# EFFECTS OF TARIFF AND NON-TARIFF BARRIERS ON INTRA-EAST AFRICA COMMUNITY TRADE IN AGRICULTURAL FOOD COMMODITIES

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## DECLARATION AND RECOMMENDATION

### Declaration

This thesis is my original work and has not been presented for a degree in any other university.

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### Recommendation

This thesis has been submitted for examination with our approval as University supervisors.

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## ABSTRACT

Theoretically, there is the belief that removal of barriers to trade would promote increased trade in commodities and particularly food commodities towards improved food security. The East Africa Community (EAC) has made significant headway in eliminating tariff and non-tariff barriers to trade via the Customs Union Protocol. However, information as to whether these policy decisions have contributed to increased availability and access to food commodities is inadequate in literature. This study, therefore, sought to examine the effects of tariff and non-tariff barriers on intra-East Africa Community trade in agricultural food commodities from 1999 to 2014. The specific objectives of the study were: to determine the proportion of tariff and non-tariff barriers applied by each country to each other for all the agricultural food commodities; to determine the effects of Tariff and Non-Tariff Barriers on trade in agricultural food commodities; and to determine the country specific welfare effects of tariff barriers (TB) and non-tariff barriers (NTB) on the national production and consumption of agricultural food commodities. Trade barrier data was gathered from the Trade Analysis and Information Systems database. Results show that trade of agricultural food commodities with EAC has been liberalized to a large extent, mainly through more duty-free lines, an attribute that contributed to more trade volumes over the 15-year study period. Countries with few *ad valorem* lines for edible vegetables like Kenya attracted huge imports from her trade partners like Uganda (0.333) and Tanzania (0.357) at 5,472,149 and 2,462,069 United States dollars. The number of duty-free lines had a significant influence on trade of cereals between countries at 1% significant level. Non-tariff barriers like sharing a common language and a shared border also had significant positive effects on trade as shown by the Random Effects Model (REM) results. Global Simulation Model (GSIM) results show that the involved countries have also increased their trading partner which has magnified the net welfare benefits to consumers and producers. Reduction of cereals tariffs led to increased net and improved consumer welfares for all countries but Uganda and Burundi. To boost trade the study recommends improvement of infrastructure especially road and modern railway networks to bridge the distance gap between non-neighboring countries, promote use of Kiswahili as a universal EAC language and tap into more markets within the region and from other countries. The countries within the EAC block can also further reduce tariff barriers however this should be done carefully since it's a major source of foreign exchange to the countries. Finally, each country should specialize more in products which it has a comparative advantage in producing and exporting.

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## LIST OF ABBREVIATIONS AND ACRONYMS

**ATPSM -** Agricultural Trade Policy Simulation Model

**BDI -** Burundi

**CEP II -** French Centre d'Etudes Prospective et d'Informations Internationales

**CET -** Common External Tariff

**CNUCED -** Conference Des Nations Unies Sur Le Commerce Et Le Development

**COMESA -** Common Market for Eastern and Southern Africa

**CS -** Consumer Surplus

**CU -** Customs Union

**DS -** Domestic Support

**EAC -** East African Community

**EACS -** East African Community Secretariat

**EAMU -** East African Monetary Union

**ES -** Export Subsidiary

**FAO -** Food and Agriculture Organization

**GDP -** Gross Domestic Product

**GSIM -** Global Simulation Model

**H-O -** Heckscher - Ohlin

**HS -** Harmonized System

**ISIC -** International Standard Industrial Classification

**KCal -** Kilo Calories

**KEN -** Kenya

**MAA -** Multilateral Agreement on Agriculture

**NGR -** Net Government Revenue

**NMC -** National Monitoring Committees

**NTB -** Non-Tariff Barrier

**NTM -** Non-Tariff Measure

**OECD -** Organization for Economic Co Operation and Development

**OLS -** Ordinary Least Squares

**PS -** Producer Surplus

**REC -** Regional Economic Community

**RWA -** Rwanda

**SSA -** Sub-Saharan Africa

**TAO -** Trade Analysis Online

**TB -** Tariff Barrier

**TM -** Tariff Measure

**TR -** Tariff Revenue

**TRAINS -** Trade Analysis and Information System

**TZA -** Tanzania

**UGA -** Uganda

**UNCTAD -** United Nations Conference on Trade and Development

**USD -** United States Dollar

# CHAPTER ONE
# INTRODUCTION

## 1.1 Background of the Study

Since the 1980's the Bretton Woods Institutions touted trade liberalization as a key solution to achieving food security guided by the concept of comparative advantage (Nguema and Ella, 2014). Trade liberalization was largely viewed as a major determinant of the extent of overall food and nutritional security of a nation by contributing towards total food availability between and among trading partners (Bezuneh and Yiheyis, 2014). The World Bank has spearheaded a number of protocols in support of trade liberalization. For instance, the "Uruguay Round" of 1994 established a food security strategy based on trade under the Multilateral Agreement on Agriculture (MAA) and in the Agreement on Sanitary and Phytosanitary measures. The recommendations of the "Uruguay Round" involved the reduction of barriers to trade and promoted the process of multilateral trade negotiations wherein falls the issues of Regional Economic Communities (RECs) (Nguema and Ella, 2014).

The East African Community (EAC) is a Regional Economic Community (REC) comprising of six countries: Kenya, Uganda, Tanzania, Rwanda, Burundi and South Sudan. The EAC population excluding South Sudan was estimated to be 143.5 million people as at 2014 with an average annual growth rate of 2.6% (East African Community Secretariat [EACS], 2014) thus presenting a huge market for commodity trading with the potential for poverty alleviation and regional development.

To promote intra-regional trade in commodities, the EAC developed a Customs Union (CU) Protocol enforced in January 2005. One major commitment of the Protocol, in line with easing of intra-EAC commodity trading, was the removal of trade obstacles such as tariff barriers (TBs) and non-tariff barriers (NTBs). A further commitment of the Protocol included: simplifying, standardizing and harmonization of trade information and documentation to facilitate trade in goods (EACS, 2014).

Article 13 of the CU Protocol outlined the removal of all existing NTBs and the non-imposition of new ones while article 11 prohibited the use of neither quantitative restrictions on imports, nor all measures having equivalent effects among EAC partner states. Consequently, the EAC implemented a Common External Tariff (CET) to all non-EAC

imports under the auspices of the CU Protocol. Intra-EAC tariffs were thus abolished though Kenya, the largest exporter within EAC was to continue paying duties on its goods entering the other four EAC countries till 2010 (Karugia *et al.*, 2009). However, while there is much effort towards the elimination of TBs and NTBs within the EAC, the partner states still apply some of these measures to protect some key sectors (Okumu and Nyankori, 2010)**.**

With agriculture being the dominant sector in EAC in terms of production and trade, for instance accounting up to 40% of the total intra-EAC trade (Ouma, 2017), any obstacle to intra-EAC agricultural trade contributes to making agricultural food inaccessible to a vast part of the EAC population. The likely resulting scenario is a case of food insecure communities which besides food inaccessibility, they partake of the problem of nutritional deficiency.

The Protocol of the EAC Customs Union, the EAC Customs Management Act (2004) and the EAC Customs Management Regulations (2006) provided for the steady removal of internal tariffs and implementation of a CET besides other measures related to NTBs elimination. The EAC has performed exemplary well in the area of abolishing intra-EAC tariffs particularly as relates to agricultural commodities (East African Community Secretariat [EACS], 2015). However, certain types of duties or levies have persisted to date thus may have contributed to a slow growth in intra-EAC trade in commodities.

EAC countries established National Monitoring Committees (NMCs), EAC regional forums and time-bound programs to identify and eliminate NTBs. However, the degree of effectiveness of these mechanisms was yet to be fully assessed and neither was realizing of the gains from the elimination of the NTBs. It was further argued that the existing frameworks for elimination of NTBs within the EAC may not be effective as these barriers continue to exist in spite of having in place the mechanisms for monitoring and eliminating them (Okumu and Nyankori, 2010). While the EAC has been fully committed towards the removal of NTBs, these barriers have continued to contribute to increasing transaction costs and slow growth in intra-EAC trade flows. The Non-Tariff Measures (NTMs) that still exist for instance in Kenya are discriminative, neither transparent nor scientifically based, and generally act as barriers to trade (Nganga, 2014).

## 1.2 Statement of the problem

Tariff Measures (TMs) and Non-Tariff Measures (NTMs) have been widely used by the EAC countries. However, when they limit trade amongst the member states, they become barriers. The EAC has made efforts to eliminate TBs and NTBs under different protocols since the removal of these barriers guarantees increased availability and access to nutrition by moving food from surplus to deficit countries within the region. However, the TBs and NTBs continue to hamper trade within the EAC as applied from one country to another. The evidence from previous researches on the effects of the TBs and NTBs also tends to focus only on cereals. Therefore, this study sought to determine the effects of TBs and NTBs on intra-EAC trade in all eight broad categories of agricultural food commodities.

## 1.3 Objectives

### 1.3.1 General objective

To contribute towards improved intra-East Africa Community trade in agricultural food commodities.

### 1.3.2 Specific objectives

i. To determine the proportion of Tariff Barriers (TBs) and Non-tariff Barriers (NTBs) applied by each EAC country to each other for all the agricultural food commodities
ii. To determine the effects of Tariff Barriers (TBs) and Non-Tariff Barriers (NTBs) on trade in agricultural food commodities in the East Africa Community
iii. To determine the effect of Tariff Barriers (TBs) and Non-Tariff Barriers (NTBs) on the country specific welfare position on the production and consumption of agricultural food commodities in the East Africa Community

## 1.4 Research questions

i. What is the proportion of Tariff Barriers (TBs) and Non-Tariff Barriers (NTBs) applied by each country to each other for each agricultural food commodity traded in the East Africa Community?
ii. What is the effect of Tariff Barriers (TBs) and Non-Tariff Barriers (NTBs) on trade in agricultural food commodities in the East Africa Community?
iii. What are the effects of Tariff Barriers (TBs) and Non-Tariff Barriers (NTBs) on the country specific welfare position in production and consumption of agricultural food commodities in the East Africa Community (EAC)

### 1.5 Justification of the study

Global empirical studies for the effects of TBs and NTBs on trade in agricultural commodities have involved case studies that span a huge number of agricultural commodities and countries. While significant attempt has been made towards disaggregation of the effects of TBs and NTBs on specific classifications of the agricultural commodities, important effects that touch on trade in agricultural food commodities within RECs such as the EAC have been heavily enveloped in representative effects through few commodities such as cereals (maize and wheat). The effects of TBs and NTBs though, vary significantly across different agricultural commodity classifications.

Access to food is a major component of food security that helps link areas of food surplus to areas of food deficit. Trade in agricultural food commodities is thus an important indicator of access to food and nutritional development. The extent of this trade in agricultural food commodities within RECs is highly dependent on the policies that are implemented towards easing trade flows amongst regional partners. Economists believe that a steady removal of TBs and NTBs would help expand the trade flow between trading partners hence improve the incomes and improve livelihoods of producers.

Moreover, enhanced intra-EAC trade in agricultural food commodities could: help the region's industries become more competitive by creating economies of scale and weeding out producers that are less productive in the marketplace; establish and strengthen the agri-food value chains; facilitate the transfer of technology and knowledge via spillover effects; incentivize and spur infrastructure development; and attract foreign direct investments in the region.

Today, globalization is largely approached through development of RECs and multilateral Preferential Trade Agreements as opposed to bilateral preferential trade agreements. Therefore, the analysis of effects of TBs and NTBs to trade in agricultural commodities ought to focus on countries in specific regional communities alongside a wide spectrum of commodity classifications.

It is against this background that this study sought to examine the effects of TBs and NTBs to trade on all classifications of agricultural food commodities amongst EAC member states. The focus on all agricultural food commodities within EAC significantly differentiates this

study from existing empirical studies which only focus on cereals such as maize and wheat as sole indicators of food security.

Moreover, since more trade is a direct outcome of increased productivity hence improved volumes of quantities traded, TBs and NTBs have a significant effect on the level of production of agricultural food commodities. The TBs and NTBs affect the level of prices which in turn either encourage producers to supply more commodities upon favorable prices or decrease production and hoard food commodities upon unfavorable prices. This study therefore also sought to determine the country specific welfare effects of TBs and NTBs within EAC in the production and consumption of agricultural food commodities under the outfit of intra-EAC trade in food commodities.

### 1.6 Scope and limitation

This study only focused on the effect of TBs and NTBs on formal trade in agricultural food commodities in the EAC. Information on the TBs and NTBs was sourced from secondary data. The study period was limited to the years 1999 to 2014. This time reflected the period before and after Burundi and Rwanda joined the EAC. One limitation of the study was that since only secondary data was used, some data was missing or inaccessible. Another limitation was that the study did not consider informal trade in agricultural food commodities which is not adequately captured in official statistics.

## 1.7 Operational definition of terms

**Food Commodities-** within the study context will be all agricultural food commodities that are traded and consumed under the disaggregated level of Harmonized System (HS) classification found in the International Standard Industrial Classification (ISIC) Revision Four (4) of the Agricultural and Food Sector

**Food Security-** within the study context refers to the domain of availability of all food commodities and accessibility to all types of food for purposes of nutritional development.

**Non-Tariff Barriers (NTBs) -** refers to trade policy measures that are not customs tariffs with potential negative economic effects (hinder) on international trade in commodities by either changing quantities traded or the commodities' prices as defined by the United Nations Conference on Trade and Development (UNCTAD) (2012).

**Tariff Barriers (TBs) -** refers to trade policy measures relating to taxes, duties or levies with potential negative economic effects (hinder) on international trade in commodities by either changing quantities traded or the commodities' prices.

**Trade Liberalization –** refers to the removal or reduction of restrictions to the free exchange or trade of commodities between and among nations. Within the study context, it specifically refers to the removal or reduction of TBs and NTBs.

# CHAPTER TWO
# LITERATURE REVIEW

This chapter reviews the work of different scholars conducted in the area of trade liberalization and its influence on the flow of food commodities among close trading partners. The next two sections give an overview of the concept of food security and the case in SSA, and the relationship between trade, liberalization and food security. The subsequent section reviews some empirical studies on trade liberalization and its effect on market access and welfare development. The chapter concludes by the summary of the theories informing the study (theoretical framework) and the conceptual framework.

## 2.1 Food security

The definition of food security has evolved over time and today encompasses three key aspects of: availability of adequate food supplies at a global and national level; and adequate nutrition and well-being. Food security encompasses availability, access and stability, while many researchers refer to food security only in terms of availability (Organisation for Economic Co-operation and Development [OECD], 2002).

### 2.1.1 Food security in sub Saharan Africa

Food security is indeed of great concern in Africa and requires urgent attention by crafting policies such as trade reforms that will guarantee food security. FAO (2003) highlighted that global food availability for direct human consumption grew by 19 percent between 1960 and 1996 to 2,720 kilo calories per day against an estimated minimum daily energy requirement of 2,200 kilo calories per day as food availability remained uneven. In Sub-Saharan Africa (SSA) calorific intake was 2,150 kilo calories per day in 2003 compared to 2,050 kilo calories per day in 1973. In contrast, the average calorie consumption in South Asia rose from, 2,000 kilo calories per day to 2,350 kilo calories per day between 1973 and 2003.

FAO (2003) argued that, since the ratio of the nutrition gap to commercial imports in SSA was projected to be 229 percent as of 2003, the gap could be filled through food imports which needed to grow by 10 percent per year from the year 2009 onwards. Christiaensen *et al*. (2011) calculated the ratio of the food import value to the total export value, excluding services, to be relatively larger for a number of SSA countries compared to other non-SSA developing countries. Minot (2010) concluded that, overall, SSA imports more food than it actually exports.

Many studies on food trade have tended to be limited in scope. Kalkuhl *et al*. (2016) cautioned against just using elementary indicators of change in international cereals markets to be sole indicators of food security since even food insecure countries do not over-rely on grain trade from the global market but instead food aid. Aksoy and Ng (2010) advocated for the analysis of agricultural trade policies to cover all agricultural commodities and not just selected few commodities to gain a broad perspective of the trade policy impact in the agricultural sector. This is the gap captured in the statement of the problem.

### 2.1.2 Trade policies and food security

von Braun (2007) indicated that trade policies have an effect on the availability of food between transacting countries. Trade policies could create a means through which food is traded or not and whether seamlessly or chaotically (Ghosh, 2010). Trade policies could also impinge on the nature of household incomes and expenditure patterns since households are either suppliers who gain in case of good prices or consumers who lose in case of unfavorable food prices (FAO, 2011). The effects of trade policy on income and expenditure could also be able to be a source of revenue to the government through tariffs and licenses (Eichengreen and Irwin, 2010).

## 2.2 Trade Liberalization

### 2.2.1 Gains of eliminating trade restrictions

Elimination and reduction of import tariff restrictions could reduce prices of imports such that the initial price at tariff rates and higher than world prices could be phased out (Goldberg *et al*., 2010). A Tariff removal or reduction measure could promote greater efficiency as it could encourage the reallocation of domestic resources, away from relatively inefficient production of importable commodities towards increased production of exportable commodities (Hoekman and Mattoo, 2008).

Hoekman and Mattoo (2008) highlighted that it would be beneficial for trading partners to focus on the production of items that they could produce with relative ease in resource availability and technology while encouraging free trade amongst themselves. Tariff reduction or removal could also reduce the prices and increase the variety of imported goods available to consumers thus expands the consumption possibilities of a country (Thow, 2009).

Stiglitz and Charlton (2006) mentioned that the TBs and NTBs reduction or removal may not be beneficial to all trading partners as additional transaction costs may emerge for the smaller countries. FAO (2011) discussed that import-substituting producers that are most inefficient or are unable to increase efficiency will be unable to compete with imports and may eventually close.

### 2.2.2 Trade liberalization and food security

More trade could contribute to economic improvements via poverty reduction and improved food security (Godfray *et al*., 2010). Barrett (2010) recommended caution when studying correlation between more trade and improved economic performance especially when demonstrating causality. This is because, trade liberalization does not expressly guarantee gains and the improvement of food security could remain just an expectation if gains from trade are not realized (Bernard *et al.*, 2007).

