alpha_7 CL_{ij} + \alpha_8 AD_{ij}\ ] + \eta_{ijt} \text{.....(5)}$$

Where $EXP_{ijt} > 0$ and $E[\eta_{ijt} \mid EXP_{ijt}] = 0$.

Equation (5) was estimated for each of the five panels/countries using the PPML technique to analyze the causes of intra-EAC exports, after carrying out all the necessary diagnosis tests. The diagnostic tests results are discussed in section 4.1 and presented in the appendices.

3.2 Definition and Measurement of Variables

Agricultural Exports (EXP) is the real value of the total annual exports of agricultural products of the exporting country to the trade partner. It is measured as the annual agricultural export values reported in UN COMTRADE database in constant 2000 US dollars.

Real Gross Domestic Product (GDP) is the annual real GPD of a country measured in constant 2000 US dollars. GDP_i is the real GDP of the exporting country while GDP_j is the real GDP of the importing country. This variable was used to capture the economic mass or income of the trading partner. Real GDP is expected to have a positive effect on the agricultural exports of a country. This is because the higher the income, the higher the demand for goods and services.

Population (POP) is the total number of people in a country, measured as the annual estimates by the International Financial Statistics (IFS) in millions. POP_i is the population of the exporting country while POP_j is the population of the importing country. Population is a measure of the market size and labor endowment of the trading partners. Population can take on a positive or negative coefficient since as a measure of market size, it implies higher demand while as a measure of lobor endowment, it may imply higher domestic production hence less demand for imports.

Exchange Rate (EXRT) is the real exchange rate between the currency of the exporting country and that of the importing country. It is measured as the ratio of the real value of the exporter's currency in US dollars to the real value of the importer's currency in US dollars. That is

$$EXRT_{ij} = \frac{ER_j}{ER_i}$$

where, ER_j is the real exchange rate of country j (importer) to the US dollar and ER_i is the real exchange rate of country i (exporter) to the US dollar. Exchange rate is expected to have negative effect on the agricultural exports. This is because discrepancies in the currency of trade are costs to trade.

Distance (DIS) is the geographical distance between the economic centres (in most cases the capital cities) of two trading partners, which is a proxy for transport, transaction, information and search costs. It is measured in kilometers. This is expected to have negative coefficient.

Common Language (CL) is a dummy representing common national language between trading partners. It takes the value of one (1) for common language, and zero (0) otherwise. This is a proxy for social ties between different trading partners. Common language is expected to have positive effect on agricultural exports.

Adjacency (AD) is a dummy representing common border between trading partners. It takes the value of one (1) for common border, and zero (0) otherwise. Is also expected to have a positive effect on agricultural exports.

3.3 Data Type and Sources

The study employed secondary data retrieved from publications on EAC countries and their trading partners for the period 2000-2012. Specific data sources included UNCOMTRADE online database, International Financial Statistics (IFS) CD-ROM, World Development Indicators (WDI).

4. Results and Discussion

4.1 Diagnostic Test Results

4.1.1 Panel Root Test

The panel root test was performed to investigate if there was any variable that was non-stationary. The presence of unit root in any variable may lead to spurious regression where the regression results may be misleading. The Im-Peseran-Shin panel unit-root test developed by Im, Pesaran and Shin (1997) was adopted in this study. The Im-Pesaran-Shim (IPS) test is based on the famous Dickey-Fuller test and it involves testing for the presence of unit roots in panels that combines information from the time series dimension with that from the cross section dimension, such that fewer time observations are required for the test to have power. IPS test is therefore superior to Augmented Dickey Fuller (ADF) test and other unit root test techniques in analyzing long-run relationships in panel data with fewer time observations (IPS 1997). The test allows for individual effects, common time effects and time trends.

