Agricultural Trade and Economic Growth in East African Community

Duncan Ouma,[41] Tom Kimani[42] and Emmanuel Manyasa[43]

Abstract

East African Community states, as many other states in the region, depend largely on agricultural activities to boost their economic growth and create employment. Up to 80 per cent of the populace depends on agriculture directly and indirectly for food, employment and income, while about 40 million people in EAC suffer from hunger. The role of trade in economic growth and vice versa cannot be over emphasized. However, whether there is any link between EAC's regional trade and the region's economic growth remain unknown. This study therefore investigated the relationship of the agricultural trade with economic growth in East African Community. Several bi-variate Vector Auto-Regressive (VAR) and Vector Error Correction Models (VECM) were also estimated. Granger causality test and Impulse response analysis on trade and economic growth were performed using panel data from UNCOMTRADE, International Financial Statistics and World Development Indicators for the period 2000 – 2012 on the five EAC members and other 77 trade partners. Empirical findings showed mixed results for the different EAC member states. There existed bi-directional relationship between agricultural exports and economic growth in Kenya, uni-directional relationship in Rwanda, and no relationship at all in Burundi, Tanzania and Uganda.

Keywords: Agricultural Trade, Economic Growth, East African Community, Regional Integration.

[41] School of Economics, Kenyatta University, P.O. Box 43844 , 00100 NairobiKenya

[42] African Economic Research Consortium, 3rd Floor-Middle East Bank Towers Building, Milimani Road | P. O. Box 62882 00200 Nairobi Kenya.

[43] Twaweza East Africa, Uwezo East Africa, School Lane 22, Westlands, P.O Box 13784-00800,Nairobi, Kenya,

1. Introduction

International trade has always been viewed as a vehicle that a country can use to climb the ladder of industrialization and economic growth, and attain better social welfare for its citizens. Large proportion of international trade takes place within regional integration set-up. Signing into force of several agreements has resulted in the rise of intra-regional trade volumes within the regional trade agreements (RTAs) in general. The formation of NAFTA, for instance, led to increase in the intra-regional trade from less than 35 per cent in the late 1980s, to almost 50 per cent in 1999. Over the same period, trade among the MERCOSUR members doubled from 10 to 20 per cent. In Africa, the picture is mixed. The extent of regional integration among COMESA members has been relatively static over the past two decades. In contrast, the share of intra-regional trade has increased substantially for ECOWAS since the early 1980s, and for SADC since the late 1980s, (Vinaye 2009). The increased trade has in turn lead to increased economic growth in some countries and/or regions.

In EAC, countries are coming together with the ultimate goal of increasing the level of interactions, transactions and achieving higher rates of economic growth and development. The volume and flow of trade in goods and services describes how ‘open' an economic integration is. At the same time, agricultural products from developing countries rarely penetrate the international market in the developed countries due to protectionist strategies such as subsidization of local production in developed countries, high standard requirements and tariffs, among others, notwithstanding the fact that the majority of the players in the agricultural sector in developing countries are small and medium scale farmers. These factors have quicken the move by developing countries to form their own regional agreements with the aim of improving trade amongst themselves and gaining a batter bargaining position and terms of trade in the world market.

The main driving force behind regional integration is economic growth and development, poverty eradication and improved welfare of the population, of course not withstanding the political influence. Regional integration has been found to promote trade as countries open up gradually to the world and reduce or eliminate both tariff and non-tariff trade barriers. On the other hand, increased trading between a country and the rest of the world has a positive effect on economic growth and development. Thirlwall (2000) noted that countries with fastest growth in international trade have also experienced fastest growth in Gross Domestic Product (GDP).

According to Romer (1990), Krugman (1990) and Warner (2003), integration fosters growth through different channels, including increasing innovation, technological spillovers and elimination of replication in research and development (R&D). It has also been proved empirically that integration leads to a larger market access, more stock of technology and knowledge, and therefore, contributes to innovation and economic growth. According to Sachs and Warner, 1995, such expanded markets and increased productivity lead to increasing returns in the sectors that require a lot of R&D. Literature widely concur that the level of international trade in an economy is likely to be one of the sources of its growth. Many arguments have been put across for trade-led growth hypothesis. It is believed, therefore, that increase in exports generate increase in GDP, since both foreign and domestic demands are components of the GDP as defined in the national income accounting (Gurgul and Lach, 2010). Additionally, exports may also have significant impact on GDP growth indirectly. Exports do lead to increased investment that in turn leads to improved labour productivity. Furthermore, due to high competition in the international market, exports are likely to enhance efficiency in the domestic economy, thus raising the GDP. On the other hand, economies that are less endowed with natural resources and technology highly depend on importation of these necessary factors of production for GDP growth.

However, modern theories of trade show that economic growth, on the other hand, is a pre-condition for growth in international trade. Increase in output leads to rise in exports if such increase is coupled with rise in productivity and decline in unit costs. It becomes easier to sell domestic goods abroad. Hence, the connection between economic growth and international trade may be closer and more than one way effect. Safdari, Mahmoodi and Mahmoodi (2011) highlight four different kinds of relationships possible between economic growth and international trade as follows: export-led growth (ELD), growth driven export (GDE), case of feedback relationship between export and economic growth (bi-directional), and case of no relationship at all. Some studies have found a unidirectional causality, others have found bi-directional causality, while yet some have found no evidence of relationship, (see Islam, 1998; Konya, 2006; Galimberti, 2009; Tang and Lai, 2011).