Menyah *et al*. (2014) highlighted that trade openness and economic growth has a direct positive relationship. However, Dao (2014) argued that there is no convincing evidence that trade liberalization is predictably associated with subsequent economic growth and that studies that demonstrate that there is indeed evidence are mis-attributing economic phenomena to trade policy. Godfray *et al*. (2010) mentioned that nations reduce trade barriers as they become richer giving early economic growth opportunities and inclination towards trade protection.

Goldberg *et al*. (2010) argued that trade liberalization has led to import growth overtaking export growth that is possibly attributable to the shrinking of domestic production potential. Mayda and Steinberg (2009) converged at the view that besides trade openness, other factors counted in explaining trade performance of countries in food commodities such as: demographic dynamics, infrastructural and technical differences, climate and weather variability, and domestic policy options.

Domestic market reforms ought to accompany a trade openness policy so as to fully achieve the gains from trade by probably increasing the comparative advantage position (Wacziarg and Welch, 2008). FAO (2011) argued that removal or imposition of TBs and NTBs affect relative prices of commodities, that is, both import and export prices thus inducing changes in the allocation of resources to different activities.

Martin and Ivanic (2016) argued that positive changes in income levels due to favorable prices could reduce poverty levels and in doing so, improve the food security status by increasing the access of food to the poor. These two arguments will partly be answered by the current study.

Additionally, Nguema and Ella (2014) pointed out that access to food in Africa depended on the existence and quality of some physical infrastructures besides trade restrictions or production shortfalls. Olaseni and Alade (2012) discussed that poor roads and ports infrastructure affect prices as costs of transportation soar and the burden is shifted to the final consumer. However, the scope of this study will not include effects of infrastructure although Dao (2014) argued that the GDP of importing countries could be used as a proxy to measure the capacity to import while that of exporting countries as a measure of the capacity to produce and export factoring in infrastructural developments.

The effects of trade liberalization are still unclear. Barrett (2010) argued that trade liberalization may bear negative consequences for some people such as, the poor people albeit having acknowledged that trade liberalization could guarantee economic improvement for any country. Indeed, Bezuneh and Yiheyis (2014) established that the benefits of trade liberalization are not certainly completely realized by all parties pointing out that some groups of individuals within some countries are likely to be disadvantaged.

### 2.2.3 Trade liberalization and market access

Suggestions have been proposed that food commodities, particularly staple foods in Africa should be granted an access platform to international markets by lowering of applied tariffs as compared to other non-food agricultural commodities (Nguema and Ella, 2014). However, Africa should reinforce regional and continental integrations in harmonizing and modernizing the agriculture in order to have an important domestic market (EACS, 2015). This is the perspective that motivated this study.

### 2.2.4 Trade liberalization and welfare development

Trade liberalization could lead to efficiency gains on the part of producers especially for developing countries which are small (Ghosh, 2010). However, FAO (2011) indicated that the adjustment to efficiency could be slow due to high costs in agriculturally dependent countries like the East African economies.

On the other hand, the application of trade restrictions through TBs for instance from a national welfare point of view such as import tariff is an important source of revenue while export tariffs keep domestic food prices relatively low (EACS, 2015).

Exports for example may not adversely affect food security whether under the goal of self-reliance or self-sufficiency (Bezuneh and Yiheyis, 2014). However, in periods of production shortfalls in any country, continued exportation of food commodities could potentially aggravate a food insecurity situation hence contribute to increased inaccessibility of food domestically (Godfray *et al*., 2010). Scenarios such as famine and production shortages prompt countries to impose TBs and NTBs that limit exports (Minot, 2010).

Protectionist trade policies of TBs and NTBs may not necessarily guarantee improved national welfare through revenue collection (Dillon and Barret, 2013). Timmer (2008) argued that increased food prices for example due to TBs and NTBs only increase gains to producers and creates rents in case of licenses leading to dead-weight welfare losses and market inefficiencies. Eichengreen and Irwin (2010) discussed that protectionism encourages the allocation of resources into sectors in which a country does not have comparative advantage.

Wade (2010) argued that protectionism reduces the quantity and variety of imports and increases the price of imported commodities, therefore reducing consumer welfare. Tariffs and non-tariff barriers also encourage unproductive activities such as rent-seeking, tax avoidance and evasion which contribute to inefficiency in the economy (EACS, 2015).

To attain adequate levels of food security, a strategy towards food self-reliance guided by international trade policies could be advanced (FAO, 2011). Even in countries with agriculture as the major income earner, shifting of resources to produce non-food export crops and importing staple food requirements is tenable (Ncube, 2012).

### 2.3 Nature of intra-EAC trade

Kimenyi *et al*. (2012) indicated that informal trade which is not captured by official statistics is widespread in Africa. For instance, it was estimated that in 2006, Uganda exported USD 231 million worth of goods informally to the other East Africa countries, an amount that was approximately 86 percent of its official export volume to the East African countries in that year (Lesser and Moise-Leeman, 2009). Kimenyi *et al*. (2012) argued that the existence of informal trade is inextricably tied to formal trade therefore addressing challenges of formal trade would by extension imply addressing the factors that undermine informal trade.

This is because, the numerous prohibiting costs and red tape involved in exporting one's products through the formal economy force producers to participate in the informal economy (EACS, 2015) . This study therefore concentrated only on the formal trade in food commodities within East Africa that is captured in official statistics.

## 2.4 Theoretical and conceptual framework

### 2.4.1 Theoretical framework

The effects of TBs, NTBs and Trade Liberalization strategies on intra-regional trade in food commodities as discussed in this study used the Ricardian trade theory of comparative advantage under the assumptions of perfect competition and the Heckscher-Ohlin (H-O) theorem. The Ricardian comparative advantage theory proposed that differences in productivity and opportunity costs of production between countries form the underlying reasons why it is advantageous for countries to engage in trade.

East African Economies fall under the bracket of developing economies heavily endowed with natural resources, land and labor with little capital and technology. Given the Ricardian theory of comparative advantage, the EAC countries individually and collectively have a comparative advantage in agricultural trade. It is therefore crucial to investigate how feasible it would be for the five EAC countries to trade food commodities amongst each other. Specialization and product differentiation would gain impetus encouraging a shift from trade in primary food commodities to value-added food commodities.

The Heckscher-Ohlin (H-O) theorem discusses about the pattern of trade, based on nations' differing factor endowments and the factor requirements of different kinds of goods. The theory highlights that trade occurs because the cost of labor relative to that of capital is lower in the labor-abundant country, implying that the price ratio of labor-intensive goods to capital intensive goods is lower in the labor abundant country than in the capital-abundant country.

The Heckscher-Ohlin theorem therefore bolstered the Ricardian theory of comparative advantage by providing a basis for comparative advantage. When trade begins each country exports commodities that use the relatively abundant factors of production and imports those that use scarce factors of production more intensively. Under competitive free market conditions, trade maximizes potential economic welfare internationally, by creating a situation where no country could be made better off without another being made worse off.

Countries that gain from trade could fully compensate those countries that lose and still be better off: the total gain will be greater than the total loss. With free trade, a point would be reached where more of each traded good is produced, such that everyone will gain if suitable redistribution is made.

The Heckscher-Ohlin (H-O) theorem postulated that: First, the outcome described is dependent on the assumption of competitive markets. In the absence of a level playing field for all trading partners, countries may be better off intervening to restrict free trade; Secondly, countries will not necessarily gain equally from trade: the relative gains will depend on the terms of trade; Thirdly, if there are no mechanisms in place to ensure that losers in the world market will be compensated by those that benefit, the gains of trade will remain potential gains and not actually realized; Fourthly, the issue of redistribution also applies within countries, where there will also be gainers and losers from trade. Finally, any comparative static solution described by the Heckscher-Ohlin theory assumes that all external costs are internalized, including environmental externalities.

Although the Heckscher-Ohlin (H-O) theorem is the basis of modern trade economics, there are gaps in the theory's coverage over some of its predictions. Theoretically, factor proportions alone cannot explain the pattern of international trade. Extensions to the model need to be developed to take account of any empirical shortcomings, and to cater for such factors as trade policies and the absence of perfect competition. It is also evident that being endowed with labor could be a loss factor. Little technology is many times more productive than hundreds of labor.

The underlying assumptions of the Heckscher-Ohlin (H-O) theorem are: the assumption of perfect competition, where no country or firm is able to influence prices, where there are no economies of scale and where products are homogeneous; also the assumption of second-best situations being recognized and acted upon, and that externalities have been internalized.

Under the Heckscher-Ohlin (H-O) theorem, it is argued that countries could use optimum tariff levels since in certain circumstances a country could gain more from imposing a tariff than from free trade assuming other countries do not retaliate. Such gains from any unilateral tariff would be at the expense of losses by other trading partner countries. Larger economies among trade partners could use tariffs to influence their terms of trade in world markets. Smaller economies could also use optimum tariff levels if their major source of national income is the export of the commodities they produce.

The Heckscher-Ohlin (H-O) theorem justified trade protectionism by arguing for the protection of infant industries. Where an industry has large economies of scale, firms may need protection to allow them time to grow before competing with more established firms across the border. However, the prevailing assumption in this case was that there should exist an underlying comparative advantage in the product. If the development strategy involves an export shift from raw materials to processed products the perspective of infant industries' protection could hold.

### 2.4.2 Conceptual framework

Conceptually a set of causal factors affect the volume and monetary value of bilateral imports of food, and the national welfare position seen through consumer surplus, producer surplus, net government revenue and deadweight losses (Figure 1). The volume and monetary value of bilateral imports of food commodities, and the national welfare effects are the final outcomes that demonstrate whether a country is food secure or not.

As seen in Figure 1, the causal factors are independent variables which include: the Average Weighted and Unweighted TBs per country to each commodity and country, NTB coverage ratio to each commodity and country, comparative TB and NTB measures; other control variables such as: exporter GDP, importer GDP, exporter commodity prices, importer commodity prices, number of food commodities in the trade basket, distance between capital cities and the existence of shared border. The TB and NTB variables also affect intermediate indicators of changes in supply, demand, imports and exports which in turn affect the welfare position.

A set of intervening factors indirectly influence the degree to which the causal factors affect the volume and monetary value of bilateral trade imports and the welfare position in production and consumption of a country as indicated in Figure 1. These intervening variables include structural and institutional environment factors such as response of input markets and credit markets which either reduce or increase the effect of the independent variables on the final outcome; also, the nature of crop mix (food versus non-food and tradable versus non-tradable).

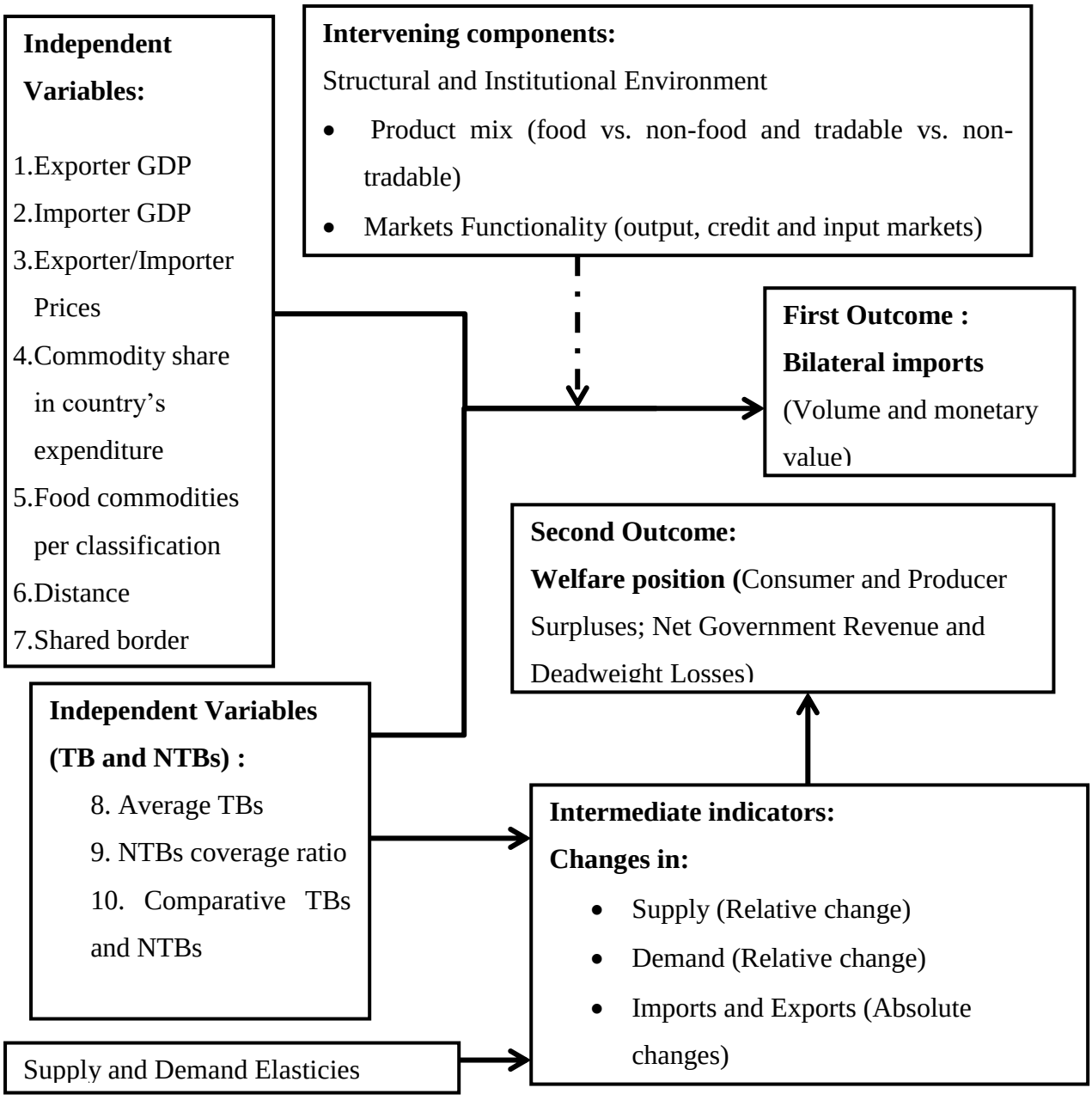


**Figure 1**: Conceptual framework for factors influencing the level of bilateral imports and the welfare position of the countries in East Africa

# CHAPTER THREE
# METHODOLOGY

## 3.1 Study area

The EAC is a Regional Economic Community composed of six countries in the Eastern African Region: Burundi, Kenya, Rwanda, Uganda, Tanzania and South Sudan. The Countries of EAC in this study excluded South Sudan as it was the newest member having been accepted into the EAC in 2016 and bears no adequate data of trade flow and trade policy imposed affecting or affected by the other five EAC member states. The EAC countries were also selected since they have made more progress in transitioning the community from a free trade area, to a customs union to a common market protocol compared to other regional economic communities in Africa. The region has a total surface area of 1,817,700 square kilometers. Tanzania accounts for 51.7% of the surface area, Kenya and Uganda account for 32.1% and 13.3% respectively, while both Burundi and Rwanda account for an equal percentage of 1.5%. The EAC total agricultural land as of 2014 was estimated at 124,718 hectares. Proportionally, Kenya accounts for 45.6% of the total agricultural land use followed by Tanzania at 38.6% while Burundi, Uganda and Rwanda account for 0.9%, 13.0% and 1.8% respectively. The EAC population as at 2014 was estimated to be 143.5 million with an average annual growth rate of 2.6% (EAC, 2014).The EAC entered into a fully-fledged Customs Union in January 2010 and commenced the implementation of the Common Market Protocol in July 2010. The EAC signed a protocol establishing the East African Monetary Union (EAMU) in November 2013 (EAC, 2014).

In 2013, the total exports from Intra-EAC trade amounted to USD 3,508 million while total imports amounted to USD 2,315 million, thus an intra-trade surplus of USD 922 million. Burundi and Rwanda recorded deficits while Kenya, Uganda and Tanzania recorded surpluses (EAC, 2014). Retail average market prices for some selected food commodities increased in 2013. For instance, the average retail market price for a kilogram of maize in EAC was USD 0.73 in 2013 from USD 0.67 in 2012. Bean prices increased by 14.6% to USD 0.98 IN 2013. The average retail price of a kilogram of rice in Burundi in 2013 recorded the highest increase in the EAC at 52.8%. The total production of cattle soared from 52,074 thousand heads in 2012 to 55,466 thousand heads in 2013 in the region. Goats and sheep moved up 3.1% and 9.3% respectively. Fish catch within EAC increased from 955 thousand tonnes in 2012 to 977 thousand tonnes in 2013.