The Im-Pesaran-Shin panel unit root test hypotheses are as follows;
Ho: All panels contain unit root
Ha: Some panels are stationary

The results of the unit-root test for all the panels are presented in Table 4A in the appendices. The results of unit root tests showed the rejection of null hypothesis at one per cent level of significance for exports (which was the dependent variable in the study) at levels for all the five exporters. On the contrary, all other variables were non-stationary at levels, implying the presence of unit root. However, all variables, except the population of the importer, became stationary at 1% level of significance upon first differencing. This implies that the dependent variable is integrated of order zero, I(0), while the independent variables are integrated of order one, I(1). Based on these findings, augmented gravity equations were specified with the dependent variable (Agricultural Exports), the dummies and distance at levels, while the other independent variables (GDP, Population, Exchange rate) at first difference using the PPML technique. However, population of the importers was dropped from all the equations because of failing to be stationary even after first differencing and de-trending, and also being highly collinear with the GDP of the importer.

4.1.2 Hausman Test

Hausman test helps in determining which between random effect model (REM) and fixed effects model (FEM) is the most appropriate for the study data. Hausman (1978) suggested a test for correlation between the unobserved effect (the country-specific effect) and the explanatory variables as comparison between the fixed effect and random effect estimates, assuming that the idiosyncratic errors and explanatory variables are uncorrelated across all time periods. REM assumes that there are random/probabilistic variations across the panel, while FEM assumes individual heterogeneity. The Hausman test results are presented in Table 6A in the appendices.
The results of Hausman test imply rejection of the null hypothesis of "no systematic difference in random and fixed effects coefficients" for all the data sets. The test results show that Chi-square statistics and the corresponding p-values for the difference between FEM and REM were 2.20 (0.9005), 2.92 (0.6110), 2.65 (0.8310), 2.86 (0.7216) and 8.66 (0.1235) for Kenya, Tanzania, Uganda, Rwanda and Burundi, respectively. All the p-values were larger than the critical values of 0.01 (at one per cent), 0.05 (at five per cent) and 0.1 (at 10 per cent) implying that the REM is most suitable for the study data.

4.2 Results and Discussions

The objective of the study was to investigate the causes of the agricultural trade among the EAC member countries. Random-effects PPML technique was used to estimate the panel poisson gravity equation (5) for each of the five EAC member states. Bootstrap method suggested by Lancaster (2003) and also used by Vinaye (2009) was used to correct for heteroskedasticity, which could lead to biased and inconsistent estimates in a log-linearized equation.

The regression results (presented in table 4 in the appendices) shows that the causes of the intra-EAC agricultural exports vary across the EAC member partners. The GDP for Kenya and Tanzania have the expected positive signs and are highly significant at one per cent. The GDP for Rwanda is also significant at one per cent but has a negative sign, while GDP for Uganda and Burundi are statistically insignificant. These coefficients show that a one per cent increase in the real GDP of Kenya leads to 2.1 per cent increase in Kenyan agricultural exports to the EAC. Similarly, one per cent increase in real GDP of Tanzania leads to about 8.9 per cent increase in Tanzanian agricultural exports to the region, while a one per cent increase in real GDP of

Rwanda leads to about 5.3 per cent decrease in Rwandan agricultural exports to the region. This implies that the bigger the economy in terms of the GDP in EAC, the larger the intra-EAC agricultural exports.

The findings for Kenya and Tanzania are similar to those of Paas (2000) who found the coefficient of GDP to be positive and highly significant in relation to Estonia's exports, while the findings for Rwanda, Uganda and Burundi deviate from that position. Increase in GDP implies improvement in production in the country, which may lead to more exports as the local market may not be able to absorb all the products. On the hand, increased GDP may also imply higher income to nationals leading to higher demand for the products. This may reduce exports as ready market becomes available at home. However, according to the results, the GDP of the importer did not affect the intra-regional agricultural exports except for Rwanda where the coefficient had the expected positive sign and was statistically significant at one per cent, and for Uganda where the coefficient was significant at five per cent but has negative sign.

Additionally, the results show that the population of the exporting country does not play a significant role in determining the volume of the country's agricultural exports to the region, as the coefficients are all statistically insignificant except for the case of Tanzania where the variable is found to have the expected positive sign and significant at one per cent level of significance. This implies that a one per cent increase in the population in Tanzania would lead to approximately 39.3 per cent increase in Tanzanian agricultural exports to the EAC region. According to Vinaye (2009), population of the exporting country can have ambiguous effect on the country's exports. It may provide more labour force leading to more output, hence, more exports. But it can also provide a ready market for the output at home, hence, leading to fewer exports. The effects may cancel out leading to no significant effect on exports on the county's products, as predicted by the regression results.