Growth in agriculture and agricultural trade has attracted greatest attention, especially in developing countries, due to its potential to reduce poverty levels since majority of the populace in developing countries dwell in rural areas where agriculture is the main economic activity. 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 not only accounts for a higher proportion of the economic activities in less developed countries, it also plays important role 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 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 contribute significantly to 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 1 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.

Despite the significant role that agriculture plays in the economies of the EAC member states as highlighted above, the link between agricultural trade and economic growth in EAC remains unknown. Many other studies in other regions have found mixed results, that is, cases of a uni-directional relationship, bi-directional relationship and no relationship at all. This study therefore investigates the relationship between agricultural trade and economic growth in EAC.

The rest of the paper is organized as follows; section two presents brief empirical literature on international trade, agricultural trade and economic growth, while the methodology adopted by the study is presented in section three. The study findings, discussions of the results and policy implication are presented in section four of the study.

2. Empirical Literature

Afonso (2001) analyzed the impact of international trade on economic growth in 41 Less Developed Countries (LDCs) for the period between 1963 and 1985. Adopting the endogenous growth model developed by Romer and Lucas (1990), Afonso found that international trade was a motivating factor of economic growth where the integrating states had different levels of human capital. The study also found that differences among countries (such as initial provision of factors and technological capacities) determined trade patterns and their effect on economic growth. The endogenous approach to growth analysis, incorporating increasing returns and non-competitive market structures, was significant, since it no longer made it mandatory for the perfect competition condition to be met for optimal trajectories of growth to exist. This gave room for the governmental intervention in cases where the growth path was not optimal. In references to economic growth, Afonso agreed with Romer's 1990 work, which viewed international trade as an ingredient of economic growth. However, Afonso's study did not consider the causality relationship between international trade and economic growth, neither did it disintegrate trade into agricultural and non-agricultural products.

Abdulai and Jaquet (2002) tested the export led growth hypothesis in Cote d'Ivoire using time series data for the period 1961-1997. The examined both the short-run and long-run relationship between economic growth, exports, real investments, and labor force. Testing for cointegration and using the ECM, the authors found that there was evidence of one long-run equilibrium relationship among all the four variables. Exports were also found to granger cause economic growth both in the short-run and in the long-run. Additionally, bidirectional causality between the variables was also found to be statistically significant. The authors concluded that the recent reforms in Cote d'Ivoire's trade, such as promotion of domestic investment and recovery international competitiveness, contribute to export growth, diversification, and can potentially promote the country's economic growth in the future.

Andre and Hinaunye (2007) analyzed the causality between exports and GDP in Namibia using time series data for the period 1970 to 2005. Employing Granger causality and cointegration techniques to test for the growth led exports hypothesis, they found that exports Granger cause GDP and GDP per capita. The authors concluded that the export-led growth strategy through various incentives has a positive influence on economic growth.

Gurgul and Lach (2010) examined the linear and non-linear causalities between the international trade and economic growth in the Polish economy using quarterly data for the periods 1996-2008 and 1996-2009 separately to capture for the effect of the 2008/2009 financial global crisis. The authors estimated a restricted VAR model involving GDP, exports and imports. The findings of linear Granger causality tests revealed existence of a relationship between the export growth rate and growth in GDP in both time periods, while no direct causality was found between GDP growth rate and imports growth rate. However, based on the weak evidence of casual linkage between GDP and import growth rates in the pre-crisis period, one can only imagine the existence of some indirect links. In addition, the impulse response analysis performed revealed that a shock from exports caused a positive response in GDP over the next three quarters. However, the same shock caused negative responses in the fourth and fifth quarters. While on the other hand, shock from GDP caused a positive response in exports over a period of seven quarters. A shock from exports caused a positive response in imports in the next two quarters, with negative response in the third, fourth and fifth quarters, and shock in imports caused a negative response in exports in the first three quarters.

Safdari et al. (2011) studied the causality relationship between exports and economic growth for thirteen (13) Asian Developing Countries for the period 1988 to 2008. Applying Panel Vector Error Correction Model based on Wald test, they found that there was sufficient evidence to accept the null hypothesis that export did not Granger cause economic growth, while Wald test statistics showed that economic growth Granger cause exports, hence an indication of unidirectional causality from economic growth to exports, supporting the growth-driven exports (GDE) hypothesis.

3. Methods

Following the work of Feder (1982), the standard neoclassical production function can be developed to an augmented neoclassical growth model incorporating trade as one of the key determinants of economic growth. The standard neoclassical production function describes economic output as a function of the inputs, labour and capital. The aggregate growth in the economy is related to the changes in capital and labour through the underlying production function (Jay, 1971; Balassa, 1978; Tyler, 1981; Izani, 2002; Lin and Li, 2002; and Safdari, Zaroki and Shahryar, 2012). That is,

$$Y = F(K, L) \quad (1)$$

Where Y is the national output (GDP), K is capital and L is labour.

The economy's resources are allocated between production of exports and non-exports (locally consumed commodities), and the total production is the sum of output from the two sectors. Let N denote output from the non-export sector and X denote output from the export sector (proxy by the total exports). Then

$$N = F(K_n, L_n, X) \quad (2)$$

$$X = G(K_x, L_x) \quad (3)$$

where, N is the non-exports, X is the exports, K_n and K_x are the respective sector capital stock, and L_n and L_x are the respective sector labour stock. Assuming the ratio of the marginal factor productivities in the sectors deviates from unitary by a factor Φ, then

$$\frac{G_K}{F_K} = \frac{G_L}{F_L} = (1 + \Phi) \quad (4)$$

where G_K, G_L – Respective factor marginal productivity in the export sector

F_K, F_L - Respective factor marginal productivity in the non-export sector.