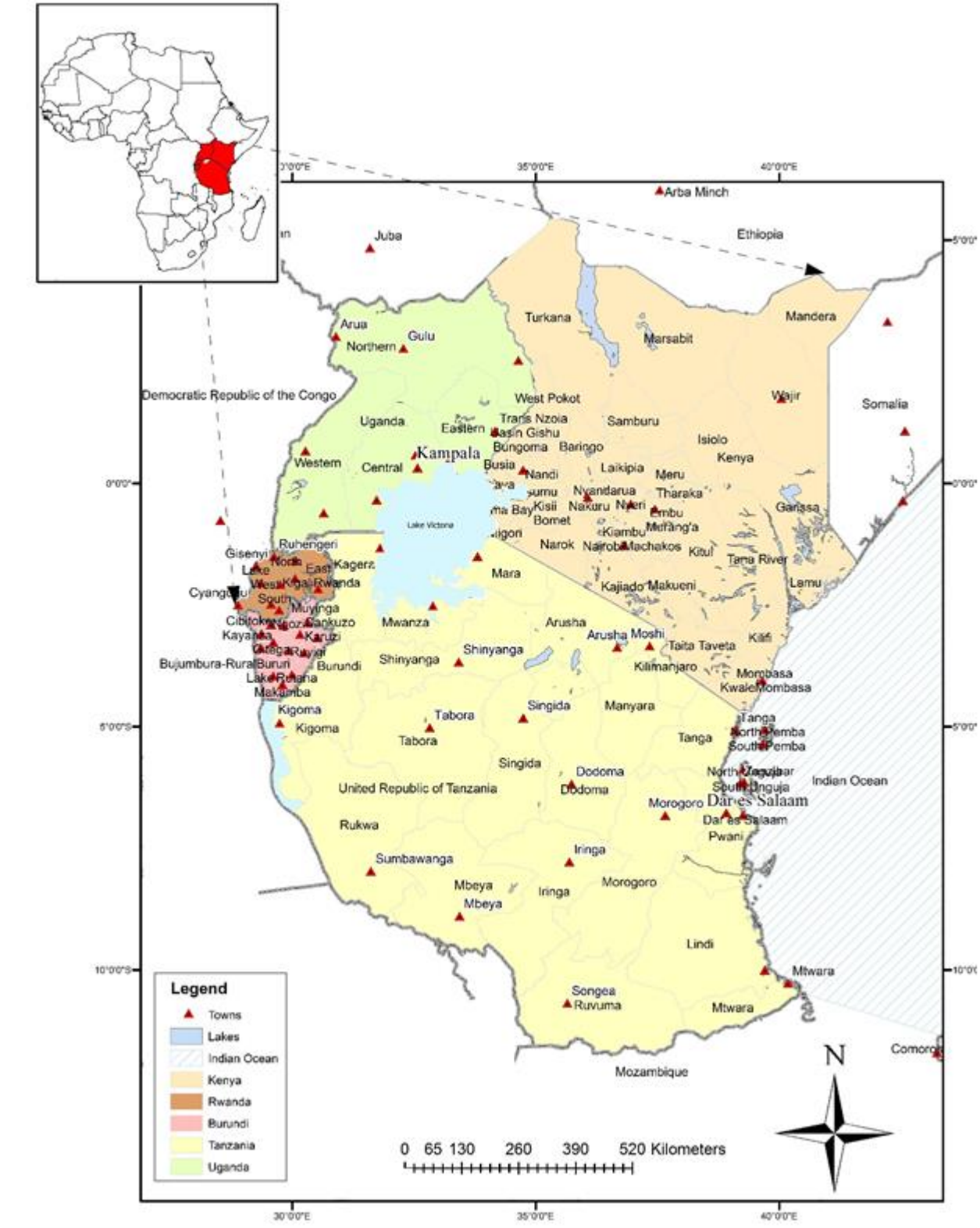


**Figure 2:** Map of East Africa

**Source:** World Resource Center, 2017

The study comprised of data from five (5) EAC countries namely: Kenya, Uganda, Tanzania, Rwanda and Burundi. The observations represented bilateral trade of each country with each other making it four (4) trade observations for each of the five (5) countries annually. This was done for sixteen (16) time periods (Year 1999 to Year 2014). Therefore, the study used 320 observations in the analysis.

$$n = number\_of\_countries * number\_of\_bilateral\_trades * time\_periods$$

$$n = 5x4x16$$

$n$ = 320 observations

### 3.2 Data Collection

Secondary data was obtained of average annual TBs and NTBs for all food commodities traded within EAC for all five (5) EAC countries. This study used data from the UNCTAD TRAINS Database. The UNCTAD TRAINS Database provided a stock of bilateral TBs, NTBs and trade flow between and among countries and regions in the world.

Food commodities to be assessed were sourced from the International Standard Industrial Classification (ISIC) Revision 4 of the Agricultural and Food Sector. Specific product categories were identified under each of the Harmonized System (HS) categories at the 4-digit ISIC classification as shown in Appendix 1. Data on level of production was sourced from FAOSTAT. Data on consumer price indices was sourced from CEPII database and Trade Analysis Online (TAO). Data on household expenditure levels was sourced from the respective bureaus of statistics for the 5 EAC countries.

### 3.4 Data Analysis

#### 3.4.1 Descriptive Statistics

To analyze objective one: to determine the proportion of Tariff Barriers (TBs) and Non-tariff Barriers (NTBs) applied by each EAC country to each other for all the food commodities, descriptive statistics such as the average and number were used. Tabular analysis was used to compare the average TBs and NTBs for each county to the other for each food commodity involved for the sixteen (16) years. In particular, the five countries' average weighted or unweighted tariff rates for the food commodities in the ISIC Agricultural sector were calculated. This analysis helped to determine the average number and type of TBs and NTBs applied by each country to each other within East Africa to each food commodity being assessed.

### 3.4.2 Gravity model of bilateral trade flow and barriers

To analyze objective two: to determine the effects of TBs and NTBs on the flow of trade in food commodities within the EAC**,** this study adopted an estimable trade model developed by Haveman *et al.* (1999). The modification of the gravity model allowed for either homogenous or differentiated goods including provisions for differential TBs and NTBs imposed on one commodity imported from different countries. The model specification is as follows:

The demand equation for bilateral imports:

$$M_{ij} = {Y_i Y_j}\Big/{Y_w} \qquad \textbf{(1)}$$

Where: $M_{ij}$ is the value of bilateral imports of country *i* from country *j*; $Y_i$ and $Y_j$ are the per capita Gross Domestic Products (GDPs) of trading partners *i* and *j*; $Y_w$ is global income.

The modified demand equation for bilateral imports:

$$M_{ij}^{k} = \alpha_i^k \gamma_j^k Y_i Y_j {\left(P_j^k t_{ij}^k\right)^{-\sigma}}\Big/{P_i^k} \qquad \textbf{(2)}$$

With $P_i^k = \sum_l \gamma_l^k Y_l \left(P_l^k t_l^k\right)^{1-\sigma}$ is a price index over imported food commodities. $P_j^k$ is country j's price for commodity 'k', $t_{ij}^k$ is an exporter specific tariff, $\alpha_i^k$ is the share of good 'k' in country 'i' consumption expenditure, $\gamma_j^k$ denotes commodity k's production share in country 'j' output, $Y_i$ and $Y_j$ are the GDPs of trading partners 'i' and 'j', and $\sigma$ is the elasticity of substitution between foreign food commodities.

Equation (2) however may not separate bilateral effects from multilateral effects. For this study the equation is modified to include substitution between local and foreign commodities. The study assumes consumers allocate expenditure between domestic and imported food commodities on a constant elasticity of substitution 'p'.

The choice to consume an imported food commodity is a secondary consideration hence substituting for one another with an elasticity '$\sigma$' which may differ from 'p'. The new equation therefore for the bilateral demand for imports that indicates bilateral trade between countries 'i' and 'j' for commodity 'k' has a functional form of:

$$M_{ij}^{k} = \left[ \frac{\left(P_i^k \tau_i^k\right)^{-p}}{\Gamma_i^k} \right] \alpha_i^k \gamma_j^k Y_i Y_j \frac{\left(P_j^k t_{ij}^k\right)^{1-\sigma}}{P_i^k} \quad \textbf{(3)}$$

Where: $\Gamma_i^k = \left[\left(P_i^k \tau_i^k\right)^{1-p} + \left(P_i^{k*}\right)^{1-p}\right]^{\frac{1}{1-p}}$ is a price index covering domestic and foreign food commodities, ideally altering the consumption share parameter to include substitutions between domestic and foreign food commodities; $P_i^{k*}$ is a price index over domestically produced food commodities; and $\tau_i^k$ is country i's average tariff on commodity 'k'. Country j's imports are a function of country i's average tariff $\tau_i^k$ and bilateral tariffs $t_{ij}^k$.

The modified gravity model therefore captures the possible emergence of: Reduction effects, where a uniform tariff results to a uniform trade contraction from each exporter; and Diversion effects where preferential tariff elimination leads to a reorganization of imports across exporters. Fixed costs of trading such as maintaining logistical and distributional systems impose additional effects. From Helpman and Krugman (1986), this study will adopt the assumption that the supply side of the food commodities is characterized by increasing returns to scale inherent to producers in an individual country. Therefore, each country produces and supplies a number of food commodities proportional to the country's size. On the demand side, this study assumes that each importer is small, and the utility is of the form,

$$U = \prod_{i=1}^{n} x \bullet v_i \quad \textbf{(4)}$$

Where: $n$ is the number of countries with whom the importer trades; $x$ is the equilibrium quantity of each food commodity consumed; $v_i$ is the number of food commodities produced by country $i$. In equilibrium, the larger countries are supposed to produce more food commodities. Utility maximization is therefore subject to:

$$E = F * n + \tau * X * \sum_{i-1}^{n} v_i$$
$$n \leq N \quad \textbf{(5)}$$

Where: $E$ is the level of expenditure on imports; $F$ represents per country fixed costs; $\tau$ is the tariff; and N is the maximum number of possible exporters. A simulation can therefore be conducted to assess: the impact of increasing fixed costs on the number of exporters for all

levels of tariffs; and the number of food commodities that are imported conditional on the tariff and the level of fixed costs.

The estimated equation becomes the logarithm of Equation (3)

$$\ln\left(M_{ij}^{k}\right) = -p\ln\tau_{i}^{k} - \sigma t_{ij}^{k} + \ln\left(\alpha_{i}^{k}\right) + \ln\left(\tau_{j}^{k}\right) + \ln\left(Y_{i}\right) + \ln\left(Y_{j}\right) - \sigma\ln\left(P_{j}^{k}\right) - \ln\Gamma_{i}^{k} - p\ln\left(P_{i}^{k}\right) \quad \textbf{(6)}$$

The Right Hand Side (RHS) variables can be replaced by constructs of both TBs and NTBs. The modified estimated equation for Regression Analysis:

$$\begin{aligned}
&\ln\left(M_{ijt}^{k}\right) = \beta_{0} + k_{k}H_{k} - p\ln\tau_{it}^{k} - \sigma t_{ijt}^{k} + \ln\left(\alpha_{it}^{k}\right) + \ln\left(\tau_{jt}^{k}\right) \\
&+ \ln\left(Y_{it}\right) + \ln\left(Y_{jt}\right) - \sigma\ln\left(P_{jt}^{k}\right) - p\ln\left(P_{it}^{k}\right) \\
&+ \beta_{1}Dis\tan ce_{ij} + \beta_{2}Border_{ij} + \beta_{3}Language_{ij} \\
&+ \delta_{1}\ln\left(TAR_{it}^{k}\right) + \delta_{2}\ln\left(TARDiv_{ijt}^{k}\right) + \delta_{3}\ln\left(TARComp_{ijt}^{k}\right) \\
&+ \sum_{l}\left[X_{l1}NTB_{il}^{k} + X_{l2}NTBDiv_{ijl}^{k} + X_{l3}NTBComp_{il}^{k}\right] \\
&+ \sum_{l}X_{l4}TAR_{it}^{k} * NTB_{il}^{k} + v_{it}
\end{aligned} \quad \textbf{(7)}$$

Where Equation (7) is explained as:

- **i.** **Line 1** includes the bilateral trade flow $M_{ij}^{k}$ between country 'i' and 'j', a constant $\beta_0$, and commodity variables $H_k$ ,average barriers imposed against all exporters on commodity *k* $\tau_i^k$ and $\tau_j^k$ by country *i* and *j* respectively, exporter-specific tariff variable $t_{ij}^k$ , $\alpha_i^k$ is the share of good 'k' in country 'i' consumption expenditure
- **ii.** **Line 2** includes GDP per capita $Y_i$ and $Y_j$ of country i and j respectively, Prices $P_j^k$ and $P_i^k$ of commodity *k* in country *j* and *i* respectively
- **iii.** **Line 3** includes country pair effects of Distance, Border and Language
- **iv.** **Line 4** includes TB variables for reduction $TAR_i^k$, diversion $TARDiv_{ij}^k$ and compression $TARComp_{ij}^k$ effects respectively
- **v.** **Line 5** includes NTB variables with 'l' covering all NTB types. For each NTB type, there are corresponding variables for reduction $NTB_{il}^k$, diversion $NTBDiv_{ijl}^k$ and compression $NTBComp_{il}^k$ effects
- **vi.** **Line 6** includes the interactive term $TAR_i^k * NTB_{il}^k$ for NTBs and TBs, Error term $v_{it}$

Since the data will be panel in nature with country and commodity specific effects, goodness of fit indicators like comparing overall $R^2$ and F/wald statistics and Hausman test were used to determine whether to adopt either a Random Effects Model, Hausman-Taylor Model or a Fixed Effects Model to analyze factors influencing bilateral imports across commodities. Some of the effects were time variant while others time invariant. The regression involved the Agri-Food Category under the ISIC Revision four (4) classifications as indicated in Appendix 1. Separate regressions on Equation (7) will be performed for each of the 19 4-digit ISIC categories as indicated in Appendix 1 for the eight (8) time periods. Each regression included observations on bilateral trade flow of the food commodities within a ISIC Revision four (4) classification.

### 3.4.3 Welfare analysis

The third objective: To determine the effect of Tariff Barriers (TBs) and Non-Tariff Barriers (NTBs) on the country specific welfare position on the production and consumption of agricultural food commodities in the East Africa Community; was analyzed following Francois and Hall (2002) who demonstrated that the Global Simulation Analysis of Industry Level Trade Policy (GSIM Model) is a partial equilibrium, multiple commodities, and multiple country trade simulation model.

The GSIM model was crafted to aid policy analysts in simulating the effects of various agricultural trade policies and instruments at both industry and country level. This simulation model was based on an Excel Solver tool and was useful in allowing for the flexibility of incorporating the study's target group of countries and commodities into the simulation equations. The GSIM model also allowed using equilibrium world market prices to solve for their impact on domestic production of commodities and trade flows. The major output of the model in the analysis of welfare effects of TBs and NTBs was the computation of Exporter gains (producer surplus), Importer gains (consumer surplus) and changes in tariff revenues.

The GSIM Model worked with linearized import demand equations alongside generic export-supply equations to reduce a large system of bilateral trade relationships to one of reduced-form global supply and demand. This reduced-form system, which includes as many equations as there are exporters, was then solved for the set of world (exporter) prices.

The GSIM model also allowed for the conversion of all TBs and NTBs into their ad valorem equivalent rates. Major assumptions of the model relevant to this study included:

i. Imports were imperfect substitutes for each other hence national product differentiation
ii. The elasticity of substitution was equal and constant across products from different sources
iii. The elasticity of demand on average was constant
iv. Import supply was also characterized by constant elasticities of supply
v. All protection measures were expressed in tariff rate equivalents
vi. A country was both an importer and exporter of the one food commodity aggregated at the 4-digit ISIC level as seen in Appendix 1

**Computation of the elasticities**

Following the assumption of weakly separability in demand theory, the model computed own and cross-price demand Elasticities. The model assumed that within each importing country ***v***, import demand within product category ***i*** of goods from country ***r,*** is a function of industry prices and total expenditure on the category:

$$M_{(i,v),r} = f\left(P_{(i,v),r}, P_{(i,v)s\neq r}, Y_{(i,v)}\right) \quad \textbf{(8)}$$

Where $Y_{(i,v)}$ is the total expenditure on imports of product category *i* in country *v*, $P_{(i,v),r}$ is the internal price for commodities from region *r* within country *v*, and $P_{(i,v)s\neq r}$ is the price of other varieties. Differentiating equation (8) while applying the Slutsky decomposition of partial demand, and the zero homogeneity property of Hicksian demand, the following was derived.

$$N_{(i,v)(r,r)} = -\sum_{s\neq r}\theta_{(i,v),s}E_s + \mu_{(i,v),(r,y)}\left(\mu_{(i,v),(y,s)} - \theta_{(i,v),r}\right) \quad \textbf{(9)}$$

Where $\theta_{(i,v),s}$ is the expenditure share, $\mu_{(i,v),(r,y)}$is the industry expenditure elasticity of demand for product category *r*, and $\mu_{(i,v),(y,s)}$ is the price *s* elasticity of industry expenditure. Derivation of equations for own-price demand elasticity yielded Equation (10)

$$N_{(i,v)(r,r)} = -\sum_{s\neq r}\theta_{(i,v),s}E_s + \mu_{(i,v)(r,y)}\left(\mu_{(i,v)(y,r)} - \theta_{(i,v),r}\right) \quad \textbf{(10)}$$

Equations (9) and (10) were further simplified following the assumption of homothetic preferences for expenditures. Aggregate expenditures were then defined in terms composite price and quantity indices. To simplify Equations (9) and (10), homotheticity of preferences implied that income$\mu_{(i,v),(r,y)} = 1$.

$$\mu_{(i,v),(y,s)} = \theta_{(i,v),s}\left(1 + E_{M,v}\right) \quad \textbf{(11)}$$

Where $E_{M,v}$ is the composite demand elasticity in region *v*

By substitution, the model arrived at the following equations:

$$N_{(i,v),(r,s)} = \theta_{(i,v),s}(E_m + E_s) \quad \textbf{(12)}$$

$$N_{(i,v)(r,r)} = \theta_{(i,v),r}E_m - \sum_{s \neq r} \theta_{(i,v),s}E_s = \theta_{(i,v),r}E_m - \left(1 - \theta_{(i,v),r}\right)E_s \quad \textbf{(13)}$$

**Computation of demand and supply conditions**

The model defined some demand and supply relationships as follows. $P^*_{i,r}$ as the export price received by exporter *r* on world markets, and $P_{(i,v),r}$ as the internal price for the same commodity within the region of EAC.

$$P_{(i,v),r} = \left(1 + t_{(i,v),r}\right)P^*_{i,r} = T_{(i,v),r}P^*_{i,r} \quad \textbf{(14)}$$

In Equation 14, $T = 1 + t$, is the power of the TBs and NTBs (the NTBs expressed in TBs equivalents). The equation represents the proportional price markup achieved by the tariff. Export supply by each country was a function of world price.

$$X_{i,r} = f\left(P^*_{i,r}\right) \quad \textbf{(15)}$$

By differentiating Equations (8), (14) and (15), and subsequent mathematical manipulations, the following equations are derived:

$$\hat{P}_{(i,v)r} = \hat{P}^*_{i,r} + \hat{T}_{(i,v),r} \quad \textbf{(16)}$$

$$\hat{X}_{i,r} = E_{X(i,r)}\hat{P}^*_{i,r} \quad \textbf{(17)}$$

$$\widehat{M}_{(i,v),r} = N_{(i,v),(r,r)}\hat{P}_{(i,v),r} + \sum_{s\neq r} N_{(i,v),(r,s)}\hat{P}_{(i,v),s} \quad \textbf{(18)}$$

Where ^ denotes a proportional change, in that $\hat{X} = \frac{dy}{x}$

**Regional equilibrium conditions**

From the above systems of equations, further substitutions are made to arrive to an executable model defined in terms of world prices. Equations (12), (13), and (16) are substituted into (18), and sum over import markets.