Exchange rate is measured as the ratio of the real value of the exporter's currency to importers currency in terms of US dollars. As a result, an increase in the exchange rate implies depreciation of the exporter's currency in terms of the importer's currency. This leads to more exportation as exports become relatively cheaper to foreigners. Exchange rate was therefore expected to have a positive sign. The regression results show the expected positive sign for the coefficients for Kenya, Tanzania and Uganda which were significant at five per cent, 10 per cent and one per cent, respectively. The coefficient of exchange rate for Rwanda was insignificant at all levels, while for Burundi it had the unexpected negative sign and was statistically significant at five per cent. The results suggest that a one per cent depreciation (increase) in exchange rate between the exporter and the importer would, on average, lead to 0.5 per cent increase in Kenyan agricultural exports to the region, 0.2 per cent increase in Tanzanian agricultural exports to the region, 0.5 per cent increase in Ugandan agricultural exports to the region, and one per cent decrease in Burundi agricultural exports to the region.

The results further show that distance has the expected negative sign for all the countries except Kenya. The coefficients were statistically significant at one per cent for Kenya, Tanzania, Uganda and Burundi, and at 10 per cent for Rwanda. Distance was used as a proxy for trading costs between the exporter and the importer, where longer distances are associated with higher trading costs. The regression results show that one per cent increase in the distance between the

capital cities (or economic centres) of the trading partners will on average reduce agricultural exports to the EAC by 0.4 per cent, 1.1 per cent, 0.2 per cent and 0.4 per cent for Tanzania, Uganda, Rwanda and Burundi, respectively, and increase Kenyan agricultural exports by 2.5 per cent. This implies that trade and transactions costs remains a major impediment to intra-EAC agricultural exports to all the EAC members except Kenya. However, against expectations, the results further imply that Kenya tends to benefit from increases in cost of trading as measured by distances between the capital cities. Vinaye (2009) found distance to be trade reducing for SADC agricultural exports. Grant and Lambert (2005) found distance to be trade reducing in five out of nine individual agricultural commodities studied, for all agricultural products (aggregated) and for all non-agricultural products, no effect on trade in 3 individual commodities (Bovine cattle, sugar products and wheat durum). Additionally, they found distance to be trade increasing (positive significant coefficient) in 1 individual commodity (that is, oil seeds).

Common language shows the existence of cultural and social ties that could increase bilateral trade and interaction between trading countries. Existence of a common language between the exporter and the importer is, therefore, expected to have influence on the exports. The regression results show that common language have effects on the intra-EAC agricultural exports from Burundi, Kenya and Tanzania as the coefficients are highly significant at one per cent, five per cent and five per cent respectively. The variable is dropped in Uganda and Rwandan cases since the two countries do not share a common national language with any of the other EAC members. While Grant and Lambert (2005) found common language to positively affect trade in both agricultural and non-agricultural products, Moghaddasi (2012) found common language to have no significant effect on Iran's exports in processed agricultural products.

On the other hand, countries are expected to trade more with their close neighbours with whom they share common border since common border is likely to reduce transaction costs Vinaye (2009). Hence, adjacency is expected to have positive coefficient. The coefficient of adjacency was found to be highly significant at one per cent level of significance for all countries except in case of Tanzania where the variable was dropped, since the country shares common borders with all the other EAC members. The results further indicate that common border influences Kenyan agricultural exports to EAC and Tanzanian agricultural exports to EAC by 114.1 per cent and 108.0 per cent, respectively, while it affects Burundi agricultural exports and Rwandan agricultural exports to EAC by 28.2 per cent and 50.0 per cent, respectively. A possible explanation for the differences signs of the coefficients in cases of Burundi and Rwanda on one side, and Kenya and Tanzania on the other, could be the fact that countries that are geographically close are likely to share the same topography and climatic conditions, which result in similar patterns of comparative advantage in agricultural production, making trade between them unlikely. This is in addition to the fact that both Rwanda and Burundi and relatively smaller countries in the region in terms of production and population. It is also possible that exports are restricted at the borders of both Rwanda and Burundi making the presence of a border a trade reducing factor.