Apart from the production factors, each sector's output also depends on other factors that are unique to the sector. These factors are referred to as 'externalities', since they are not reflected in market price, and they include; introduction of improved production techniques, training of higher quality labour, development of efficient and internationally competitive management, steadier flow of imported inputs, among others, Keesing (1967). In the absence of these externalities, then Φ=0, that is, factor productivity is the same across the sectors. But since export sectors tend to experience higher factor marginal productivity, Φ>0. Differentiating equations (2) and (3) gives

$$\dot{N} = F_K.I_n + F_L \dot{L}_n + F_x \dot{X} \quad (5)$$

$$\dot{X} = G_K.I_x + G_L.\dot{L}_x \quad (6)$$

where, I_n and I_x are the respective sectoral investments, $\dot{L}_n$ *and* $\dot{L}_x$ are the respective sectoral changes in labour, F_x is the marginal effect of exports on the non-export output, $\dot{N}$ *and* $\dot{X}$ are the changes in the respective sectoral output.

Making use of (2) and (3), the total output in the economy becomes;

$$Y = N + X$$

$$Y = [F(K_n, L_n, X) + G(K_x, L_x)] \quad (7)$$

Similarly, $\dot{Y} = \dot{N} + \dot{X}$ ....(8)

Plugging equations 4 and 6 in to 7 and making use of 4, then

$$\dot{Y} = \left[F_K . I_n + F_L \dot{L}_n + F_x \dot{X} \right] + \left[G_K . I_x + G_L . \dot{L}_x \right]$$

$$\dot{Y} = F_K . I_n + F_L \dot{L}_n + F_x \dot{X} + (1+\Phi).F_K . I_x + (1+\Phi).F_L . \dot{L}_x$$

$$\dot{Y} = F_K .(I_n + I_x) + F_L .(\dot{L}_n + \dot{L}_x) + F_x . \dot{X} + \Phi.(F_K . I_x + F_L . \dot{L}_x) \qquad (9)$$

where $\dot{Y}$ is the change in total output.

Let I denote the total investment in the economy and $\dot{L}$ total growth in labour, such that

$I = I_n + I_x$ and $\dot{L} = \dot{L}_n + \dot{L}_x$

Recalling the implications of equations 3.15 and 3.17, that is,

$$F_K . I_x + F_L . \dot{L}_x = \frac{1}{1+\Phi} .(G_K . I_x + G_L . \dot{L}_x) = \frac{\dot{X}}{1+\Phi} \qquad (10)$$

$$\dot{Y} = F_K . I + F_L . \dot{L} + \left[\frac{\Phi}{(1+\Phi)} + F_x \right] . \dot{X} \qquad (11)$$

If a linear relationship between the real marginal productivity of labour in a given sector and the average output per labour in the economy exists as suggested by Bruno (1968), then

$$F_L = \phi . \left(\frac{Y}{L} \right) \qquad (12)$$

Dividing equation 11 all through by Y, denoting F_K by σ and making use of equation (12), then

$$\frac{\dot{Y}}{Y} = \sigma . \left(\frac{I}{Y} \right) + \phi . \left(\frac{\dot{L}}{L} \right) + \left[\frac{\Phi}{(1+\Phi)} + F_x \right] . \left(\frac{\dot{X}}{X} \right) . \left(\frac{X}{Y} \right) \qquad (13)$$

If the marginal productivities of factors are equal across the sectors, then Φ=0. If there are no inter-sectoral externalities, then F_x=0. Equation (13) reduces to the familiar neo-classical growth model. However, these components are likely to be non-zero in less developed countries where inter-sectoral externalities exist and marginal productivities of factors of production vary across the sectors. Equation 13, therefore, relates growth of GDP to growth in exports and other variables, hence the idea that exports influence growth is not new, Silaghi, (2009). The equation implies that there is a link between international trade (exports) economic growth. In this study agricultural trade (exports) by the EAC member states is used as a proxy for international trade.

The study, therefore investigated such relationship in agricultural trade and economic growth in EAC using VEC and VAR models, under panel data analysis.

The export/import - led growth and the growth driven export/import theories indicate interdependence between international trade and economic growth, Konya (2006) and Galimberti (2009). VAR model aids analysis where variables are linked to their own past values and the current and past values of the variable(s) in the model, since it describes the dynamic evolution of a number of variables from their common history (Verbeek, 2004). To establish the causality between economic growth and agricultural trade, tests for stationarity and cointegration were performed, and bi-variate VEC and VAR models specified and estimated. The use of VAR was motivated by its ability to capture the dynamic interaction of trade flow volumes and economic growth. VAR is a direct generalization of the uni-variate AR(k) model to the case of a vector of variables and is used to express the dynamic correlations between the variables. Equations (14) and (15) were specified and estimated.

$$\Delta GDP_{it} = \phi_{it} + \sum_{j=1}^{k} \alpha_j \Delta GDP_{it-j} + \sum_{j=0}^{k} \beta_j EXP_{it-j} + \varepsilon_{it} \qquad (14)$$

$$EXP_{it} = \psi_{it} + \sum_{j=1}^{k} \sigma_j EXP_{it-j} + \sum_{j=0} \theta_j \Delta GDP_{it-j} + \varepsilon_{it} \qquad (15)$$

Where ΔGDP is the change in real GDP of the exporter, EXP is the real exports of agricultural products.

i = 1, ..., N – The number of countries under the study.
t = 1,....., T – The number of years.
j = 0……k – The lag length.
$\phi, \alpha, \beta, \sigma, \theta, \psi$ are constants.
ε - is white noise error terms.