$$\widehat{M}_{i,r} = \sum_v \widehat{M}_{(i,v),r} = \sum_v N_{(i,v),(r,r)}\hat{P}_{(i,v),r} + \sum_v \sum_{s\neq r} N_{(i,v),(r,s)}\hat{P}_{(i,v),s} = \sum_v N_{(i,v),(r,r)}\left[P_r^* + \hat{T}_{(i,v),r}\right] + \sum_v \sum_{s\neq r} N_{(i,v),(r,s)}\left[\hat{P}_s^* + \hat{T}_{(i,v),s}\right] \quad \textbf{(19)}$$

Setting Equation (19) to be a modified version of Equation (17)

$$\widehat{M}_{i,r} = \hat{X}_{i,r} = E_{X(i,r)}\hat{P}_{i,r}^* = \sum_v N_{(i,v),(r,r)}\hat{P}_{(i,v)(r,r)}\hat{P}_{(i,v),r} + \sum_v \sum_{s\neq r} N_{(i,v),(r,s)}\hat{P}_{(i,v),s} = \sum_v N_{(i,v),(r,r)}\left[P_r^* + \hat{T}_{(i,v),r}\right] + \sum_v \sum_{s\neq r} N_{(i,v),(r,s)}\left[\hat{P}_s^* + \hat{T}_{(i,v),s}\right] \quad \textbf{(20)}$$

After solving this system for world prices, Equations (18) was used to solve backwards for export quantities, and Equation (19) to solve for import quantities. Calculations of revenue effects were then made. These were combined with partial equilibrium measures of the change in producer (exporter) surplus $\Delta PS$ and net consumer surplus $\Delta CS_{i,v}$ as crude measures of welfare effects. The measure of producer surplus approximated the difference between the export supply and the world price. The change in consumer surplus is the difference between demand and the composite commodity price.

$$\Delta PS_{(i,r)} = R_{(i,r)}^0 \cdot \hat{P}_{i,r}^* + \frac{1}{2} \cdot R_{(i,r)}^0 \cdot \hat{P}_{i,r}^* \cdot \hat{X}_{i,r} = \left(R_{(i,r)}^0 \cdot \hat{P}_{i,r}^*\right) \cdot \left[1 + \frac{E_{X(i,r)} \cdot \hat{P}_{i,r}^*}{2}\right] \quad \textbf{(21)}$$

$R_{(i,r)}^0$ Represented benchmark export revenue (bilateral or in total) valued at world prices.

$$\Delta CS_{i,v} = \left(\sum_r R_{(i,v),r}^0 \cdot T_{(i,v),r}^0\right) \cdot \left[\frac{1}{2} E_{M,(i,v)} \hat{P}_{(i,v)}^2 \cdot \sin\left(\hat{P}_{i,v}\right) - \hat{P}_{i,v}\right] \quad \textbf{(22)}$$

Where $\hat{P}_{i,v} = \sum_r \theta_{(i,v),r}\hat{P}_r^* + \hat{T}_{(i,v),r}$

In equation (22), consumer surplus was measured with respect to the composite import demand function, with $P_{i,v}$ representing the price for composite imports, and $R_{(i,v),r}^0 \cdot T_{(i,v),r}^0$ representing expenditure at internal prices within EAC. To derive the relative change in

composite good prices, quantities were defined such that the initial composite price was unity. To approximate welfare changes, the model combined the change in producer surplus, consumer surplus, and import tariff revenues.

**Trade creation and trade diversion**

Since the case of EAC was that of small economies compared to developed economies, the model found it technically feasible to link the functional relationships above to a representation of trade creation and trade diversion. The model assumed that world prices were fixed, so that price changes were simply influenced by changes in TBs and NTBs.

$$\widehat{M}_{(i,v),r} = N_{(i,v),(r,r)}\hat{P}_{(i,v),r} + \sum_{s\neq r} N_{(i,v),(r,s)}\hat{P}_{(i,v),s} = N_{(i,v),(r,r)}\hat{T}_{(i,v),r} + \sum_{s\neq r} N_{(i,v),(r,s)}\hat{T}_{(i,v),s} \quad \textbf{(23)}$$

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Decomposing Equation (23) into Trade Creation and Trade Diversion

Trade Creation: $TC_{(i,v),r} = M_{(i,v),r} \cdot \left[N_{(i,v),(r,r)}\hat{T}_{(i,v),r}\right]$ **(24)**

Trade Diversion: $TD_{(i,v),r} = M_{(i,v),r} \cdot \sum_{s\neq r} N_{(i,v),(r,s)}\hat{T}_{(i,v),s}$ **(25)**

For Equations (24) and (25), trade creation was defined as trade generated by own country tariff reductions while trade diversion as trade changes due to changes in TBs and NTBs on imports from the other countries. Trade creation and diversion are a special occurrence of the cross-price and own-price effects that constitute import demand in Equations (19) and (20).

### 3.5 Explanation of variables used in the regression analysis

$M_{ij}^{k}$ is the trade flow observation and dependent variable expressed as bilateral imports of country *i* from country *j* in US Dollars for food commodity *k*. Zero observations will not be omitted to avoid regression bias and inconsistency since the zero values could be a result of the TBs and NTBs. However, where there are zero observation due to complete absence of trade between trading partners, those observations will be dropped in this study. Complete absence of trade for a commodity between trading partners could be due to the imposition of TBs and NTBs, or also due to small or zero production and consumption levels.

From Equation (7), $-p\ln\tau_i^k - \sigma t_{ij}^k$ indicate a pair of trade barrier variables that can result from both TBs and NTBs. The average barriers imposed against all exporters $\tau_i^k$ and the exporter-specific tax variable $t_{ij}^k$ for commodity *k*.

$TAR_i^k$ Variable indicates the TBs Trade reducing effects. Its measure is a trade weighted average of the bilateral tariffs imposed by country 'i' for food commodity 'k'. It's indicative of the changes in price index of imported commodities relative to the domestic price level. The expected sign of the coefficient is negative (-) since an increase in bilateral tariffs is expected to reduce imports as consumers substitute domestic for imported commodities.

$TARDiv_{ij}^k$ Variable indicates TBs Trade diversion effect. The variable denotes the extent of divergence in the tariffs applied across countries and commodities (by country of origin) due to preferential tariff elimination. The variable is calculated as the difference between the tariff a country faces and those faced by other countries exporting the same commodity to a single importer in the region. The expected sign of the coefficient is negative (-) since a high expected tariff is expected to divert trade away from certain exporters.

$NTB_{il}^k$ Variable for NTB reduction effect is a trade weighted NTB coverage ratio for NTB type *l* imposed by country *i* on commodity *k*. Depending on domestic demand and supply elasticity, NTBs could either increase or decrease the value of trade.

The coefficient of the variable is expected to either be positive (+) or negative (-) depending on the supply and demand elasticity. When the "Quantity effect" > "Price effect", the expected sign is negative (-). When the "Price Effect" > "Quantity Effect", the expected sign is positive (+).

$NTBDiv_{ijl}^k$ Variable denotes diversion effects of NTBs where trade is diverted from exporting countries facing NTBs towards countries not facing NTBs or facing fewer NTBs. The coefficient of the variable is expected to bear a positive sign (+) and equal in magnitude to the proportion of countries covered by the NTB to exporters exempted from the NTBs.

A negative (-) sign is expected and equal to the proportion of countries exempted from NTBs to those covered by the NTBs. A positive (+) sign will indicate increase in bilateral trade flows.

Variable for food commodities $H_k$ indicates the number of products at Harmonized System (HS) 6-digit level within the ISIC Revision Four (4) of Agriculture and Food sector. This is a predictor variable to indicate the measure of product diversification for both the exporting and importing country. If the production pattern within East Africa is identical, then $\alpha_i^k$ will be similar across the countries and show only cross-ISIC classification variability.

Importer and exporter country GDPs $Y_i$ and $Y_j$ are the per capita GDPs, measuring the level of development and infrastructure necessary to perform imports and the level of development and infrastructure necessary to perform exports. The GDP per capita of the importing country could either be positive if there is high export demand or negative if there is low export demand due to economies of scale in the importing country.

To indicate country pair and fixed effects, Variables of Distance and Shared Border will be used in this study. The Distance variable factors the road distance between capital cities and is a proxy for transaction costs of trade. Shared border indicates closeness of trading partners and the possible existence of share cultures including staple foods. Table 1 presents the variables used in the regression analysis and their expected signs as explained above.

### 3.8 Description of variables

**Table 1: Description of objective 1 variables and their measurement**

| Variable | Variable description | Measurement |
|---|---|---|
| Simple Average | Simple average tariff rates of included products (in percentage) | Percent |
| Weighted Average | Weighted average tariff rates | Number |
| Min Rate | Returns the lowest tariff rate at the tariff line level within the product category (in percentage) | Percent |
| Max Rate | Returns the highest tariff value at the tariff line level within the product category (in percentage) | Percent |
| Trade Value | Value of imports of a specific product from the East Africa Community (EAC) | US Dollars (in thousand US $) |
| No. of Tariff Lines | Total number of tariff lines within the product category | Number |
| No. of Duty-free Lines | Number of tariff lines within the product category for which the rates are free | Number |
| No. of Dutiable Lines | Number of tariff lines within the product category for which the rates are in ad valorem | Number |

**Table 2: Description of objective 2 variables, their measurement and expected signs**

| Variable | Variable description | Measurement | Expected sign |
|---|---|---|---|
| **Dependent variable** | | | |
| **Trade value** | **Value of imports of a specific product from the EAC** | **US Dollars (in thousand US $)** | |
| **Independent variables** | | | |
| log_GDP_1 | GDP per capita - USD of reporting country | US Dollars | - |
| log_GDP_2 | GDP per capita - USD of partner country | US Dollars | + |
| Landlocked | Landlockness of a country | 1= Yes 0=No | - |
| Shared border | Sharing a border | 1= Yes 0=No | + |
| Official language | Official language of the country | | |
| Profit_tax_A | Profit tax percentage for partner country | 1= English_Swahili 2= French_English 3= French | +/- |
| Burden_CustProc | Burden of customs procedure for reporting country | 1=extremely inefficient to 7=extremely efficient) | + |
| Burden_CustProc_A | Burden of customs procedure for partner | 1=extremely inefficient to 7=extremely efficient) | - |
| A_No_dty_free_lines | Number of tariff lines within the product category for which the rates are free | Number | + |
| A_No_*ad-valorem* _lines | Number of tariff lines within the product category for which ad valorem equivalent | Number | + |
| A_Num_Exporters | Number of exporters | Number | + |
| A_Num_Entrants | Number of entrants | Number | - |
| A_Weighave | Weighted average tariff rates | Number | +/- |
| log_A_Value_Per_Exptr_Mean | Log of Export Value per Exporter: Mean | US Dollars | - |
| log_A_Value_PerEntra_Mn | Log of Export Value per Entrant: Mean | US Dollars | + |
| log_A_Unit_Pric_Per_Expt_Mean | Unit Price per Exporter: Mean | US Dollars | - |
| log_A_Share_Top25_Expt | Share of top 25% Exporters in Total Export Value (TEV) | Proportion | - |

# CHAPTER FOUR
# RESULTS AND DISCUSSION

This chapter presents the results of the study. The analysis uses a panel dataset of 16 years (1999-2014) of exports for eight selected agricultural food commodities traded within the East African Community (EAC) considering Kenya, Uganda, Tanzania, Burundi and Rwanda. It is divided into three sections (Section 4.1, 4.2 and 4.3). Section 4.1 presents results and discussion for objective one for the proportion of Tariff Barriers (TBs) and Non-Tariff Barriers (NTBs) applied by each EAC country to each other for all the ten selected commodities. Section 4.2 presents results and discussion for objective two for the effect of Tariff Barriers (TBs) and Non-Tariff Barriers (NTBs) on trade in agricultural food commodities in the East Africa Community. Section 4.3 presents results and discussion for objective three for the effects of Tariff Barriers (TBs) and Non-Tariff Barriers (NTBs) on the country specific welfare position in production and consumption of agricultural food commodities in the East Africa Community (EAC). Within the results and discussion, the first acronym of the countries involved (for example KEN_UGA), represents the importing country while the second acronym is the exporter for example, KEN_UGA implies Kenya imported from Uganda.

## 4.1 Proportion of Tariff Barriers (TBs) applied by each EAC country to each other for all the agricultural food commodities

### 4.1.1 Proportion of Tariff Barriers (TBs) for EAC countries in relation to each other

**Live animals**

Live animals are some of the most traded commodities in Eastern Africa. The average percentage of tariff rates across countries varied from 0.25% (Uganda to Rwanda) to 12.5% (Rwanda to Tanzania) (**Error! Reference source not found.**). The tariff rates are different from one country to another and this influences the number of live animals traded. As a result, the trade value of the commodity varies from USD 1,590 (Rwanda to Tanzania) to USD 1,137,854 (Uganda to Rwanda). This implies that the Rwanda took advantage of the demand in Uganda and imposed a higher tariff rate resulting in high revenues. The average tariff rates for imports to Burundi were approximately 5% depending on the source country (that is, Burundi – Kenya = 5.667% and Burundi - Uganda = 4.417%). Burundi had the highest imports of live animals from Uganda (USD 464,888) which could be influenced by bilateral trade agreements between the two countries where Burundi further opened its

borders from the year 2010 to allow free movement of its products between Burundi and Uganda through Rwanda after Burundi joined the EAC in the year 2007 and the move to liberalize trade in line with the Common Market for Eastern and Southern Africa (COMESA) free trade area.

**Table 3: The level tariff barriers and trade value of live animals among EAC countries (1999-2014)**

| | Simple Average *(tariff rate)- (in percentage)* | Trade Value *(in thousand USD)* | No. of Tariff Lines | No. of Duty-free Lines | No. of Dutiable *(ad valorem)* Lines |
|---|---|---|---|---|---|
| BDI_KEN | 5.667 | 9.111 | 2.444 | 1.556 | 0.444 |
| BDI_RWA | | 18.433 | 3.000 | 3.000 | |
| BDI_TZA | | 4.720 | 1.000 | 1.000 | |
| BDI_UGA | 4.417 | 464.888 | 4.083 | 2.667 | 0.500 |
| KEN_RWA | | 0.097 | 1.000 | 1.000 | |
| KEN_TZA | 1.364 | 39.811 | 3.818 | 3.545 | 0.273 |
| KEN_UGA | 2.308 | 12.519 | 3.231 | 2.846 | 0.385 |
| RWA_KEN | | 3.374 | 2.500 | 2.500 | |
| RWA_TZA | 5.000 | 0.389 | 1.000 | | 1.000 |
| RWA_UGA | 0.250 | 1,137.854 | 8.750 | 7.125 | 0.500 |
| TZA_BDI | | | | | |
| TZA_KEN | 2.595 | 521.573 | 9.083 | 7.083 | 0.500 |
| TZA_RWA | 12.500 | 1.590 | 1.000 | 0.500 | 0.500 |
| TZA_UGA | 2.500 | 23.337 | 2.333 | 2.167 | 0.167 |
| UGA_BDI | | 27.785 | 1.000 | 1.000 | |
| UGA_KEN | 1.480 | 247.384 | 8.000 | 6.000 | 0.333 |
| UGA_RWA | 0.500 | 4.168 | 1.600 | 1.400 | 0.200 |
| UGA_TZA | 1.600 | 5.934 | 1.900 | 1.500 | 0.400 |

**Key:** No. – Number, BDI – Burundi, RWA – Rwanda, KEN – Kenya, TZA – Tanzania, UGA – Uganda

Similarly, Rwanda imported animals mostly from Uganda and had the lowest tariff rates in the whole region. On the other hand, there were minimal live animal imports from Eastern African countries to Kenya despite the slightly low tariff rates of about 2%. Tanzania used high tariff rates (12.5%) to bar live animal imports from Rwanda. However, the country has low tariff rates of about 2.5% between other countries which led to high import from Kenya (USD 521,573). Further, Uganda had some of the lowest tariff rates ranging between 0.5% to 1.6% and the largest live animal business partner was Kenya.

The trade between the countries was further influenced by the number of duty-free tariff lines within the product category. All countries had at least one tariff line with its trading partners, but the lines were highest between Tanzania and Kenya, Uganda and Kenya and Rwanda and Uganda. As a result, the countries with high number of duty-free tariff lines registered the highest live animal imports. This was further reflected by the number of duty-free lines which were also highest in these countries. The results also reveal that the average number of lines with *ad-valorem* rates (No. of dutiable lines in Table 3) was at least one in several years.

*Ad-valorem* refers to the tariff imposed on the goods imported based on the value of the commodities. Tariffs are generally known to have a varying impact on different stakeholders involved in the international trade. This includes the importing country consumers and producers and the exporting country producers and consumers. The *ad-valorem* rates was highest between Rwanda and Tanzania (1.000). In addition, the countries experienced a low trade value of about USD 389 as compared to other countries with a low tariff rates. This implies that because of the high tariffs, consumers of the product in the importing country (Rwanda) experienced reduced well-being because of the trade tariff. Besides, the rise in price of both domestic and imported goods reduces amount of consumer surplus in the market. Nonetheless, producers of substitute products in Rwanda (importing country) may experience an increase in well-being as result of the trade tariff. However, the public (consumers) who are most adversely by the tariffs, will purchase relatively lesser imported goods, an issue that explains the low rate of importation of live animals into Rwanda as shown in Table 3. Overall, Rwanda is the highest importer of live animals followed by Tanzania, Burundi, Uganda and finally Kenya from the Eastern Africa region. Moreover, Uganda is the largest exporter of live animals in the region with most exports going to Burundi and Rwanda.