These findings on the border effects on intra-regional trade are partially consistent with the findings of Anderson and Wincoop (2003) and the findings of Furtan and Melle (2004). Anderson and Wincoop (2003) found that common border reduced trade between US and Canada by 44 per cent and 29 per cent among other industrial countries, while Furtan and Melle

(2004) found a large border effect of 91.4 in Canadian-Mexico agricultural trade, suggesting that the agricultural trade between the two countries was more restricted despite the existence of a trade agreement. These restrictions was partly explained by the nature of trade policy between Canada and Mexico which aggregated all agricultural trade into one trade measure, unlike the Canada-United States trade policy which had different measures for different commodities and consequently had lower border effects.

5 Concluding Remarks and Policy Implications

The EAC secretariat and the respective governments in EAC member countries should pay more attention to measures that would reduce currency value disparities among the member states. The empirical results show that depreciation on a country's currency in terms of the importers' currencies has positive and significant effect on intra-regional agricultural exports in all the countries, except for Rwanda where it is insignificant, and Burundi where the effect is negative. The proposed monetary union and harmonization of the currencies, which currently lags behind schedule, would significantly reduce transactions costs and thereby improve intra-EAC agricultural exports.

Kenyan and Ugandan governments should take measures to ensure full liberalization of their borders with the other EAC member states, since adjacency is found to spur Kenyan and Ugandan agricultural exports to the EAC. Kenya's formation of Joint border committees (JBC) and cross border traders associations (CBTA) seems to be yielding positive results. Elimination of restrictions for traders and goods crossing the borders would significantly increase Kenyan and Ugandan agricultural exports to the region, as shown by the study results. Regional cooperation in 'behind the border' reforms seems to offer potential benefits to Kenya and Uganda. This can significantly improve efficiency and facilitate more trade in both goods and services, agricultural and non-agricultural.

On the other hand, Rwanda and Burundi governments should put more emphasis on dealing with impediments to trade at their border with the other EAC members. This is because the results show that the presence of the border has negative effect on their agricultural exports to the region, implying that agricultural exports from Rwanda and Burundi to the region are restricted at the border. These countries should also come up with institutional frameworks such as JBCs and CBTAs to facilitate border liberalization and promote cross border trade.

EAC secretariat in conjunction with individual state governments in the region need to implement strategies that focus on reducing infrastructural and technological bottlenecks in the region and thereby reducing transportation, information and search costs amongst the EAC states. This is because geographical distance, which is a proxy for transport, information and search costs, is found to reduce intra-EAC agricultural exports from all member countries except for Kenya. Transport, information and search costs are directly related to the nature and level of infrastructural and technological network and development in the region. These measures should involve coordination of initiatives related to trade facilitation and reduction of costs of trading among member countries, such as coming up with alternative cheaper means of transport for goods within the region, reducing the cost of communication and investing cheaper and reliable

information technology across the region. Regional cooperation in trade facilitation can improve transparency, reduce cost of business and thereby promote trade among the members.

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APPENDICES

Table 1A: EAC Population and Agriculture

COUNTRY	POPULATION (MILLI0NS)	VALUE ADDED, AGRICULTRE (% OF GDP)	RURAL POPULATION (% OF TOTAL POPULATION)
BURUNDI	8.2	31.6	90
KENYA	36.6	24.0	79
RWANDA	9.5	41.3	82
TANZANIA	39.5	37.9	75
UGANDA	29.9	28.7	87

Source: The World Bank - The Little Data Book on Africa 2008/09.

Table 2A: Intra-EAC Agricultural Exports as a Proportion of the Total EAC's Agricultural Exports.