The study adopted Vector Error Correction (VEC) and Vector Auto Regressive (VAR) models in testing for Granger causality between international trade and economic growth upon testing for stationarity and cointegration, following Giles and Williams (2000).

The study further estimated several bi-variate Vector Error Correction (VEC) and Vector Autoregressive (VAR) models as specified in equations (14), and (15) to meet the study objective. The Akaike Information Criterion (AIC) and the Schwarz Information Criterion (SIC) were employed to determine optimal lag length of the variables in the model. To find the direction of the causality, the study will further perform panel unit root, panel cointegration and panel causality based on Panel-VECM, Panel VAR model and Wald test, as suggested by Granger (1969, 1988) and also employed by Safdari et al. (2011). To establish the impact of the intra-regional agricultural trade on the economic growth, the study used the coefficients of VEC and VAR estimated to derive of impulse responses. The study covered all the five EAC member states and other 77 trading partners. The 77 trading partners were selected on the basis of data availability. Only countries that recorded consistent agricultural trade with the EAC members over the period of the study were selected. The list of all the 82 countries under the study is provided in the appendices. 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, Discussion and Policy Implication

The stationarity test based on the Im-Peseran-Shim (1997) panel unit root test was conducted and the results presented in Table 2 in the appendices. The results show that both exports and change in GDP exporter are stationary at levels in case of Burundi, that is, both variables are integrated of order zero, (I(0)). Giles and Williams (2000) stated that if all variables in the system are stationary at level, it is appropriate to estimate the VAR model rather than testing for cointegration and estimating vector error correction model (VECM) or an differenced vector autoregressive model (DVAR), and test for causality using an appropriate approach.

However, for Kenya, Uganda and Rwanda, changes in GDP exporter (a measure of economic growth of the exporting country) are stationary at level, while agricultural exports are non-stationary at level but become stationary upon first differencing. Therefore, change in GDP exporter is integrated of order zero (I(0)) while exports is integrated of order one (I(1)). This implies that there was need to carry out cointegration test to investigate existence a long run relationship between the variables. The data from Tanzania showed that both variables are non-stationary at level but become stationary upon first differencing, implying that both exports and change in GDP exporter are integrated of order one (I(1)). As a result, VAR model was estimated with variables at first differences.

Since some series were found to contain unit root in levels, test of cointegration was carried out. This was aimed at investigating whether there was more than a single cointegration relationship between real exports and economic growth for Kenya, Uganda and Rwanda panels. Johansen Fisher panel cointegration test, Pedroni residual cointegration test and Kao residual cointegration test was carried out on the three panels (results presented in Tables 3, 4 and 5 in the appendices). The cointegration test results show rejection of null hypothesis of 'no cointegration' for all the three panel data sets, hence implying long run relationship (cointegration) between agricultural exports and economic growth of the exporter. According to Enders (1995), the evidence of cointegration between the variables implied no spurious correlation. This suggested that it was appropriate to estimate vector error correction model (VECM) instead of VAR model for the data sets as stated by Giles and Williams (2000).

To specify and estimate the VAR and VEC models, the study used the Akaike information criterion (AIC) and Schwarz information criterion (SIC) as proposed by Tada and Yamamoto (1995) to determine the optimal lag length for the exports and the growth in GDP. According to Gianni and Giannini (1997), AIC and SIC are measures of trade-off fit against loss of degrees of freedom, such that the best lag length that minimizes both is obtained. The AIC and SIC optimal lag lengths results showed the optimal lag length for the variables in various panel data sets (results presented in Table 6 in the appendices). In Kenya, the optimal lag length is two (2) as selected by all the criteria. In the case of Tanzania, Uganda and Rwanda, the optimal lag length is four (4), while Burundi's data set shows optimal lag length of three (3). The VAR and the VEC models were specified based on this information.

VAR system is dynamically stable if the root of the matrix of all the coefficients are less than one in absolute value, if not, then Vector error correction model is more appropriate (Viegi, 2010). Lack of dynamic stability in VAR system may have same effects as the presence of unit root in the series leading to spurious results. The tests for stability in VAR models were carried out and the results showed that the model for Burundi is stable as all the characteristic unit roots fall within the circle. But the model for Tanzania becomes stable upon reduction of the lag length by one lag, while those for Kenya, Uganda and Rwanda remain unstable. In line with these finding, VAR models were estimated for Burundi and Tanzania, while VEC models were estimated for Kenya, Uganda and Rwanda.

The regressions for VAR model estimates for Tanzania and Burundi and VEC model estimates for Kenya, Uganda and Rwanda were carried out. The main uses of VAR/VEC estimates in empirical applications are to facilitate the Granger causality test, impulse response analysis and variance decomposition. However, for the purposes of this study, variance decomposition was not carried out due to the nature of the bi-variate VAR/VEC model specified. Granger causality tests and corresponding impulse responses analysis are presented and discussed in the subsequent sections.

From the VAR and VEC estimates, Granger causality tests were carried out and the results are presented in Tables 7 and 8 in the appendices, respectively. The Granger causality tests show that agricultural exports does not granger cause economic growth neither do economic growth granger cause agricultural exports for both Tanzania and Burundi. This implies that economic growth in Tanzania and Burundi does not predict agricultural exports, while at the same time Tanzanian and Burundi agricultural exports do not predict the countries' economic growth. The VEC Granger causality test results presented in Table 8 show mixed outcomes for Kenya, Uganda and Rwanda. In Kenya, the null hypotheses of 'economic growth does not granger cause agricultural trade' and agricultural trade does not cause economic growth' are rejected at one per cent and five per cent levels of significance, respectively. This implies a bi-directional relationship between economic growth and agricultural exports in Kenya.