**Meat and edible meat offal**

The importation of meat and edible meat offal has been increasing in the Eastern Africa economic region with Tanzania being the largest importer of the product followed by Uganda, Burundi, Rwanda and Kenya. Kenya is however the largest exporter of meat and edible meat offal in the region with the highest exports going to Tanzania and Uganda (Table 4). This could be attributed to Kenya's climatic condition favoring beef production. The tariff rates for the product varied from 0.4% (Uganda to Rwanda) to 6% (Tanzania to Uganda). However, the largest imports were to Tanzania's from Kenya (USD 2,706,823) despite the

tariff rates of approximately 3% which is considerably high. Burundi mainly imports meat and edible meat offal from Uganda at tariff rates of (4%) while Rwanda and Uganda import from Kenya at rates of (1.5% and 2%) respectively. The results further reveal that across the years of 1999-2014, Tanzania-Kenya had on average the highest number of tariff lines (13) where 9 were duty-free lines while Rwanda-Uganda and Uganda-Kenya had approximately 6 tariff lines. The tariff lines are high in between Kenya which is the exporting country and the partner country, Tanzania, with the highest imports.

From Table 4, it is evident most of the tariff lines Tanzania had imposed on Kenya when importing meat and edible meat offal were duty-free (on average 9). Duty-free tariff lines are meant to increase trade between the countries. This attracted huge trade volumes of meat and edible meat offal from Kenya to Tanzania making the traded value the highest in the region USD 2,706,823. Moreover, imposing trade barriers on the commodity implies that Tanzania was protecting meat producers from cheap meat products from Kenya. However, the huge trade value indicates a scarcity of the commodity in Tanzania, hence Kenya was still getting market

**Table 4: Averages of tariff barriers and trade value of meat and edible meat offal averages (1999-2014)**

| | Simple Average *(tariff rate)- (in percentage)* | Trade Value *(in thousand USD)* | No. of Tariff Lines | No. of Duty-free Lines | No. of Dutiable (*ad valorem)* Lines |
|---|---|---|---|---|---|
| BDI_KEN | | | | | |
| BDI_RWA | | 2.122 | 2.000 | 2.000 | |
| BDI_TZA | | | | | |
| BDI_UGA | 4.111 | 139.824 | 3.778 | 1.444 | 0.444 |
| KEN_TZA | | 0.189 | 1.000 | 1.000 | |
| KEN_UGA | | 4.235 | 2.000 | 2.000 | |
| RWA_BDI | | | | | |
| RWA_KEN | 1.500 | 64.972 | 4.500 | 4.200 | 0.100 |
| RWA_TZA | | 0.838 | 1.000 | 1.000 | |
| RWA_UGA | 0.429 | 4.176 | 6.000 | 5.000 | 0.143 |
| TZA_KEN | 2.821 | 2,706.823 | 13.083 | 9.083 | 0.417 |
| TZA_UGA | | 186.678 | 3.000 | 3.000 | |
| UGA_KEN | 2.000 | 354.150 | 6.133 | 3.133 | 0.333 |
| UGA_RWA | | | | | |
| UGA_TZA | 6.000 | 1.706 | 1.000 | | 1.000 |

**Key:** No. – Number, BDI – Burundi, RWA – Rwanda, KEN – Kenya, TZA – Tanzania, UGA – Uganda

**Fish and crustaceans, molluscs and other aquatic invertebrates**

Rwanda was the largest importer of fish among Eastern African countries between 1999 and 2014 attributed to its landlocked status and the lack of large water bodies for fishing (

Table 5). Further, most of fish in the region was exported by Tanzania which could be attributed to the access to large water bodies for fishing including Lakes Tanganyika and Victoria as well as the Indian Ocean. Another major factor that could have influenced the high exports from Tanzania is its centrality to the importing countries since it shares a border with the largest importers among them Rwanda and Kenya. The importation of fish by Kenya could be influenced by large populations demanding the product and lack of self-sufficiency. It is approximated Kenya consumed 195,206 tonnes of freshwater fish in 2014 and imports approximately 5,900 tonnes annually (Farm Africa, 2016). The tariff rates between the countries varied from 0.7% to 8%. The tariff rates for fish products between countries were relatively higher compared to those of meat products. Burundi imposed the highest rates (8%) for fish imports from Kenya and a lower rate (4.7%) from Uganda. Tanzania seemed to protect its fish industry by slapping a 6.25% tariff on Uganda which was relatively higher than the 2% Uganda charged Tanzania. This effectively discouraged fish flow from Uganda. However, Tanzania imposed lower rates on fish from Kenya (2.68%) which were relatively low as compared to 5.36% by Kenya from Tanzania. Notwithstanding, the high demand of fish from Kenya encouraged their importation by Tanzania.

Rwanda-Uganda had the highest number of tariff lines (22) among them 18 were duty-free which implied a large flow of fish to Rwanda. Further, Rwanda had 10 tariff lines from Kenya all of which were free and yet the country registered low imports from Kenya probably because of the perishability of fish and the long distance between the two countries.

A similar scenario of all duty-free tariff lines on fish products was between Burundi and Rwanda which also recorded low imports. This could be attributed to low quantity of fish in Rwanda since the geographical distance between the countries is relatively shorter compared to countries like Kenya. At least 75% of all tariff line across the Eastern African countries on fish, crustaceans, molluscs and other aquatic invertebrates' imports were duty-free.

However, Table 5 also reveals a different scenario, where there is a high demand of fish from Tanzania in Kenya (USD 864,325) compared to those from Uganda (USD 223,860) despite the lower tariff rates from Uganda (3%) compared to 5% in Tanzania. This could be attributed to customer preferences and probably unaccounted fish captured and sold by fishermen from both countries on Lake Victoria which is a shared water body.

**Table 5: Averages of tariff barriers and trade value of fish and crustaceans, molluscs and other aquatic invertebrates averages (1999-2014)**

| | Simple Average *(tariff rate)- (in percentage)* | Trade Value *(in thousand USD)* | No. of Tariff Lines | No. of Duty-free Lines | No. of Dutiable (*ad valorem)* Lines |
|---|---|---|---|---|---|
| BDI_KEN | 8.000 | 0.554 | 1.000 | | 1.000 |
| BDI_RWA | | 4.973 | 1.600 | 1.600 | |
| BDI_TZA | 5.000 | 140.944 | 4.000 | 3.556 | 0.444 |
| BDI_UGA | 4.727 | 33.511 | 5.182 | 4.727 | 0.455 |
| KEN_TZA | 5.357 | 864.325 | 7.214 | 5.143 | 0.357 |
| KEN_UGA | 2.500 | 223.860 | 5.917 | 5.500 | 0.167 |
| RWA_BDI | | 116.734 | 8.571 | 8.571 | |
| RWA_KEN | | 51.406 | 10.000 | 10.000 | |
| RWA_TZA | 3.444 | 3,044.380 | 9.778 | 7.889 | 0.333 |
| RWA_UGA | 0.738 | 1,608.529 | 21.500 | 18.125 | 0.375 |
| TZA_KEN | 2.681 | 64.991 | 3.917 | 3.000 | 0.333 |
| TZA_UGA | 6.250 | 2.967 | 1.250 | 1.000 | 0.250 |
| UGA_KEN | 2.000 | 238.959 | 10.933 | 8.867 | 0.333 |
| UGA_RWA | 6.000 | 0.130 | 1.000 | | 1.000 |
| UGA_TZA | 2.000 | 255.510 | 10.133 | 7.400 | 0.333 |

**Key:** No. – Number, BDI – Burundi, RWA – Rwanda, KEN – Kenya, TZA – Tanzania, UGA – Uganda

**Dairy produce, birds' eggs, natural honey, edible products of animal origin, not elsewhere specified or included**

Kenya was both the largest importer and exporter of the dairy produce, eggs and honey in East Africa region between 1999 and 2014 (

Table 6). Kenya also had the highest tariff rates (20%) specifically against Tanzania on the import of the dairy produce, eggs and natural honey. Since it produces similar products, such rates become necessary to protect its local industry. A similar pattern was observed for trade between Burundi and Uganda where the latter imposed high rates (12%) on dairy produce, eggs and honey from Burundi with the intention of reducing their entry and protection of its local industry. The rest of the region had varying tariff rates ranging from 0.5% to 12%

The results also reveal that the number of tariff lines varied across the countries ranging from 2 to 18 lines. However, majority of these tariffs were duty-free lines with each country having an occasional *ad valorem* line with the trading partners.

**Table 6: Averages of tariff barriers and trade value of dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included averages (1999-2014)**

| | Simple Average *(tariff rate)- (in percentage)* | Trade Value *(in thousand USD)* | No. of Tariff Lines | No. of Duty-free Lines | No. of Dutiable (*ad valorem)* Lines |
|---|---|---|---|---|---|
| BDI_KEN | 5.000 | 521.019 | 6.571 | 4.571 | 0.571 |
| BDI_RWA | 2.000 | 24.605 | 2.250 | 2.000 | 0.250 |
| BDI_TZA | 2.000 | 6.552 | 5.000 | 3.600 | 0.600 |
| BDI_UGA | 3.700 | 229.047 | 11.300 | 8.000 | 0.800 |
| KEN_TZA | 20.243 | 90.736 | 2.385 | 1.462 | 0.154 |
| KEN_UGA | 9.589 | 5,197.310 | 5.800 | 5.067 | 0.400 |
| RWA_BDI | | 4.119 | 8.125 | 8.125 | |
| RWA_KEN | 2.615 | 89.464 | 10.385 | 9.462 | 0.308 |
| RWA_TZA | 6.600 | 247.975 | 3.500 | 2.200 | 0.500 |
| RWA_UGA | 2.100 | 541.267 | 12.308 | 9.077 | 0.615 |
| TZA_KEN | 5.384 | 2,991.379 | 15.750 | 10.083 | 0.833 |
| TZA_RWA | | | | | |
| TZA_UGA | 0.500 | 331.167 | 6.100 | 6.000 | 0.100 |
| UGA_BDI | 12.000 | 17.511 | 1.000 | | 1.000 |
| UGA_KEN | 3.305 | 1,859.160 | 18.600 | 8.400 | 0.867 |
| UGA_RWA | 2.400 | 1.509 | 1.800 | 1.400 | 0.400 |
| UGA_TZA | 0.545 | 12.368 | 2.455 | 2.364 | 0.091 |

**Key:** No. – Number, BDI – Burundi, RWA – Rwanda, KEN – Kenya, TZA – Tanzania, UGA – Uganda

**Edible vegetables and certain roots and tubers**

Kenya and Rwanda were the leading importers of edible vegetables in the East Africa region in the years of 1999 to 2014 (Table 7). This could be because of demand that the local production could not meet. The results reveal that Uganda is the main exporter of edible vegetables in EAC which could be attributed to the favorable environmental conditions. Contrary, it was evident that Kenya despite being a net importer, it imposed the highest tariff rates of about 10% which could be meant to protect the local vegetable sector. Burundi also had high tariff rates of between 4% and 12%. The rest of the countries that is Tanzania, Uganda and Rwanda had low import tariff rates for edible vegetables ranging from 0.4% to 2.5%. Countries with few *ad valorem* lines for edible vegetables and certain roots and tubers like Kenya attracted huge imports from her trade partners like Uganda (0.333) and Tanzania (0.357) at USD 5,472,149 and 2,462,069. The trade values are relatively high compared a country like Burundi whose traded value with Kenya was USD 5,484 but with higher average *ad valorem* of 1.333.

The low *ad valorem* from Kenya to her trading partners could imply a move to attract more imports given a high local demand and lack of self-sufficiency. This could be because of a high demand for green vegetables in Kenya, a country where *ugali,* whose accompaniment is mainly vegetables, is one of the main staple foods. Kenya's vegetable products Import Dependency Ratio (IDR) rose from 26% in 2013 to 46.9% in 2017 attributable to a rise in imports due to food deficits experienced in the country (KNBS 2018). This is despite the rise in value of locally produced and marketed vegetables from USD 229,233,000 in 2013 to 240,646,000 in 2017 (KNBS, 2018).

**Table 7: Averages of tariff barriers and trade value of edible vegetables and certain roots and tubers averages (1999-2014).**

| | Simple Average *(tariff rate)- (in percentage)* | Trade Value *(in thousand USD)* | No. of Tariff Lines | No. of Duty-free Lines | No. of Dutiable (*ad valorem)* Lines |
|---|---|---|---|---|---|
| BDI_KEN | 11.667 | 5.484 | 1.667 | 0.333 | 1.333 |
| BDI_RWA | 4.375 | 871.087 | 10.375 | 9.375 | 0.500 |
| BDI_TZA | 5.182 | 315.502 | 5.000 | 2.909 | 0.909 |
| BDI_UGA | 4.083 | 239.961 | 7.667 | 5.417 | 0.833 |
| KEN_RWA | | 0.010 | 1.000 | 1.000 | |
| KEN_TZA | 10.357 | 2,462.069 | 9.786 | 7.571 | 0.357 |
| KEN_UGA | 9.667 | 5,472.149 | 6.600 | 4.667 | 0.333 |
| RWA_BDI | | 389.458 | 20.571 | 20.571 | 0.615 |
| RWA_KEN | 0.923 | 1,179.386 | 15.538 | 14.077 | 0.556 |
| RWA_TZA | 1.302 | 740.568 | 12.222 | 9.667 | 0.667 |
| RWA_UGA | 0.796 | 1,761.633 | 32.222 | 25.111 | |
| TZA_KEN | 2.526 | 311.278 | 9.750 | 8.750 | 0.333 |
| TZA_RWA | | 68.708 | 3.200 | 3.200 | |
| TZA_UGA | 0.400 | 373.736 | 3.700 | 3.200 | 0.100 |
| UGA_BDI | | | | | |
| UGA_KEN | 2.000 | 480.516 | 28.267 | 18.600 | 0.333 |
| UGA_RWA | 1.778 | 58.781 | 2.444 | 1.778 | 0.333 |
| UGA_TZA | 2.000 | 356.679 | 6.800 | 5.467 | 0.333 |

**Key:** No. – Number, BDI – Burundi, RWA – Rwanda, KEN – Kenya, TZA – Tanzania, UGA – Uganda

The tariff lines in the East Africa region for edible vegetables ranged from 2 to 32 varying from one country to another but Rwanda had the highest number of import tariff lines. Moreover, the highest proportion of the tariff line for edible vegetables were duty-free as evidenced in the results.

**Edible fruits and nuts, peel of citrus fruit or melons**

The largest importer of edible fruits and nuts in the EAC between 1999 and 2014 was Rwanda while the largest exporter was Tanzania (Table 8). Tanzania's agro-ecological environment has allowed for a well-established fruit production system while Rwanda has high demand for the products. However, to protect the local fruit production in Kenya, high tariff rates were imposed on Tanzania (5.7%). The rest of the region had tariff rates ranging from 0.25% and 2.5%.

It is also evident from the results (Table 8) that Rwanda has high imports of edible fruits, nuts, peel of citrus or melons which could be explained by the low tariff rates (less than 1%) to encourage importation of the commodity to the country. The number of tariff lines for the trade commodities in the region ranged from 1 to 32. However, most of the tariff lines are duty-free with a few *ad valorem* lines across the period. This indicates a relatively liberalized trade of edible fruits, nuts, peel of citrus or melons across the EAC region probably because all the countries produce the products and mainly export surplus or import to meet deficits.

**Table 8: Averages of tariff barriers and trade value of edible fruit and nuts; peel of citrus fruit or melons averages (1999-2014)**

| | Simple Average *(tariff rate)- (in percentage)* | Trade Value *(in thousand USD)* | No. of Tariff Lines | No. of Duty-free Lines | No. of Dutiable (*ad valorem)* Lines |
|---|---|---|---|---|---|
| BDI_RWA | | 0.047 | 1.000 | 1.000 | |
| BDI_UGA | | 0.162 | 1.000 | 1.000 | |
| KEN_RWA | | 0.983 | 1.000 | | 1.000 |
| KEN_TZA | 5.705 | 645.619 | 6.538 | 5.615 | 0.538 |
| KEN_UGA | | 282.980 | 8.286 | 8.286 | |
| RWA_BDI | | 261.211 | 12.000 | 12.000 | |
| RWA_KEN | | 66.411 | 19.875 | 19.875 | |
| RWA_TZA | 0.714 | 361.961 | 7.857 | 7.000 | 0.286 |
| RWA_UGA | 0.250 | 521.792 | 24.750 | 20.250 | 0.500 |
| TZA_KEN | 2.546 | 433.857 | 8.250 | 7.333 | 0.250 |
| TZA_RWA | | | | | |
| TZA_UGA | | 3.507 | 1.000 | 1.000 | |
| UGA_BDI | | 3.282 | 1.000 | 1.000 | |
| UGA_KEN | 2.000 | 299.696 | 32.667 | 21.000 | 0.333 |
| UGA_RWA | 2.000 | 8.758 | 1.333 | 0.667 | 0.333 |
| UGA_TZA | 1.091 | 36.378 | 3.273 | 3.000 | 0.182 |

**Key:** No. – Number, BDI – Burundi, RWA – Rwanda, KEN – Kenya, TZA – Tanzania, UGA – Uganda

**Coffee, tea, mate and spices**

Kenya is the largest importer of coffee, tea, mate (a wild shrub for flavoring tea) and spices from other Eastern Africa countries. The significance of tea and coffee is because the country hosts the largest auction house for these commodities in Africa (Table 9). This makes EAC countries particularly Uganda and Rwanda which produce large quantities of coffee and tea to transport it to the Mombasa (Kenya) auction for sale. The results also reveal that Kenya is the largest exporter of coffee, tea, mate and spices across EAC which is attributed to its reputable high-quality coffee and tea in the world. Tea and coffee accounted 4% and 30% of Kenya's recorded total marketed agricultural products (USD 4,469,212,000) in 2017 (KNBS, 2018). However, majority of imports of the products to countries such as Rwanda from Burundi and Uganda from Rwanda could be on transit to the port of Mombasa.