	Total Agricultural Exports to the World (USD)	Total Agricultural Exports to the EAC (USD)	Proportion of EAC to World Agricultural Exports (%)
Kenya (2010)	4,831,876,185	234,622,628	4.86
Tanzania (2012)	2,833,159,208	237,720,109	8.39
Uganda (2012)	2,181,217,799	281,597,753	12.91
Rwanda (2012)	452,537,250	173,046,908	38.24
Burundi (2012)	177,908,801	1,839,867	1.03

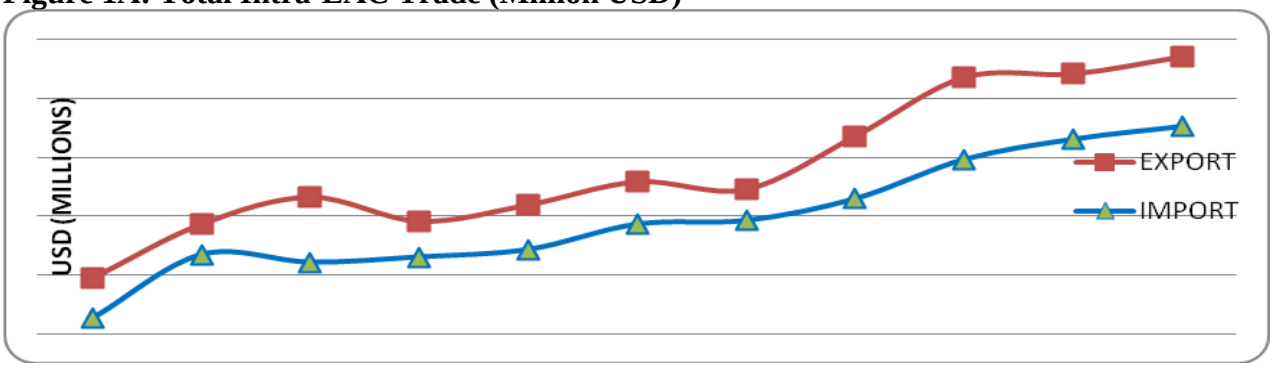
Source: Author's computation using UNCOMTRADE Data.

Table 3A: Intra-EAC Agricultural Exports as a Proportion of the Total Intra-EAC Exports.

	Total Intra-EAC Exports (USD)	Total Agricultural Intra-EAC Exports (USD)	Proportion of Agricultural to Total Intra-EAC Exports (%)
Kenya (2010)	1,109,231,620	234,622,628	21.15
Tanzania (2012)	601,302,696	237,720,109	39.53
Uganda (2012)	563,269,403	281,597,753	49.99
Rwanda (2012)	3,412,23,152	173,046,908	50.71
Burundi (2012)	4,463,161	1,839,687	41.22

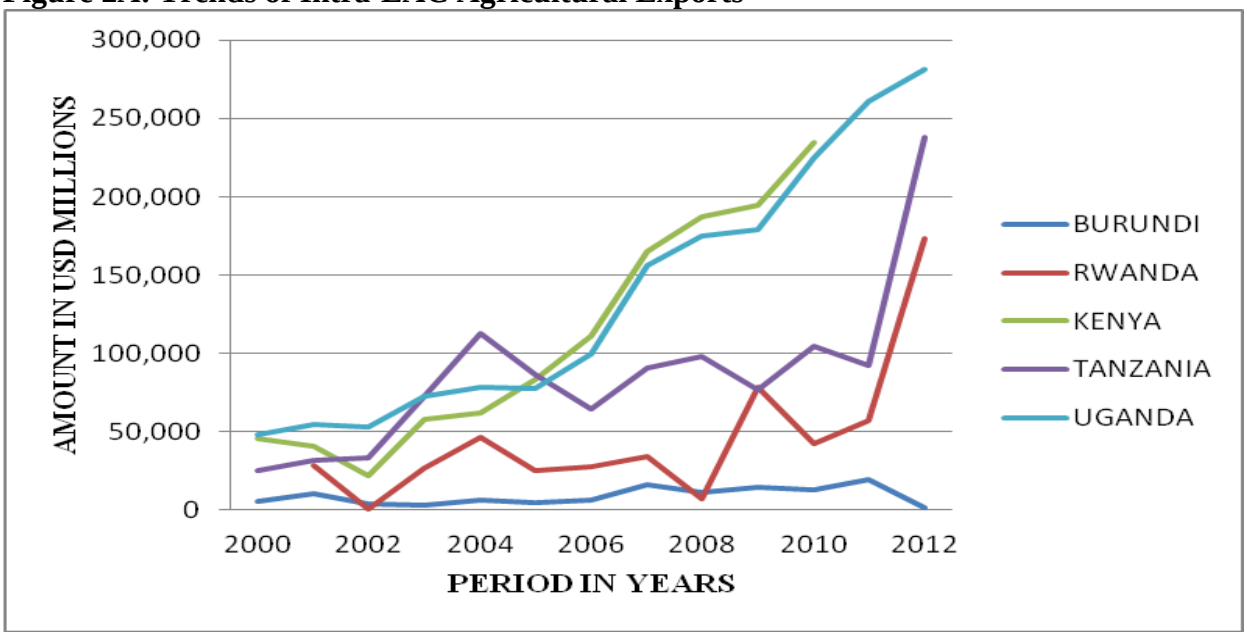
Source: Author's computation using UNCOMTRADE Data.