On the other hand, results for Rwanda show a uni-directional relationship between economic growth and agricultural exports. The hypothesis of 'agricultural exports does not granger cause economic growth' is rejected at one per cent level of significance, while the results further show that there was no sufficient evidence to reject the null hypothesis of 'economic growth does not granger cause agricultural exports. This implies that Rwandan economic growth does not predict its agricultural exports, while Rwandan agricultural exports predict its economic growth. Furthermore, the results show existence of no predictive relationship at all between economic growth and agricultural exports in the case of Uganda, as the null hypotheses are not rejected at both one per cent and five per cent levels of significance.

Impulse response functions give time path for a variable explained in VAR/VEC model following a shock in another variable in the model. That is, it describes how one variable in the model responds to the shock in the other variable(s) over a period of time. Based on the results of the Granger Causality tests in the previous section, the study used the impulse response functions to analyze the impact of agricultural exports on economic growth for the Kenya and Rwanda, where agricultural exports were found to Granger cause economic growth.

(a) Impact of Kenyan Agricultural Exports on Economic growth

The impact of one standard deviation shock to Kenyan agricultural exports on Kenyan economic growth is shown in Figure 1 in the appendices. A one standard deviation shock to Kenyan agricultural exports causes a negative response in Kenyan economic growth. The negative response lasted for the first two and a half years, and thereafter became positive. The impact zooms out after four years.

(b) Impact of Rwandan Agricultural Exports on Economic growth

The impact of one standard deviation shock to Rwandan agricultural exports on Rwandan economic growth is shown in Figure 2 in the appendices. A one standard deviation shock to Rwandan agricultural exports causes a small instantaneous negative response in Rwandan economic growth, which becomes positive in less than one year. The positive effect lasts until the fourth year where it becomes negative and immediately becomes positive again. The highest positive values are reported for the third and the fifth years. The effect of a shock in agricultural exports seems to have a small constant positive and permanent log-run effect on economic growth in Rwanda.

Based on the empirical findings, this study concludes that the relationship between the agricultural trade (exports) and economic growth in EAC vary amongst the EAC member states. The results indicated bi-directional relationship between economic growth and agricultural exports for Kenya, uni-directional relationship for Rwanda (economic growth Granger cause agricultural exports), and no relationship at all between economic growth and agricultural exports for Uganda, Tanzania and Burundi.

The study therefore recommends that to achieve and sustain high economic growth, the Kenyan and Rwanda governments have to implement strategies that promote agricultural trade, specifically agricultural exports, make agricultural exports more transparent by reducing technical barriers. This is because empirical results show that agricultural exports have a predictive ability on the economic growth for Kenya and Rwanda. Further analysis shows that shocks in agricultural exports for Kenya and Rwanda have long run positive effects on the countries' economic growth. Policies that would promote agricultural exports include; reduction in exchange rate discrepancies and reduction in transaction costs in the region, among others. Additionally, economic growth can also be used as a policy instrument to promote Kenyan agricultural exports. This is because the results show that economic growth predict agricultural exports in Kenyan case.

References

Abdulai, A. and Jaquet, P. (2002). Exports and Economic Growth: Cointegartion and Causality Evidence for Cote D'Ivoire. *African Development Review*, 14(1), 1-17.

Afonso, Ó. (2001). The Impact of International Trade on Economic Growth. *CEMPRE Working Paper*, University Of Porto, Portugal.

Andre, C.J. and Hinaunye, J.E. (2007). Export and Economic Growth in Namibia: A Granger Causality Analysis. *South African Journal of Economics*, 75(3), 540-547.

Balassa B., and Bauwens, L. (1987). Intra-Industry Specialisation in a Multi-Industry Framework, *Economic Journal*, 97, 923-939.

Baltagi, B. H., (2005). *Econometric Analysis of Panel Data*, John Wiley & Sons Ltd, 3rd Edition.

Bidlingmaier, T. (2007). International Trade and Economic Growth in Developing Countries, Paper prepared for presentation at the DEGIT XII conference in Melbourne.

Bruno, M. (1968). Estimation of factors contribution to growth under structural disequilibrium, *International Economic Review*. 9 (1), 49-62.

EAC (2010). Trade Report 2008, East African Community Secretariat, Arusha.

EAC Secretariat (2011). East African Community Facts and Figures, Arusha.

Feder, G. (1982). On export and economic growth, *Journal of Development Economics*. 12, 59-73.

Galimberti, J. K. (2009). Conditioned Export-Led Growth Hypothesis: A Panel Threshold Regressions Approach, MPRA Paper, No. 13417.

Giles, J.A. and Williams, C.L. (2000). Export-Led Growth: A Survey of the Empirical Literature and Some Noncausality Results, *Journal of International Trade and Economic Development*. 9, 261-337.

Granger, C. W. J. (1969). Investigating causal relationships by econometric models and crossspectral methods, *Econometrica*, 37, 424-438.

Granger, C. W. J. (1988). Some recent development in a concept of causality, *Journal of Econometrics*. 39, 199-211.

Gurgul, H. and Lach, L. (2010). International Trade and Economic Growth in the Polish Economy, University of Science and Technology, Cracow, Poland.

Islam, M. N. (1998). Export Expansion and Economic Growth, Testing for Cointegration and Causality. *Applied Economics*, 30, 415-425.

Izani I. (2002). On Exports and Economic Growth. Jurnal Pengurusan. 21, 3-18.