**Table 9: Averages of tariff barriers and trade value of coffee, tea, maté and spices averages (1999-2014)**

| | Simple Average *(tariff rate)- (in percentage)* | Trade Value *(in thousand USD)* | No. of Tariff Lines | No. of Duty-free Lines | No. of Dutiable (*ad valorem)* Lines |
|---|---|---|---|---|---|
| BDI_KEN | 5.000 | 13.752 | 2.429 | 1.571 | 0.286 |
| BDI_RWA | 8.750 | 0.508 | 1.000 | 0.500 | 0.500 |
| BDI_TZA | 2.000 | 0.328 | 2.200 | 1.800 | 0.400 |
| BDI_UGA | 4.000 | 2.045 | 2.000 | 1.444 | 0.556 |
| KEN_BDI | | 431.132 | 1.667 | 1.667 | 0.167 |
| KEN_RWA | 2.500 | 19,261.211 | 2.000 | 1.833 | 1.846 |
| KEN_TZA | 4.615 | 2112.866 | 6.615 | 4.308 | 1.286 |
| KEN_UGA | 4.286 | 17,995.786 | 4.857 | 3.214 | 0.462 |
| RWA_BDI | | 530.086 | 12.429 | 12.429 | 0.143 |
| RWA_KEN | 3.013 | 52.882 | 8.923 | 8.077 | 1.091 |
| RWA_TZA | 0.714 | 1.527 | 2.000 | 1.857 | |
| RWA_UGA | 1.439 | 112.585 | 12.909 | 9.545 | |
| TZA_KEN | 2.804 | 296.722 | 8.917 | 7.583 | 0.500 |
| TZA_RWA | | 0.760 | 1.000 | 1.000 | |
| TZA_UGA | 0.500 | 3.410 | 1.600 | 1.500 | 0.100 |
| UGA_BDI | 1.250 | 210.726 | 1.250 | 1.000 | 0.250 |
| UGA_KEN | 1.723 | 1,609.324 | 19.933 | 11.600 | 0.600 |
| UGA_RWA | 1.250 | 518.637 | 1.625 | 1.375 | 0.250 |
| UGA_TZA | 0.923 | 251.534 | 5.231 | 4.692 | 0.231 |

**Key:** No. – Number, BDI – Burundi, RWA – Rwanda, KEN – Kenya, TZA – Tanzania, UGA – Uganda

Most of tariff rates ranged from between 0.7% to 5% across EAC countries apart from Burundi-Rwanda which had the highest rate of 8.75%. Further, the numbers of tariff lines varied across countries ranging from 1 to 20 (Uganda from Kenya). Most countries have at least one *ad valorem* lines with some (Kenya-Rwanda and Kenya-Tanzania) having approximately two *ad valorem* lines. The low tariffs suggest that the countries were keen in increasing trade value in these commodities between each other especially to they are auctioned.

**Cereals**

Cereals are some of the most traded commodities in the EAC because they are a basic ingredient is the staple foods (Table 10). Kenya is the largest importer of the cereals like maize rice and wheat in the region which could be because a large population and the decreasing productivity of cereals in Kenya which could be attributed to climate change. For example, between 1999 and 2014 maize produced in Kenya increased from 2,250,000 tonnes to 3,510,000 tonnes a 56% increase but the imports rose from 73,500 tonnes to 458,900 tonnes a 524% increase (KNBS 2004; KNBS, 2018). The tariff rates for cereals are highest between Kenya and Tanzania with an average of 30.57% which could be attributed to Kenyan government attempts to protect the local cereals sector. However, they had little effect on imports. In a review of maize policies in Kenya, Mulinge and Witwer (2012) argue that there were no significant import tariffs or non-tariff trade measures that directly affected cereals imports from Uganda and Tanzania between 2005-2007 and 2010. The results further reveal Uganda to be the largest exporter of cereals in the region which could be because of favorable weather and high productivity of cereals in the country. Uganda's high productivity for cereals can be indicated by its maize yield which averaged 24.43 - 100kg bags per hectare between 2011-2017 while Kenya's averaged 16.35 - 100kg bags per hectare over the same period (FAOStat, 2018). It is also evident that Burundi, Rwanda and Kenya rely heavily on Tanzania and Uganda for cereals. This could be because of the low tariff rates for cereals in EAC region which ranged between 0.3% (Tanzania from Uganda) to 7% (Kenya from Uganda) except for high rates of 30% and 25% between Kenya-Tanzania and Tanzania-Burundi respectively. The relatively higher tariff rates faced by Uganda and Tanzania could be because cereal imports from these countries to Kenya have been subject to a 2.75% inspection fee according to conditions set in an agreement in the EAC since 2005 (Mulinge and Witwer, 2012).

The cereals tariff lines are highest between Uganda and Kenya (14.2) among them 10 being duty-free lines. The results further reveal that despite their existence, most of the tariff lines (approximately 75%) are duty-free line with at least one *ad valorem* line between all the EAC countries. Further, all cereal tariff line between Kenya-Rwanda and Rwanda-Burundi are duty-free lines. This could be because Kenya faces a growing deficit in maize production, which is a staple cereal, which is mostly met through importing duty-free maize from her neighbors like Uganda and Tanzania at prices below the world market prices (Mulinge and Witwer (2012).

**Table 10: Averages of tariff barriers and trade value of cereals averages (1999-2014)**

| | Simple Average *(tariff rate)- (in percentage)* | Trade Value *(in thousand USD)* | No. of Tariff Lines | No. of Duty-free Lines | No. of Dutiable (*ad valorem)* Lines |
|---|---|---|---|---|---|
| BDI_KEN | 1.250 | 16.139 | 2.500 | 2.000 | 0.500 |
| BDI_RWA | 3.889 | 221.756 | 2.111 | 1.667 | 0.222 |
| BDI_TZA | 5.303 | 1,999.878 | 7.455 | 4.727 | 0.909 |
| BDI_UGA | 3.583 | 3,501.658 | 3.667 | 2.083 | 0.667 |
| KEN_RWA | | 457.997 | 1.000 | 1.000 | |
| KEN_TZA | 30.570 | 5,114.481 | 8.286 | 6.357 | 0.357 |
| KEN_UGA | 7.055 | 7,385.412 | 8.133 | 6.067 | 0.333 |
| RWA_BDI | | 61.804 | 7.750 | 7.750 | |
| RWA_KEN | 1.596 | 821.177 | 5.692 | 4.769 | 0.538 |
| RWA_TZA | 5.837 | 3,697.612 | 6.615 | 4.000 | 0.923 |
| RWA_UGA | 2.179 | 3,817.760 | 6.769 | 4.308 | 0.615 |
| TZA_BDI | 25.000 | 0.662 | 1.000 | | 1.000 |
| TZA_KEN | 1.278 | 1,311.555 | 5.583 | 5.167 | 0.167 |
| TZA_UGA | 0.303 | 6,489.409 | 4.636 | 4.364 | 0.091 |
| UGA_BDI | 1.719 | 45.397 | 2.000 | 2.000 | |
| UGA_KEN | | 2,576.030 | 14.200 | 9.867 | 0.600 |
| UGA_RWA | 1.556 | 36.088 | 2.333 | 1.667 | 0.667 |
| UGA_TZA | 1.322 | 3,427.589 | 6.467 | 5.267 | 0.333 |

**Key:** No. – Number, BDI – Burundi, RWA – Rwanda, KEN – Kenya, TZA – Tanzania, UGA – Uganda

### 4.1.2 Proportion of Non-Tariff Barriers (NTBs), GDP and Profit after tax for EAC countries in relation to each other

The proportion of Non-Tariff Barriers (NTBs) was measured in the form of the Burden of Custom Procedures for both the importers and exporters within the EAC (Table 11). It was evident from the results that Rwanda had the highest burden custom procedures as compared to the rest of the countries in the region. That is, while all countries custom burdens ranged between three and four, Rwanda's were between five and six. This tends to influence the amount of trade since most traders will be motivated to exchange with countries where burdens are less.

In addition to measuring the proportion of NTBs in the form of the burden of custom procedures, Table 11 recorded the measures of GDP and profit after tax for each country to another. The GDP was a measure of the importing and exporting capacities of each country hence reflect the purchasing power or sales power. The countries' GDP were measured in thousands of US Dollars. The results revealed that Kenya had the highest GDP in the region while Burundi had the least (Table 11). This means that the purchasing power of Kenya was higher than that of the other countries in the region while that of Burundi was the lowest and this could influence the level of trade in the region.

There were differences in the proportions of average profit after tax in each country. While Burundi had the highest profit levels in all countries, Rwanda and Uganda had the lowest. This could be because, Burundi having the lowest GDP might have a low value of agricultural inputs as compared to the other countries which implies that assuming same commodity prices are charged across the region, then they would experience the highest levels of profits. This is also considering that EAC countries have a standard Value Added Tax (VAT) rate of 18% except Kenya which has a tax rate of 16% (East African Community [EAC], 2018).

On the other hand, the profit after tax proportions for the other countries ranged between 35.39% to 46.39%. The results also imply that while Burundi traders may be making supernormal profits after export of agricultural produce, the other countries may be making relatively normal profits. Burundi's high profits after tax of both imported and exported commodities could be due to low tax rates for the traded products compared to her trading partners.

East African Community (2018), points out that unlike other EAC countries, Burundi only charges a 10% tax on imported food products and processed agricultural goods transformed in Burundi and agricultural inputs and 0% on exports and international transport. Further, Burundi specifies that agricultural and livestock products are exempted from VAT when sold by owners and not withstanding turnover thresholds.

**Table 11: The level non-tariff barriers, gross domestic product and profit after tax among EAC countries (1999-2014)**

| Country | GDP Importer | GDP Exporter | Profit After Tax Importer | Profit After Tax Exporter | Burden Custom Procedures Importer | Burden Custom Procedures Exporter |
|---|---|---|---|---|---|---|
| BDI_KEN | 174.382 | 772.262 | 173.440 | 46.390 | . | 3.368 |
| BDI_RWA | 174.382 | 409.397 | 109.915 | 61.618 | 3.368 | 3.928 |
| KEN_UGA | 772.262 | 432.850 | 46.390 | 35.390 | 3.368 | 3.750 |
| RWA_BDI | 409.397 | 174.382 | 36.130 | 173.440 | 5.262 | . |
| RWA_KEN | 409.397 | 772.262 | 36.130 | 45.350 | 5.262 | 3.368 |
| RWA_UGA | 409.397 | 432.850 | 36.130 | 35.390 | 5.262 | 3.750 |
| TZA_BDI | 527.654 | 174.382 | 42.526 | 92.958 | 3.296 | 3.965 |
| UGA_KEN | 432.850 | 772.262 | 35.390 | 46.390 | 3.750 | 3.368 |
| UGA_RWA | 432.850 | 409.397 | 35.390 | 36.130 | 3.750 | 5.262 |
| UGA_TZA | 432.850 | 527.654 | 35.390 | 44.310 | 3.750 | 3.182 |
| Total | 468.049 | 468.049 | 67.132 | 67.132 | 3.749 | 3.791 |

**Key:** BDI – Burundi, RWA – Rwanda, KEN – Kenya, TZA – Tanzania, UGA – Uganda

### 4.2 Effects of Tariff Barriers (TBs) and Non-Tariff Barriers (NTBs) on trade

This section presents results of objective two for the effects of Tariff Barriers (TBs) and Non-Tariff Barriers (NTBs) on trade in food commodities. Three estimation techniques namely the Fixed-effects (FE), Random Effects (RE) Generalized Least Square (GLS) regression and Hausman- Taylor Model were used and their results presented from Table 12 to Table 20. Mundlak model based on random effects was also estimated however the results were like those of the RE-GLS regression hence it was dropped and the RE-GLS regression was retained and displayed in the tables.

The results show that there were similarities in the results across the models both in the significance and magnitude of the coefficients. This shows that none of the models was subject to severe bias. However, based on the data characteristics and ability of the models to address assumption violations, the FE and Hausman-Taylor estimators were considered unreliable while the RE-GLS regression estimators were most preferable. This is confirmed by the highly significant F/Wald statistics across all the RE model results indicating a strong joint significance of the variables whereas the FE and Hausman-Taylor had a number of insignificant variables. Additionally, the RE reported a relatively higher goodness of fit measured by $R^2$ across all commodities compared to the FE. The results reported are from the RE-GLS regression.

The log of the trade value of exported commodities was used as the dependent variable across all the models. In the Hausman- Taylor estimators the log of the gross domestic product (GDP) of an importing country was treated as the time-variant exogenous variable, while the log of the exporting country, profit after tax, burden of customs procedure, number of duty-free tariff lines, number of *ad valorem* lines, log of unit price per exporter mean, log of export value per exporter or exiting or entrant mean and weighted average tariff rates were treated as time-variant endogenous variables and finally landlocked, sharing a common border, a country's official language, were treated as time-invariant endogenous variables.

The three models were chosen due to their ability to capture effects of different variables across time. Additionally, all the models accepted time-invariant variables and still account for individual time-varying factors within the partner countries. The choice of the three models was informed by literature.

**Live animals**

Table 12 Random Effects (RE) results show that the (GDP) of the importing country had a significant negative influence on the number of live animals imported within EAC, yielding an elasticity of approximately -2.5. The higher the GDP, the lower the imports. Kenya and Uganda with comparatively higher GDP were the lowest importers (Table 12).

On the other hand, the GDP of the exporting country had a significant positive influence on the number of live animals exported within EAC, yielding an elasticity of approximately 3.3 (Table 12). This shows the relative importance of the GDP of the exporting country in influencing the direction off trade. The plausible explanation for this could be because countries with higher GDP like Kenya and Uganda are also associated with better developed production systems. Their local producers tend to be more competitive and innovative in more large-scale production of live animals. These countries are also characterized by conditions that permit large numbers of cattle to be raised by communities or ranches in northern Kenya and in Gomba district in Uganda. This shows that the higher the GDP of an importing country the more the country can import live animals from the country of origin. It was also noted that Rwanda, Tanzania and Burundi were the net importers of live animals shown by the negative balance of trade in value of traded live animals (Table 12). In addition, net exporters had a relatively higher GDP compared with the main importers.

The findings concur with Yego, (2015) who found that Kenya's GDP and the importers per capita GDP had significant positive influence on the value of Kenya's livestock exports. This agrees with Head and Mayer (2013) who argue that the domestic GDP plays a more significant role in influencing exports compared with the foreign one. The value of elasticity in this study is also higher than that of a study done for exports from Austria to mainly some developed European countries (Davidová, 2015) showing that a higher GDP in a developing country like the EAC countries play a more significant role in influencing importation of commodities.

**Table 12: Factors influencing trade of live animals with the East African Community (EAC)**

| | Fixed-effects | | | Random-effects | | | Hausman-Taylor | | |
|---|---|---|---|---|---|---|---|---|---|
| **Log_Live animals trade value** | **Coef.** | **Std. Err.** | **P>t** | **Coef.** | **Std. Err.** | **P>z** | **Coef.** | **Std. Err.** | **P>z** |
| log_GDP_Importer | 1.628 | 2.835 | 0.569 | -2.456** | 1.162 | 0.034 | 1.259 | 2.339 | 0.590 |
| log_GDP_Exporter | -1.610 | 2.750 | 0.562 | 3.252*** | 0.944 | 0.001 | -0.631 | 2.575 | 0.806 |
| Landlocked | (omitted) | | | -2.556*** | 0.783 | 0.001 | -1.505 | 2.281 | 0.510 |
| Shared_Border | (omitted) | | | 4.976*** | 1.253 | 0.000 | 4.459 | 3.908 | 0.254 |
| Official_Language_Exporter | (omitted) | | | -3.044** | 1.416 | 0.032 | -3.487 | 3.064 | 0.255 |
| Profittax_1_Importer | 0.007 | 0.057 | 0.908 | -0.015 | 0.051 | 0.763 | 0.019 | 0.055 | 0.730 |
| Burden_CustProc_Importer | -0.112 | 0.666 | 0.868 | 0.174 | 0.731 | 0.812 | 0.123 | 0.646 | 0.849 |
| Burden_CustProc_1_Exporter | 0.503 | 0.675 | 0.461 | -0.426 | 0.445 | 0.339 | -0.161 | 0.585 | 0.783 |
| A_1_No_Dty_Free_Lines | 0.217*** | 0.066 | 0.002 | 0.312*** | 0.074 | 0.000 | 0.223*** | 0.065 | 0.001 |
| _cons | 0.681 | 10.350 | 0.948 | -2.930 | 8.917 | 0.742 | -3.512 | 10.766 | 0.744 |
| sigma_u | 2.526 | | | 0.000 | | | 2.279 | | |
| sigma_e | 1.067 | | | 1.067 | | | 0.993 | | |
| Rho | 0.849 | | | 0.000 | | | 0.840 | | |
| Observations | 55.000 | | | 55.000 | | | 55.000 | | |
| F/wald statistics | 2.360 | | | 148.670 | | | 19.940 | | |
| Prob>F | 0.049 | | | 0.000 | | | 0.018 | | |
| R2 within | 0.266 | | | 0.224 | | | | | |
| R2 between | 0.150 | | | 0.841 | | | | | |
| R2 overall | 0.193 | | | 0.768 | | | | | |

**Table 13: Value of live animals (millions US $) between 1999-2014**

| **Country** | **Exported** | **Imported** | **Balance of trade** |
|---|---|---|---|
| Burundi | 27.785 | 497.152 | -469.367 |
| Kenya | 781.442 | 52.427 | 729.015 |
| Rwanda | 24.288 | 1141.617 | -1117.329 |
| Tanzania | 50.854 | 546.5 | -495.646 |
| Uganda | 1638.598 | 285.271 | 1353.327 |

Being landlocked had a significant negative influence on trade of live animals at 1% level. Landlocked countries like Rwanda and Burundi had lesser exports which could be attributed to the relatively high transaction costs involved in moving live animals. Zant, (2018) argues that Sub-Saharan African countries, especially the landlocked ones, face high costs of transportation leading to poorly functioning markets and high and volatile food prices. This also concurs with Faye *et al.* (2004) who argue that being landlocked attracts high transaction costs due to not only cost of clearing goods imported through another country's sea ports but also additional costs of transporting the same goods via poor road infrastructures from the point of entry to the destination country.

Sharing a border had a significant positive influence on trade of live animals with the EAC at 1% level. The variable (shared border) had the biggest coefficient showing the relative importance of closeness of trading countries in trade of live animals. Sharing a border shortens the distance of moving live animals like cattle, goats and sheep from one country to the other since the animals can simply walk across the border to target markets in the other country. The findings concur with Mbula (2012) who argue that countries sharing a border like Kenya and Uganda have more trade activities due to not only closeness in terms of distance but also closeness associated with a shared culture and language.