Figure 1A: Total Intra-EAC Trade (Million USD)



Source: Author's compilation using data from EAC Facts and Figures - 2011

Figure 2A: Trends of Intra-EAC Agricultural Exports



Source: Author's Computation Using UNCOMTRADE Data.

Table 4A: Results for unit-root test (Im-Peseran-Shin panel unit-root test)

***,** and * denotes rejection of the null hypothesis at 1%, 5% and 10% levels of significant.

Exporter	**Variable**	***t-bar* statistic**		
		Levels	**First Difference**	**Levels with time trend**
	Log Exports	-1.9052***	-4.2410***	-3.2065***
	Log GDP Exporter	0.4977	-1.9695***	-1.8627***
	Log GDP Importer	-0.4387	-2.4146***	-1.6340
	Log Population Exporter	-0.1985	-2.2990***	-1.1934
Kenya	Log Population Importer	-1.8430	-3.0190	-3.5130
	Log Exchange Rate	-3.2725	-4.3879***	-3.5050
	Log Exports	-2.4292***	-4.8217***	-3.1965***
	Log GDP Exporter	-0.8223	-2.2867***	-0.9318
	Log GDP Importer	-0.7194	-2.7091***	-1.7288
	Log Population Exporter	0.2301	-3.9864***	-2.0202***
Uganda	Log Population Importer	-0.8071	-2.1557**	-1.9534
	Log Exchange Rate	-1.1276	-3.1595***	-1.9663
	Log Exports	-1.8820***	-4.0893***	-2.6512***
	Log GDP Exporter	-0.3377	-4.0648***	-1.5427**
	Log GDP Importer	-0.6841	-2.7112***	-1.7507
	Log Population Exporter	13.5235	-2.4425***	-4.0569
Tanzania	Log Population Importer	-2.2635	-2.0045	-2.0797
	Log Exchange Rate	-1.4324	-3.0027***	-2.0978***
	Log Exports	-2.3150***	-4.0252***	-2.7248***
	Log GDP Exporter	-0.2019	-5.0295***	-2.9567***
	Log GDP Importer	-0.8590	-2.7095***	-1.5656
	Log Population Exporter	2.7140	-1.0619**	-0.7786
Rwanda	Log Population Importer	1.5326	-1.8489	-1.6386
	Log Exchange Rate	-1.7720	-2.2603***	-1.6466
	Log Exports	-2.5195***	-3.3583***	-2.1447
	Log GDP Exporter	0.9861	-4.5261***	-1.9115***
	Log GDP Importer	-0.5918	-3.0774***	-2.0289
	Log Population Exporter	2.1113	-6.2177***	-7.1182***
Burundi	Log Population Importer	0.8516	-2.4563**	-2.1147
	Log Exchange Rate	-2.1769	-3.1000***	-2.8437**