Keesing, D. B. (1967). Outward-looking policies and economic development, *Economic Journal*. 77 (306), 303-320.

Konya, L. (2006). Exports and growth: Granger causality analysis on OECD countries with a panel data approach, *Economic Modelling*, 23, 978-992.

Krugman, P.R. and Obstfeld, M. (1991). *International economics: Theory and policy*, 2^{nd} edition, Harper Collins, New York.

Lin, J. Y. And Li, Y. (2002). Export and Economic Growth in China: A Demand-Oriented Analysis. Peking

Safdari, M., Mahmoodi, M. and Mahmoodi, E. (2011). The Causality Relationship between Export and Economic Growth in Asian Developing Countries. *American Journal of Scientific Research*, 25, 40-45.

Safdari, M., Zaroki and Shahryar (2012). The Study Examining the Effect of Export Growth on Economic Growth n Iran, *Business Intelligence Journal*. January 2012, 5(1).

Silaghi, M.I. (2009). Exports-Economic Growth Causality: Evidence From Cee Countries. *Romanian Journal of Economic Forecasting*, 2(2009).

Tang, C.F. and Lai, Y.W. (2011). The Stability of Export-led Growth Hypothesis: Evidence from Asia's Four Little Dragons. *MPRA Paper*, No. 27962.

Thirlwall, A.P. (2000). Trade, Trade Liberalization and Economic Growth: Theory and Evidence. African

Vinaye, A. D. (2009). Assessing the SADC’s potential to promote intra-regional trade in agricultural goods. University of Mauritius, Reduit.

Vollrath, T.L. (1998). RTAs and Agricultural Trade: A Retrospective Assessment. In M. Burfisher and E. Jones (eds.), Regional Trade Agreements and U.S. Agriculture. Agricultural Economic Report, 771.

Winston, S. and Castellanos, C. (2011). Trade in East African: Increased intraregional trade and lower tariffs are paving way for faster growth. IMF Finance and Development.

World Bank (2009). The Little Data Book on Africa 08/09. World Bank

5. APPENDICES

1	Afghanistan	22	Eritrea	43	Madagascar	64	Singapore
2	Algeria	23	Finland	44	Malawi	65	South Africa
3	Angola	24	Fomer Sudan	45	Malaysia	66	Spain
4	Australia	25	France	46	Malta	67	Sri Lanka
5	Austria	26	Germany	47	Mauritius	68	Swaziland
6	Bahrain	27	Ghana	48	Morocco	69	Sweden
7	Belgium	28	Greece	49	Mozambique	70	Switzerland
8	Benin	29	Hong Kong SAR	50	Netherlands	71	Tanzania
9	Botswana	30	Hungary	51	New Zealand	72	Thailand
10	Brazil	31	India	52	Nigeria	73	Turkey
11	Bulgaria	32	Indonesia	53	Norway	74	UAE
12	Burundi	33	Iran	54	Oman	75	Uganda
13	Canada	34	Ireland	55	Pakistan	76	UK
14	Chile	35	Israel	56	Poland	77	Ukraine
15	China	36	Italy	57	Portugal	78	USA
16	Comoros	37	Japan	58	Republic Korea	79	Vietnam
17	Cyprus	38	Jordan	59	Russian Federation	80	Yemen
18	Denmark	39	Kenya	60	Rwanda	81	Zambia
19	Djibouti	40	Korea	61	Saudi Arabia	82	Zimbabwe
20	DRC	41	Kuwait	62	Senegal		
21	Egypt	42	Kyrgyzstan	63	Seychelles		

Table 1: EAC Population and Agriculture

COUNTRY	POPULATION (MILLIONS)	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 2: Results for unit-root test (Im-Peseran-Shin panel unit-root test)

Exporter	Variable	Levels		First Difference	
		t-bar stat.	*p-value*	*t-bar stat.*	*p-value*
Kenya	Exports	-1.1974	0.9999	-3.7372***	0.0000
	Change in GDP Exporter	-1.8118***	0.0001	-	-
Uganda	Exports	-1.8038	0.2179	-4.4203***	0.0000
	Change in GDP Exporter	-2.3638***	0.0000	-	-
Tanzania	Exports	-1.7776	0.5444	-4.1158***	0.0000
	Change in GDP Exporter	-0.9579	0.9999	-6.6893***	0.0000
Rwanda	Exports	-1.5337	0.4093	-2.6250**	0.0168
	Change in GDP Exporter	-2.0173**	0.0124	-	-
Burundi	Exports	-2.7015***	0.0000	-	-
	Change in GDP Exporter	-3.3691***	0.0000	-	-

*** (**) denotes rejection of the null hypothesis at 1% (5%) significant level.
Source: Study Data (2015)

Table 3: Results for cointegration test (Johansen Fisher Panel Cointegration Test)

Johansen Fisher Panel Cointegration Test

Series: Exports, Change in GDP Exporter
Null Hypotheses: 1. No cointegration
2. At most 1 cointegration relationship
Trend assumption: Quadratic deterministic trend
Lags interval (in first differences): 1 1
Unrestricted Cointegration Rank Test: Trace and Maximum Eigenvalue

	Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	p-values	Fisher Stat.* (from max-eigen test)	p-values
KENYA	Included observations: 770				
	None	1067.* **	0.0000	984.3***	0.0000
	At most 1	630.9***	0.0000	630.9***	0.0000
UGANDA	Included observations: 481				
	None	292.0***	0.0000	297.0***	0.0000
	At most 1	80.49	0.2832	80.49	0.2832
RWANDA	Included observations: 156				
	None	145.3***	0.0000	99.15***	0.0000
	At most 1	108.2***	0.0000	108.2***	0.0000