Sharing an official language between two trading countries within the EAC had a significant negative influence on trade of live animals at 5% level. This is because only Kenya shared an official language with two other countries (Uganda and Tanzania) whereas the other countries mostly shared an official language with only one other country for example Tanzania only shared Kiswahili with Kenya, Uganda shared English with Kenya while Burundi shared French with Rwanda. For example, there was very minimal trade of live animals between Rwanda and Burundi with Tanzania. This could be attributed to the fact that Tanzania's official language is Kiswahili yet for Burundi and Rwanda it is mainly French. This shows that relative language barrier between traders, who in some cases are the pastoralist communities, who may not understand either of the languages used in the neighboring country. This could be a major barrier to the trade of live animals. On the other hand, major Kiswahili speaking countries like Kenya and Tanzania could enjoy more trade of live animals' due ability of inter-border traders to share a common language. The findings concur with Otten (2013) who concluded that language barrier can be a major impediment to international trade.

The number of duty-free tariff lines for trade of live animals had a positive influence on the value of live animals traded at 1% significance level. This shows that clearly defining categories of live animals in the list of products to enjoy lesser import duties encouraged more trade between countries within EAC.

This shows that out of the major exporters, Kenya supplied a relatively high value of live animals to both Tanzania and Uganda which could signify the positive effect of creating duty-free lines. This is even more important where a country creates more duty-free lines with other countries which have comparative advantage in production of a commodity. This encourages other countries to export more into the country usually at a lower cost than if the country engaged in more production of the commodity. Kee and Nicita (2016); Stephen (2017) echo the importance of easing barriers and regulations for products coming from another country to encourage more trade in the targeted commodity.

**Table 14: Factors influencing trade of meat and edible offal**

| | Fixed-effects | | | Random-effects | | | Hausman-Taylor | | |
|---|---|---|---|---|---|---|---|---|---|
| Log_A_2_Trdvalue | Coef. | Std. Err. | P>t | Coef. | Std. Err. | P>z | Coef. | Std. Err. | P>z |
| Log_GDP_Importer | 3.794 | 4.607 | 0.415 | 2.490 | 2.851 | 0.383 | 1.313 | 3.579 | 0.714 |
| Log_GDP_Exporter | 0.142 | 4.846 | 0.977 | 1.313 | 3.579 | 0.714 | 2.490 | 2.851 | 0.383 |
| Landlocked | (omitted) | | | -1.078 | 1.263 | 0.393 | 0.253** | 0.126 | 0.046 |
| Shared_Border | (omitted) | | | -2.651 | 2.466 | 0.282 | 3.391*** | 1.295 | 0.009 |
| Official_Language_Exporter | (omitted) | | | 2.473 | 2.070 | 0.232 | -1.078 | 1.263 | 0.393 |
| A_2_No_Dty_Free_Lines | 0.248* | 0.128 | 0.060 | 0.253** | 0.126 | 0.046 | -2.651 | 2.466 | 0.282 |
| A_2_No_*Ad-valorem* _Lines | 3.333** | 1.318 | 0.015 | 3.391*** | 1.295 | 0.009 | 2.473 | 2.070 | 0.232 |
| _cons | -22.405 | 10.506 | 0.039 | -20.969 | 10.601 | 0.048 | -20.969 | 10.601 | 0.048 |
| | | | | | | | | | |
| sigma_u | 1.654 | | | 0.000 | | | 0.000 | | |
| sigma_e | 2.346 | | | 2.346 | | | 2.246 | | |
| Rho | 0.332 | | | 0.000 | | | 0.000 | | |
| Observations | 53.000 | | | 53.000 | | | 53.000 | | |
| F/wald statistics | 3.670 | | | 60.510 | | | 60.510 | | |
| Prob>F | 0.012 | | | 0.000 | | | 0.000 | | |
| R2 within | 0.250 | | | 0.249 | | | | | |
| R2 between | 0.560 | | | 0.999 | | | | | |
| R2 overall | 0.430 | | | 0.574 | | | | | |

**Meat and edible meat offal**

Table 14 shows that the number of duty-free lines for meat and edible offal had a significant positive influence on trade at 5% level. Meat and edible offal form a significant proportion of most consumer food baskets in EAC. In Kenya, food takes 36.05% of household budgets where meat takes an average of 5.68 of these budgets, second after cereals and bread which take 10.52% (KNBS, 2018). As a result, rearing of live animals including cattle, shoats and chicken is a common activity in most rural households in EAC though in a small-scale. Livestock forms 21% of Kenya's total agricultural GDP, third after cereals and other agricultural activities at 27% and 52% respectively (Engida *et al,* 2015). Most of livestock producers do it for domestic consumption and sell the surplus that mostly ends up in urban food baskets. Subsistence small-scale production systems are also reported in countries neighboring the EAC like Ethiopia (Eshetu and Abraham, (2016). However, there are also some large-scale producers in ranches and farms, and export abattoirs who bulk meat and edible meat offal to sell mostly in urban areas and foreign markets to attract better prices. This makes trading in meat and edible meat offal a competitive business, due to local production and many consumers, such that countries set duty-free lines to attract affordable imports for its consumers.

The findings further reveal that the number of *ad-valorem* lines had a significant positive impact on trade of meat and edible meat offal at 1% level. *Ad-valorem* is usually considered as proportional tax charged on imports, and the amount deducted is based on the value of a good. According to WTO (2017) *ad-valorem* lines are the percentage of products (or tariff lines) in a country's list of legal (binding) commitments. This means that a larger number of tariff rates charged as a percentage of the price of the meat and edible offal enhanced trade of the products. This could be the case if the rates were very minimal in terms total cost to be paid. The positive impact can be explained by the fact that trade policy of neighboring states is correlated, primarily because of the regional agreement. Other aspects that contribute to increased correlation include the fact that the countries have a shared history of trade. Further, the trade of meat and edible offal within the East African region is regulated by COMESA regulations. Therefore, trade in these products can be impacted by the trade policies within the COMESA region. The positive influence of number of *ad-valorem* lines concurs with trade economists who argue that *ad-valorem* lines are more transparent and less distorting than non-*ad-valorem* lines (World Bank Group, 2010).

That is, they drive a lesser gap between domestic and international commodity prices. Besides, the findings were also echoed by Kee & Nicita (2016) who was of the idea that regional trade policy impacted positively on trade.

**Table 15: Factors influencing trade of fish and crustaceans, molluscs and other aquatic invertebrates**

| | Fixed-effects | | | Random-effects | | | Hausman-Taylor | | |
|---|---|---|---|---|---|---|---|---|---|
| Log_A_3_Trdvalue | Coef. | Std. Err. | P>t | Coef. | Std. Err. | P>z | Coef. | Std. Err. | P>z |
| Log_GDP_Importer | 4.738** | 2.021 | 0.024 | 3.702 | 0.976 | 0.000 | -1.865 | 1.856 | 0.315 |
| Log_GDP_Exporter | -2.146 | 1.809 | 0.242 | 0.237 | 0.877 | 0.787 | 4.544** | 2.077 | 0.029 |
| Landlocked | (omitted) | | | 1.644 | 0.901 | 0.068 | 2.693 | 1.846 | 0.145 |
| Shared_Border | (omitted) | | | (omitted) | | | | | |
| Official_Language_Exporter | (omitted) | | | -1.425 | 0.836 | 0.088 | -0.584 | 1.660 | 0.725 |
| A_3_Weight_average | 0.032 | 0.084 | 0.706 | 0.159 | 0.121 | 0.190 | 0.037 | 0.087 | 0.672 |
| A_3_No_Dty_Free_Lines | 0.152*** | 0.042 | 0.001 | 0.107* | 0.052 | 0.038 | 0.157*** | 0.043 | 0.000 |
| A_3_No_Advalorem_Lines | 0.353 | 0.583 | 0.548 | 0.098 | 0.774 | 0.899 | 0.450 | 0.598 | 0.452 |
| Log_A_3_Value_Per_Exptr_Mean | 0.003 | 0.139 | 0.982 | 0.059 | 0.213 | 0.780 | 0.015 | 0.143 | 0.915 |
| Log_A_3_Unit_Pric_Per_Expt_Mean | -0.238 | 0.225 | 0.295 | 0.182 | 0.324 | 0.575 | -0.210 | 0.231 | 0.364 |
| _cons | -8.888 | 8.349 | 0.293 | -25.239 | 11.179 | 0.024 | -11.294 | 9.037 | 0.211 |
| | | | | | | | | | |
| sigma_u | 2.362 | | | 0.000 | | | 1.340 | | |
| sigma_e | 0.993 | | | 0.993 | | | 0.918 | | |
| Rho | 0.850 | | | 0.000 | | | 0.681 | | |
| Observations | 56.000 | | | 56.000 | | | 56.000 | | |
| F/wald statistics | 11.810 | | | 91.370 | | | 87.290 | | |
| Prob>F | 0.000 | | | 0.000 | | | 0.000 | | |
| R2 within | 0.669 | | | 0.608 | | | | | |
| R2 between | 0.202 | | | 0.710 | | | | | |
| R2 overall | 0.397 | | | 0.665 | | | | | |

**Fish and crustaceans, molluscs and other aquatic invertebrates**

The random effect model results as indicated in Table 15 revealed that the number of duty-free lines had a positive effect on trade of sea food (fish and crustaceans, molluscs and other aquatic invertebrates). The sea products fall on the list of products that are exempted from taxation in the East African region and this encourages trade between countries. Similar findings were echoed by Barrios *et al.* (2012) who suggested that removing trade barriers can encourage trade between countries as they have a negative impact on globalization.

**Table 16: Factors influencing trade of dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included**

| | Fixed-effects | | | Random-effects | | | Hausman-Taylor | | |
|---|---|---|---|---|---|---|---|---|---|
| Log_A_4_Trdvalue | Coef. | Std. Err. | P>t | Coef. | Std. Err. | P>z | Coef. | Std. Err. | P>z |
| Log_GDP_Importer | 4.968* | 2.504 | 0.053 | -2.778 | 2.117 | 0.190 | 0.241 | 2.320 | 0.917 |
| Log_GDP_Exporter | -2.014 | 2.375 | 0.401 | 3.250** | 1.562 | 0.037 | 2.675 | 2.456 | 0.276 |
| Landlocked | (omitted) | | | -2.493** | 1.111 | 0.025 | -3.365 | 2.939 | 0.252 |
| Shared_Border | (omitted) | | | 3.721** | 1.517 | 0.014 | 1.985 | 4.350 | 0.648 |
| Official_Language_Exporter | (omitted) | | | -1.279 | 1.089 | 0.240 | -3.810 | 3.185 | 0.232 |
| A_4_No_Dty_Free_Lines | 0.076 | 0.051 | 0.143 | 0.249*** | 0.061 | 0.000 | 0.071 | 0.053 | 0.176 |
| A_4_No_Advalorem_Lines | 0.777 | 0.474 | 0.108 | 0.960 | 0.660 | 0.145 | 0.586 | 0.485 | 0.227 |
| A_4_Num_Exporters | 0.000 | 0.007 | 0.993 | 0.013* | 0.007 | 0.064 | 0.001 | 0.007 | 0.845 |
| Log_A_4_Share_Top25_Expt | -0.022 | 0.288 | 0.939 | 0.160 | 0.476 | 0.736 | 0.051 | 0.296 | 0.863 |
| _cons | -13.868* | 7.818 | 0.082 | -5.164 | 12.266 | 0.674 | -13.119 | 9.321 | 0.159 |
| | | | | | | | | | |
| sigma_u | 4.172 | | | 0.000 | | | 3.080 | | |
| sigma_e | 1.427 | | | 1.427 | | | 1.345 | | |
| Rho | 0.895 | | | 0.000 | | | 0.840 | | |
| Observations | 64.000 | | | 64.000 | | | 64.000 | | |
| F/wald statistics | 6.850 | | | 48.960 | | | 42.440 | | |
| Prob>F | 0.000 | | | 0.000 | | | 0.000 | | |
| R2 within | 0.461 | | | 0.323 | | | | | |
| R2 between | 0.083 | | | 0.642 | | | | | |
| R2 overall | 0.205 | | | 0.476 | | | | | |

**Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included**

Random Effect model results suggest that GDP of the importing country had a significant positive influence on the trade of dairy produce with an elasticity of 3.3 (Table 16). This shows that when the GDP of an importing country is greater than that of an exporting nation, the importing state has a higher purchasing power which is also spread across its consumers.

Based on a country's comparative advantage, importing dairy products from a different country could be cheaper as compared to local production, an aspect that promotes trade between the countries. Caporale *et al.* (2015) asserted that GDP per capita patterns have a significant influence on trade since it will determine whether a state will trade on capital-intensive goods or labor-intensive products. Countries with a weak economy are likely to have fewer export volumes as compared with the counterparts with a stable economy.

Being landlocked was found to negatively impact the trade of dairy produce. The observation can be explained by the fact that lack of a coastline makes it expensive to transport bulky dairy products from one country to another. Besides, water transport is usually considered a cheap means of transportation compared to land. The findings were in harmony with Faye *et al.* (2004) who indicated that landlocked developing countries must rely on neighboring states for their international trade, an aspect that attracts a high transactional cost. The high transportation cost and poor infrastructure impacts negatively on trade, hence a bottleneck to the growth of the global economy (Faye *et al.,* 2004).

Additionally, sharing a border was found to have positive impact on trade of dairy products. A shared border indicates that a country is close to another; therefore, cross-border trade is relatively higher. This can further be explained by the fact that countries that share border often have a common history or cultural background, an aspect that makes it possible for the countries to trade with one another. Furthermore, for economic development to be achieved, such countries develop bilateral trade policies which encourage the movement of goods through the border without many regulations. The findings were also echoed by Mbula (2012) who stated that trade between Kenya and Uganda is triggered by the fact that the countries share a border and a lot regarding culture and language.

The number of duty-free lines had a positive influence on trade of dairy products. This shows that dairy products in the region fell in the list of products exempted from customs duty, an aspect that impacts positively on trade. Lifting the tax burden makes the products to be priced low, an element that will encourage trade between the countries. The findings agree with Barrios *et al.* (2012) concluded that removal of trade barriers can be a means to enhancing globalization.

Like trade of meat and edible offal, number of *ad-valorem* lines was found to have a significant positive influence on the trade of dairy products. This implies that a larger number of *ad-valorem* lines helped stabilize domestic prices to be relatively equivalent to the world prices. As a result, this encouraged fair trade of dairy products without distorting prices in local markets. This can be explained by the trade policy developed between the trading countries, an aspect that has also been echoed by Kee & Nicita (2016).

**Table 17: Factors influencing trade of edible vegetables and certain roots and tubers**

| | Fixed-effects | | | Random-effects | | | Hausman-Taylor | | |
|---|---|---|---|---|---|---|---|---|---|
| Log_A_7_Trdvalue | Coef. | Std. Err. | P>t | Coef. | Std. Err. | P>z | Coef. | Std. Err. | P>z |
| Log_GDP_Importer | 10.525 | 4.077 | 0.013 | 5.306*** | 1.229 | 0.000 | -3.060 | 3.000 | 0.308 |
| Log_GDP_Exporter | -7.832 | 3.988 | 0.056 | -2.279* | 1.281 | 0.075 | 5.604* | 3.048 | 0.066 |
| Landlocked | (omitted) | | | -0.147 | 1.208 | 0.903 | 0.094 | 2.280 | 0.967 |
| Shared_Border | (omitted) | | | -0.706 | 1.189 | 0.553 | -1.031 | 2.925 | 0.725 |
| Official_Language_Exporter | (omitted) | | | 0.276 | 1.204 | 0.819 | -0.736 | 2.165 | 0.734 |
| A_7_Weight_Average | 0.135 | 0.243 | 0.581 | 0.279 | 0.246 | 0.258 | 0.195 | 0.236 | 0.409 |
| A_7_Nbr_Duty_Free_Lines | -0.010* | 0.056 | 0.859 | 0.080** | 0.040 | 0.045 | 0.016 | 0.053 | 0.757 |
| A_7_Nbr_Advalorem_Lines | 0.174 | 0.981 | 0.860 | 0.934 | 0.880 | 0.289 | 0.190 | 0.963 | 0.843 |
| Log_A7_Value_Perentra_Mn | 0.673 | 0.325 | 0.044 | 0.675** | 0.287 | 0.019 | 0.530* | 0.310 | 0.088 |
| Log_A7_Untpric_Perexpt_Mn | -0.598 | 0.345 | 0.090 | -0.599* | 0.342 | 0.080 | -0.521 | 0.336 | 0.121 |
| _cons | -11.912 | 11.352 | 0.300 | -15.457 | 10.336 | 0.135 | -9.458 | 12.123 | 0.435 |
| | | | | | | | | | |
| sigma_u | 2.973 | | | 0.000 | | | 1.808 | | |
| sigma_e | 2.152 | | | 2.152 | | | 2.002 | | |
| Rho | 0.656 | | | 0.000 | | | 0.449 | | |
| Observations | 62.000 | | | 62.000 | | | 62.000 | | |
| F/wald statistics | 1.700 | | | 43.210 | | | 10.560 | | |
| Prob>F | 0.134 | | | 0.000 | | | 0.393 | | |
| R2 within | 0.209 | | | 0.138 | | | | | |
| R2 between | 0.459 | | | 0.839 | | | | | |
| R2 overall | 0.306 | | | 0.459 | | | | | |

**Edible vegetables and certain roots and tubers**

The Random Effects model findings suggest that GDP of the exporting country had a positive effect on the value of edible vegetables, roots, and tubers exported, resulting in an elasticity of about 5.3 (Table 17). The findings further revealed that the higher the GDP of the exporting country, the higher the trade between the two countries. An increase in the exporting country's GDP by 1% implies that there will be a positive increase in trade by approximately 5%. This could imply that countries with higher GDP could also be having a comparative advantage of producing diverse edible vegetables, roots, and tubers and as a way of earning a living given that the living standards in such a country could also be relatively high. The findings agree with a study conducted by (Yun, 2012) which indicated that countries with small slope coefficients are likely to have fewer imports from the exporting countries. Besides, the perception is supported by the idea that when the cost of production rises, sometimes it is cheaper to import from abroad.

However, the GDP of the importing country had a negative influence on the number of edible vegetables, roots, and tubers exported within EAC with an elasticity of approximately -2.3. The findings can be explained by the fact that countries with low GDP tend to have a low PPP as compared to their counterparts with high GDP. This could encourage local producers to produce more for own consumption. The negative slope of the GDP indicates that bilateral trade between the countries become expensive because of high local production and trade costs (Yun, 2012).