Table 5A: Regression Results by Countries (Dependent Variable: Log of Exports

	KENYA		TANZANIA		UGANDA		RWANDA		BURUNDI	
	Coefficients	P - value	Coefficients	P – value	Coefficients	P - value	Coefficients	P - value	Coefficients	P - value
Log GDP Exporter	2.085***	0.009	8.927***	0.000	-0.694	0.399	-5.317***	0.000	0.230	0.836
Log GDP importer	-9.904	0.235	-0.363	0.427	-1.726**	0.020	4.382***	0.005	0.810	0.458
Log POP Exporter	-91.238	0.349	39.255***	0.000	25.837	0.668	8.969	0.321	-5.865	0.526
Log Exchange Rate	0.530**	0.033	0.241*	0.072	0.503***	0.003	0.316	0.631	-0.968**	0.013
Log Distance	2.446***	0.002	-0.438***	0.000	-1.138***	0.000	-0.171*	0.061	-0.407***	0.000
Common Language	-0.567***	0.001	-0.055**	0.049	dropped		*dropped*		0.373***	0.000
Adjacency	1.141***	0.000	*dropped*		0.108***	0.004	-0.500***	0.000	-0.282***	0.000
Constant	-11.519**	0.020	3.556***	0.000	2.324	0.250	3.374***	0.000	4.614***	0.000
No. of Observations	40		48		48		44		48	
Pseudo R^2	0.741		0.810		0.448		0.470		0.406	
Pseudo log-likelihood	-83.278		-98.585		-101.172		-94.940		-96.163	

***, ** and * denote statistical significance at one, five and 10 percent levels, respectively.

Table 6A: Hausman test results for FEM and REM (Dependent Variable: Log of Exports)

***, ** and * denote statistical significance at 1, 5 and 10 percent levels, respectively.

VARIABLE	KENYA			TANZANIA			UGANDA			RWANDA			BURUNDI		
	FEM	REM	DIFF.	FEM	REM	DIFF.	FEM	REM	DIFF.	FEM	REM	DIFF.	FEM	REM	DIFF.
Log GDP Exporter	4.22***	4.20***	0.02	2.74	2.54	0.20	1.10	3.13	-2.03	4.00	5.92	-1.92	-24.37***	-21.27***	-3.11
Log GDP importer	0.56	0.61***	-0.05	0.51	0.94***	-0.44	2.91**	1.17***	1.74	1.13	-0.37	1.49	-3.72	0.29	-4.01
Log POP Exporter	-2.72	-2.51	-0.21	-3.61	-2.58	-1.034	-2.42	-3.59	1.16	-8.97	-7.62	-1.35	27.22***	21.39***	5.84
Log POP Importer	0.40	0.09	0.31	1.66	-0.03	1.69	-1.75*	-0.64**	-1.11	13.12	0.40	12.72	2.97	-0.59	3.55
Log Exchange Rate	-0.07	-0.03	-0.04	0.32	0.10	0.22	-0.25	-0.11	-0.14	0.80	-0.08	0.87	-1.04**	-0.38	-0.67
Log Distance	-0.34**	-		Omitted	-1.60**		Omitted	-1.70*							
		1.49***	1.15			-			-	Omitted	-0.76	-	Omitted	0.18	-
Common Language	Omitted	-0.69**	-	Omitted	2.09***	-	Omitted	Omitted	-	Omitted	Omitted	-	Omitted	0.30	-
Adjacency	Omitted	-0.64	-	-0.94***	1.37	-2.31	Omitted	2.90*	-	Omitted	-3.08**	-	Omitted	-0.91	-
EAC1	0.53***	0.50***	0.02	0.06***	0.16	-0.10	Omitted	-0.45	-	-2.27**	-0.68	-1.58	Omitted	0.57	-
EAC 2	Omitted	Omitted	-	Omitted	Omitted	-	Omitted	Omitted	-	Omitted	Omitted	-	-1.16***	Omitted	-
Constant	15.54	25.36		13.61	30.45		22.39	42.95		-49.37	58.67		-170.57***	-129.23***	
No. of Observation	770	770		793	793		481	481		156	156		182	182	
R-Squared: Within	0.262	0.260		0.183	0.170		0.287	0.267		0.200	0.152		0.116	0.087	
Between	0.219	0.385		0.158	0.517		0.000	0.276		0.071	0.432		0.000	0.011	
Overall	0.218	0.362		0.133	0.419		0.001	0.266		0.018	0.245		0.000	0.001	
F-statistics	-			-			7.76			28.71			8.68		
Prob>F	-			-			0.000			0.000			0.001		
Chi-square statistics		895.18	2.20		146.29	2.92		53.96	2.65		100.500	2.86		71.95	8.66
Prob>Chi-square		0.0000	0.9005		0.0000	0.611		0.0000	0.8310		0.0009	0.7216		0.0000	0.1235