*** (**) denotes rejection of the null hypothesis at 1% (5%) significant level.

Table 4: Results for cointegration test (Padroni Residual Cointegration Test)

Pedroni Residual Cointegration Test			
Series:	Exports, Change in GDP exporter		
Null Hypothesis:	No cointegration		
Trend assumption:	Deterministic intercept and trend		
Lag selection:	Automatic SIC		
Alternative hypothesis:	Common AR coefs. (within-dimension)		
	Included observations: 770		
		Statistic	**p-value**
	Panel v-Statistic	5.076615***	0.0000
KENYA	Panel rho-Statistic	-3.838845***	0.0001
	Panel PP-Statistic	-23.63375***	0.0000
	Panel ADF-Statistic	N/A	N/A
	Included observations: 481		
		Statistic	**p-value**
	Panel v-Statistic	1.488747	0.0683
UGANDA	Panel rho-Statistic	1.712097	0.9566
	Panel PP-Statistic	-10.00445***	0.0000
	Panel ADF-Statistic	-11.51180***	0.0000
	Included observations: 156		
		Statistic	**p-value**
RWANDA	Panel v-Statistic	4.069280***	0.0000
	Panel rho-Statistic	-0.119127	0.4526
	Panel PP-Statistic	-2.898533***	0.0019
	Panel ADF-Statistic	-5.558764***	0.0000

*** (**) denotes rejection of the null hypothesis at 1% (5%) significant level.
Source: Study Data (2015)

Table 5: Results for cointegration test (Kao Residual Cointegration Test)

Kao Residual Cointegration Test				
Series:	Exports, Change in GDP exporter			
Null Hypothesis:	No cointegration			
Trend assumption:	No deterministic trend			
Lag selection:	Automatic by SIC			
	Included observations: 770			
		t-Statistic		**p-value**
	ADF	2.107144**		0.0176
KENYA	Residual variance		1.73E+08	
	HAC variance		1.51E+08	
	Included observations: 481			
		t-Statistic		**p-value**
	ADF	1.783680**		0.0372
UGANDA	Residual variance		1.12E+08	
	HAC variance		79551842	
	Included observations: 156			
		t-Statistic		**p-value**
RWANDA	ADF	2.622026***		0.0044
	Residual variance		1.39E+08	
	HAC variance		82936551	

*** (**) denotes rejection of the null hypothesis at 1% (5%) significant level.
Source: Study Data (2015)

Table 6: Results of Lag Order Selection Criteria

VAR Lag Order Selection Criteria

Endogenous variables: Exports, Change in GDP Exporter
Exogenous variables: Constant

	Lag	LogL	LR	FPE	AIC	SIC	HQ
	Included observations: 490						
KENYA	0	-6164.166	NA	2.92e+08	25.16802	25.18514	25.17475
	1	-5384.669	1549.449	12322991	22.00273	22.05409	22.02290
	2	-5297.029	173.4917*	8758980.*	21.66134*	21.74694*	21.69496*
	3	-5295.175	3.654627	8836068.	21.67010	21.78994	21.71717
	Included observations: 259						
	Lag	**LogL**	**LR**	**FPE**	**AIC**	**SIC**	**HQ**
	0	-2957.893	NA	28934951	22.85631	22.88378	22.86736
UGANDA	1	-2657.359	594.1046	2930635.	20.56648	20.64888	20.59961
	2	-2650.080	14.27728	2857379.	20.54116	20.67849	20.59637
	3	-2605.378	86.98874*	2086768.	20.22685*	20.41912*	20.30415*
	4	-2422.584	352.8831	524663.3*	18.84621	19.09340	18.94560
	5	-2417.778	9.204674	521430.2	18.83998	19.14211	18.96145
	Included observations: 488						
	Lag	**LogL**	**LR**	**FPE**	**AIC**	**SIC**	**HQ**
	0	-5470.183	NA	18834939	22.42698	22.44415	22.43372
TANZANIA	1	-4898.883	1135.575	1841750.	20.10198	20.15350	20.12222
	2	-4729.179	335.9320	933886.6	19.42286	19.50873	19.45659
	3	-4638.377	178.9983	654330.9	19.06712	19.18733	19.11434
	4	-4574.564	125.2720*	512081.0*	18.82198*	18.97654*	18.88270*
	Included observations: 91						
	Lag	**LogL**	**LR**	**FPE**	**AIC**	**SIC**	**HQ**
	0	-871.7733	NA	750170.3	19.20381	19.25899	19.22607
RWANDA	1	-850.1144	41.88972	508893.6	18.81570	18.98125	18.88249
	2	-841.4008	16.46959	458893.4	18.71211	18.98802	18.82342
	3	-821.1452	37.39498	321159.9	18.35484	18.74113	18.51068
	4	-794.3018	48.37705*	194527.9*	17.85279*	18.34944*	18.05316*
	Included observations: 112						
	Lag	**LogL**	**LR**	**FPE**	**AIC**	**SIC**	**HQ**
	0	-832.6228	NA	10180.47	14.90398	14.95252	14.92368
BURUNDI	1	-796.7995	69.72762	5767.399	14.33571	14.48134	14.39479
	2	-756.2364	77.50441	3002.372	13.68279	13.92552	13.78127
	3	-741.3942	27.82911	2474.404	13.48918	13.82900*	13.62706
	4	-734.5854	12.52334*	2354.223*	13.43903*	13.87593	13.61629*

* indicates lag order selected by the criterion

LR: Sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SIC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 7: Results of Granger Causality Test (VAR model)

VAR Granger Causality Test				
	Included observations: 488			
TANZANIA	**Null hypothesis**	**Dependent variable**	**Chi-square stat**	**p-value**
	Economic Growth does not Granger Cause Agricultural Exports	Change in Exports	4.831464	0.1846
	Agricultural Exports does not Granger Cause Economic Growth	Change in GDP Exporter	2.588540	0.4595
	Included observations 112			
BURUNDI	**Null hypothesis**	**Dependent Variable**	**Chi-square stat.**	
	Economic Growth does not Granger Cause Agricultural Exports	Exports	3.842575	0.2790
	Agricultural Exports does not Granger Cause Economic Growth	Change in GDP Exporter	0.550000	0.9078

***, ** and * denotes rejection of the null hypothesis at one per cent, five per cent and 10 per cent significant levels.

Table 8: Results of Granger Causality Test (VEC model)

VEC Granger Causality Test				
	Included observations: 490			
	Null hypothesis	**Dependent variable**	**Chi-square stat**	**p-value**
KENYA	Economic Growth does not Granger Cause Agricultural Exports	D(Exports)	16.40684***	0.0003
	Agricultural Exports does not Granger Cause Economic Growth	D(Change in GDP Exporter)	7.288371**	0.0261
	Included observations 259			
	Null hypothesis	**Dependent Variable**	**Chi-square stat.**	
UGANDA	Economic Growth does not Granger Cause Agricultural Exports	D(Exports)	4.509470	0.2114
	Agricultural Exports does not Granger Cause Economic Growth	D(Change in GDP Exporter)	5.384827	0.1457
	Included observations: 78			
RWANDA	**Null hypothesis**	**Dependent Variable**	**Chi-square stat.**	**p-value**
	Economic Growth does not Granger Cause Agricultural Exports	D(Exports)	2.610219	0.4557
	Agricultural Exports does not Granger Cause Economic Growth	D(Change in GDP Exporter)	12.89046***	0.0049

***, ** and * denotes rejection of the null hypothesis at one per cent, five per cent and 10 per cent significant levels.

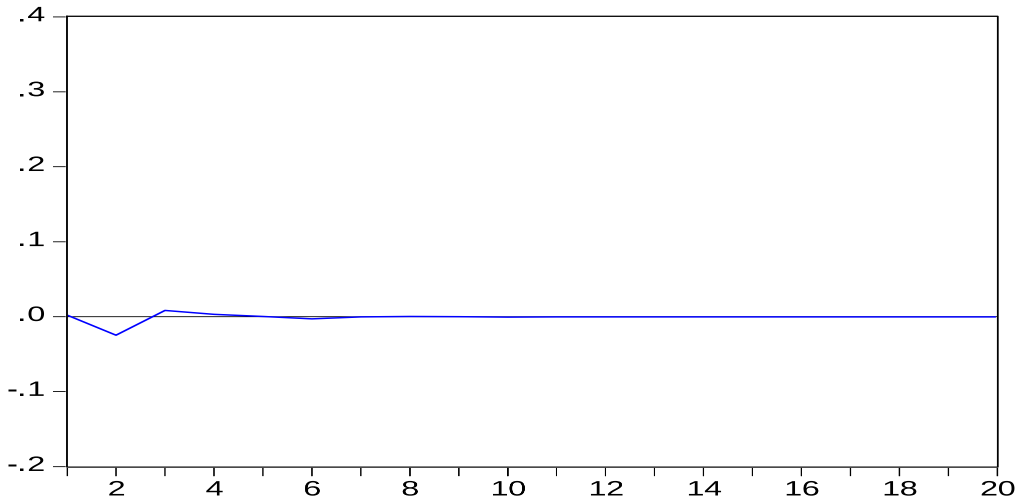

Figure 1: Impact of Kenyan Agricultural Exports on Kenyan Economic Growth.

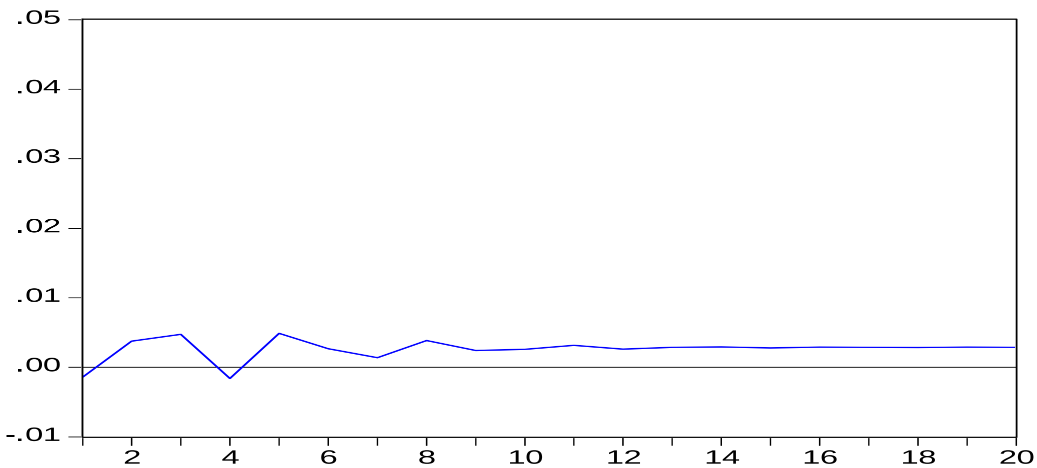

Figure 2: Impact of Rwandan Agricultural Exports on Rwandan Economic Growth.