The number of the duty-free lines had a positive influence on the trade of edible vegetables, roots and tubers exported. Vegetables and fruits are perishable agricultural products hence the need to release them quickly into the market. Therefore, reducing restriction on trading of such products will encourage trade between countries. Kenya is the main exporter of edible vegetables, roots and tubers to Tanzania and Uganda which could be because the countries have trade agreements supporting the free flow of agricultural products through their borders like Malaba border. Besides, the seasonality in agricultural production has supported the idea of moving agricultural produce from areas of abundance to areas where the products are scarce. This concurs with Elliott (2010) asserts that there are numerous benefits associated with the provision of duty-free to countries as it enhances trade between countries.

The average price per unit of edible vegetables, roots, and tubers exported to its counterparts within the EAC market had a significant positive influence on trade of these products at 5% level. This means that when the price of edible vegetables, roots, and tubers rises, the more they export. This is in line with the theory of demand and supply and rationality of sellers where higher demand attracts higher prices which act as an incentive for sellers to supply more of a product into a given market. This concurs with the findings of Handley & Limão (2017) that policies leading to a rise in aggregate prices for China's vegetables and manufactured goods in major industrial countries like US attracted more exports from China.

On the other hand, the average value of edible vegetables, roots, and tubers exports an entrant (new exporter from EAC) brings into the EAC market for edible vegetables, roots, and tubers had a significant negative influence on trade of these products at 10% level. This implies that there were new entrants who came in as competitors and as a result, holding the available market constant, the existing sellers had a smaller market share and ended up selling lesser quantities to the market.

Edible vegetables, roots, and tubers being common household food items in the EAC countries and therefore they have a relatively stable demand where all sellers have to share the available market. A higher number of entrants into the EAC market for tradable commodities like vegetables could be attributed to a stable demand and trade liberalization within the region. Impullitti and Licandro (2017) argues that trade liberalization stiffens competition by increasing the productivity level of participating firms and reducing the markups of existing players.

**Table 18: Factors influencing trade of edible fruit and nuts; peel of citrus fruit or melons**

| | Fixed-effects | | | Random-effects | | | Hausman-Taylor | | |
|---|---|---|---|---|---|---|---|---|---|
| Log_A_8_Trdvalue | Coef. | Std. Err. | P>t | Coef. | Std. Err. | P>z | Coef. | Std. Err. | P>z |
| Log_GDP_Importer | 8.659*** | 2.609 | 0.002 | 0.821 | 0.995 | 0.409 | -3.712 | 2.410 | 0.123 |
| Log_GDP_Exporter | -5.143** | 2.562 | 0.049 | 1.375 | 0.997 | 0.168 | 7.150*** | 2.443 | 0.003 |
| Landlocked | (omitted) | | | -1.604** | 0.678 | 0.018 | -0.098 | 2.846 | 0.972 |
| Shared_Border | (omitted) | | | (omitted) | | | | | |
| Official_Language_Exporter | (omitted) | | | -1.374** | 0.655 | 0.036 | -1.639 | 2.807 | 0.559 |
| A_8_Weight_Average | -0.010 | 0.053 | 0.852 | -0.054 | 0.063 | 0.396 | -0.015 | 0.053 | 0.778 |
| A_8_Nbr_Duty_Free_Lines | -0.016 | 0.029 | 0.587 | 0.088*** | 0.025 | 0.000 | -0.012 | 0.029 | 0.675 |
| A_8_Nbr_Advalorem_Lines | -0.139 | 0.442 | 0.754 | 0.744 | 0.517 | 0.150 | -0.078 | 0.441 | 0.859 |
| _cons | -16.371*** | 4.875 | 0.001 | -8.440 | 6.019 | 0.161 | -15.391 | 6.198 | 0.013 |
| | | | | | | | | | |
| sigma_u | 2.881 | | | 0.000 | | | 2.875 | | |
| sigma_e | 1.456 | | | 1.456 | | | 1.396 | | |
| Rho | 0.797 | | | 0.000 | | | 0.809 | | |
| Observations | 69.000 | | | 69.000 | | | 69.000 | | |
| F/wald statistics | 10.920 | | | 56.640 | | | 53.450 | | |
| Prob>F | 0.000 | | | 0.000 | | | 0.000 | | |
| R2 within | 0.489 | | | 0.311 | | | | | |
| R2 between | 0.006 | | | 0.880 | | | | | |
| R2 overall | 0.066 | | | 0.482 | | | | | |

**Edible fruit and nuts; peel of citrus fruit or melons**

At 5% significance level, it was observed that a country being landlocked had a negative influence on the exportation of edible fruits, nuts, and peel of citrus fruit or melons. Fruits, nuts, and melons are perishable commodities and bulky (Table 18). Since water transport is poorly developed in Lake Victoria, road transport remains the preferred means to ferry commodities. However, road transport system in East Africa is not well developed either, an aspect that makes transport of the bulky perishable commodities to be relatively expensive and time consuming, thus negatively affecting trade. This is due to the need for specialized refrigerated trucks to transit tradeable amounts on road.

From Table 18, it was further observed that using French as the official language had a negative influence on trade. The language barrier is one of the issues that limits efficient transaction between traders of edible fruits, nuts, and peel of citrus fruit or melons. Therefore, countries with a common formal language are more likely to trade with one another. For instance, traders from Rwanda would in most cases trade with traders from Burundi because they all use French. This limits the countries Burundi and Rwanda can trade with since the rest of the EAC members are English and Kiswahili speaking. However, traders from Kenya can easily trade with Tanzania and Uganda as they use a common language. These findings agreed with results obtained by Otten (2013).

The higher the number of duty-free lines, more trade would take place. Duty-free lines meant that some of the edible fruits, nuts, and peel of citrus fruit or melons could be traded without paying for taxes, an aspect that encourages traders to export or import products falling in such a classification. The boost in trade due to more duty-free lines could be because most of the edible fruits, nuts, and peel of citrus fruit or melons are traded by small business enterprise (SME) owners in collaboration with smallholder fruit farmers who have relatively low capital to meet high trade transaction costs. According to Trademarkeea.com (2015), to boost cross-border trade within East African Community, EAC has introduced the Simplified Trade Regime which means that traders can import or export goods at duty value if their value is below $2000.

**Table 19: Factors influencing trade of coffee, tea, mate, and spices**

| | Fixed-effects | | | Random-effects | | | Hausman-Taylor | | |
|---|---|---|---|---|---|---|---|---|---|
| Log_A_9_Trdvalue | Coef. | Std. Err. | P>t | Coef. | Std. Err. | P>z | Coef. | Std. Err. | P>z |
| Log_GDP_Importer | 0.532 | 2.412 | 0.826 | 0.175 | 0.995 | 0.861 | 1.627 | 1.404 | 0.247 |
| Log_GDP_Exporter | 0.598 | 2.453 | 0.808 | 0.404 | 0.566 | 0.476 | -0.452 | 1.451 | 0.755 |
| Landlocked | (omitted) | | | 2.090*** | 0.572 | 0.000 | 3.757*** | 1.353 | 0.005 |
| Shared_Border | (omitted) | | | -0.614 | 0.456 | 0.178 | -0.188 | 1.258 | 0.881 |
| Official_Language_Exporter | (omitted) | | | 2.333*** | 0.567 | 0.000 | 1.801 | 1.474 | 0.222 |
| A_9_Weight_Average | 0.050 | 0.123 | 0.686 | 0.083 | 0.124 | 0.500 | 0.036 | 0.119 | 0.762 |
| A_9_Nbr_Duty_Free_Lines | 0.116** | 0.049 | 0.021 | 0.229*** | 0.034 | 0.000 | 0.122*** | 0.046 | 0.009 |
| A_9_Nbr_Advalorem_Lines | 0.280 | 0.221 | 0.211 | 0.578*** | 0.206 | 0.005 | 0.310 | 0.211 | 0.141 |
| A_9_Num_Exporters | 0.031*** | 0.007 | 0.000 | 0.023*** | 0.006 | 0.000 | 0.030*** | 0.007 | 0.000 |
| A_9_Num_Entrants | -0.032*** | 0.012 | 0.008 | -0.027** | 0.012 | 0.027 | -0.031*** | 0.012 | 0.006 |
| Log_A9_Value_Per_exptr_Mn | -0.518*** | 0.192 | 0.010 | -0.435** | 0.203 | 0.032 | -0.534*** | 0.188 | 0.004 |
| Log_A9_Value_per_Entra_Mn | 0.228 | 0.153 | 0.143 | 0.321** | 0.159 | 0.044 | 0.234 | 0.151 | 0.122 |
| Log_A9_Share_Top25_Expt | -0.448** | 0.189 | 0.022 | -0.367* | 0.206 | 0.075 | -0.444** | 0.187 | 0.017 |
| Log_A9_Untpric_Perexpt_Mn | -0.507** | 0.235 | 0.036 | -0.610*** | 0.229 | 0.008 | -0.551** | 0.217 | 0.011 |
| _cons | 12.415 | 8.363 | 0.144 | 11.890 | 8.453 | 0.160 | 9.735 | 8.606 | 0.258 |
| sigma_u | 2.422 | | | 0.000 | | | 1.403 | | |
| sigma_e | 1.274 | | | 1.274 | | | 1.147 | | |
| Rho | 0.783 | | | 0.000 | | | 0.600 | | |
| Observations | 70.000 | | | 70.000 | | | 70.000 | | |
| F/wald statistics | 11.310 | | | 268.010 | | | 135.730 | | |
| Prob>F | 0.000 | | | 0.000 | | | 0.000 | | |
| R2 within | 0.726 | | | 0.675 | | | | | |
| R2 between | 0.656 | | | 0.948 | | | | | |
| R2 overall | 0.617 | | | 0.830 | | | | | |

**Coffee, tea, mate, and spices**

From Table 19, Random effects results show that being a landlocked country had a significant positive influence on trade of coffee, tea, maté and spices at 1% significance level. This could be because being landlocked hindered EAC countries like Rwanda, Burundi and Uganda from exporting the products directly to overseas countries like the European Union. As a result, they export through the port of Mombasa which also has the advantage of hosting the largest auction house for tea and coffee in Africa.

Burundi, Rwanda, and Uganda have a long history of using the port of Mombasa to coordinate their global sales or purchases. The positive results indicate that the trading countries have over time developed well-managed logistics and coordination with relatively low transactional cost. It is imperative to note that the findings contradict previous studies which had suggested that being landlocked has a negative impact on trade (Faye *et al.,* 2004).

The official language used by the trading nations was another aspect that was observed to have a significant positive influence on trade of coffee, tea, maté and spices. Having the same official language influenced trade of coffee, tea, maté and spices in a positive way. Egger & Toubal (2016) posited that language is understood to influence bilateral trade.

The number of duty-free lines had a significant positive influence on the trade of coffee, tea, mate, and spices. This suggests that the products fall on the list of import-tax exempted products. The duty-free line on these products means that they were priced low, an aspect that encouraged trade between countries. The observations are by Barrios *et al.* (2012) who suggested that removing tax will enhance trade.

The number of *ad-valorem* lines available to a country was also found to have a significant positive influence on trade of coffee, tea, mate, and spices. The positive impact can be explained by increased number of valueadded products. This encourages the sellers to sell more to the neighboring countries and the consumers to buy more of the products. The findings concur with Kee & Nicita (2016) who appreciated the importance of price elasticities on trade.

The number of exporters in a country had a significant positive influence on the trade of coffee, tea, maté, and spices. A country with a greater number of exporters impacted positively on the export of the commodities as compared to countries with few exporters.

Exporting products to the international market requires a lot of logistics. The more the number of actors, the easier they can meet the specific requirements of different buyers in the international market through innovation and efficient export processing. The number of new entrants, on the other hand, was found to impact negatively on the trade of coffee, tea, maté, and spices. With more suppliers into the trade, competition becomes stiff, and profit margin are reduced due to reduced market share. This therefore discourages trade; which is consistent with economic theory. However, the study findings contradict with Lamaj (2015) that existence of few suppliers in the international market leads to imperfect trade, hence with more entrants, it will streamline operations, an aspect that will enhance trade. Naylor & Soegaard (2018) also argue that a higher number of foreign entrants increases product market competition and therefore increases the trade value and gains from the traded commodities.

However, despite more new entrants negatively impacting trade of coffee, tea, maté, and spices exports, if a new entrant brings on board high values of then there was a significant positive influence on trade at 5% level. This means if a new entrant managed to penetrate the market and brought on board more coffee tea maté, or spices into the EAC market, the total trade value for the entire EAC market rose. For example, Kenya being the main importer of these products from other countries within EAC would have more products to trade with if a new entrant came on board. Additionally, it would create competition from its supplier countries hence leading to better quality and probably lesser prices leading to a net gain to Kenya and its producers. The findings concur with Harrison *et al.* (2014) who found out that increased competition more than doubled the estimated welfare benefits of producers involved in trade between countries in the European Union.

The average export value of coffee, tea, maté, and spices per exporter had a significant negative influence on the trade value of the products within EAC at 5% level (Table 19). This implies that over time, prices of these commodities in the EAC declined thereby reducing the trade value for exporters in the market. This is in line with the negative effect of more new entrants showing that with more exporters each exporter could only export very little to other countries in the region over time. This could be attributed to the negative effects of competition to any player in given market where if a firm's competitors are able to sell more it implies that the firm must sell less to the same market.

Table 19 shows that the share of top 25% exporters in Total Export Value (TEV) had significant negative influence on the trade value of coffee, tea, maté, and spices at 10% level. This implies that if the TEV of the main exporters rose the trade value for other countries, who are the majority, dropped. In this case, Uganda and Rwanda being major exporters of tea and coffee to Kenya, they increased TEV over the study period, therefore, reducing the trade value for other countries like Tanzania and Burundi. This could be attributed to the effects of oligopolistic behavior where a few large firms enjoy a large market share, it significantly reduces the market available for smaller competitor firms in the same market.

The average unit price per exporter of coffee, tea, maté, and spices had a significant negative influence on the trade value at 1% level. This implies that major importers like Kenya offered lower prices to EAC countries leading to an overall decline in its trade value. This is because these commodities are bought for re-export However, this differs with the findings of Handley & Limão (2017 that policies leading to a rise in aggregate prices for China's vegetables and manufactured goods in major industrial countries like US attracted more exports from China.

**Table 20: Factors influencing trade of cereals**

| | Fixed-effects | | | Random-effects | | | Hausman-Taylor | | |
|---|---|---|---|---|---|---|---|---|---|
| Log_A_10_Trdvalue | Coef. | Std. Err. | P>t | Coef. | Std. Err. | P>z | Coef. | Std. Err. | P>z |
| Log_GDP_Importer | 3.367** | 1.593 | 0.039 | -0.156 | 0.943 | 0.869 | -0.233 | 1.409 | 0.869 |
| Log_GDP_Exporter | -2.019 | 1.453 | 0.170 | 0.044 | 0.716 | 0.951 | 1.180 | 1.515 | 0.436 |
| Landlocked | (omitted) | | | -0.033 | 0.617 | 0.958 | -0.395 | 1.218 | 0.746 |
| Shared_Border | (omitted) | | | 2.742*** | 0.682 | 0.000 | 2.505 | 1.653 | 0.130 |
| Official_Language_Exporter | (omitted) | | | -1.694** | 0.686 | 0.013 | -1.922 | 1.228 | 0.117 |
| A_10_Weight_Average | -0.038 | 0.032 | 0.239 | -0.035 | 0.034 | 0.304 | -0.048 | 0.033 | 0.146 |
| A_10_Nbr_Duty_Free_Lines | 0.080* | 0.042 | 0.062 | 0.164*** | 0.049 | 0.001 | 0.103** | 0.043 | 0.018 |
| A_10_Nbr_Advalorem_Lines | 0.443 | 0.322 | 0.175 | 0.229 | 0.375 | 0.541 | 0.414 | 0.336 | 0.218 |
| A_10_Num_Exporters | 0.002 | 0.004 | 0.609 | 0.006* | 0.003 | 0.074 | 0.002 | 0.004 | 0.597 |
| Log_A10_Value_Perexptr_Mn | -0.237 | 0.148 | 0.114 | -0.166 | 0.187 | 0.374 | -0.228 | 0.154 | 0.140 |
| Log_A10_Share_Top25_Expt | 0.274 | 0.188 | 0.151 | 0.364 | 0.242 | 0.132 | 0.320 | 0.196 | 0.102 |
| Log_A10_Untpric_Perexpt_Mn | -0.125 | 0.132 | 0.348 | -0.276* | 0.167 | 0.099 | -0.154 | 0.138 | 0.263 |
| _cons | -0.015 | 5.309 | 0.998 | 6.569 | 6.766 | 0.332 | 0.871 | 5.741 | 0.879 |
| sigma_u | 1.781 | | | 0.000 | | | 1.018 | | |
| sigma_e | 0.910 | | | 0.910 | | | 0.842 | | |
| Rho | 0.793 | | | 0.000 | | | 0.594 | | |
| Observations | 73.000 | | | 73.000 | | | 73.000 | | |
| F/wald statistics | 6.230 | | | 93.400 | | | 54.810 | | |
| Prob>F | 0.000 | | | 0.000 | | | 0.000 | | |
| R2 within | 0.509 | | | 0.426 | | | | | |
| R2 between | 0.153 | | | 0.626 | | | | | |
| R2 overall | 0.339 | | | 0.609 | | | | | |

**Cereals**

Random Effects (RE) model results in Table 20 shows that sharing a border has a significant positive influence on trade of cereals. When common borders are shared, it is relatively easy to have cereals moved in trucks between countries, particularly from Uganda to either Kenya or Tanzania. Ihle *et al.* (2011) echoed a similar view although they emphasized further that national export bans and poor infrastructure are some of the aspects that limit cross border trade. However, although Uganda and Rwanda share border, trade was not as much as between itself with Kenya and Tanzania. Therefore, the low trade volume between Uganda and Rwanda can be influenced by other factors other than distance between the two states. Odozi (2015) revealed that high transaction cost is one of the aspects that contribute to lower trade volumes between neighboring countries.

The official language used amid the exporting and importing countries had a significant negative impact on trade between countries. It was evident that most trade happened between English and Kiswahili speaking countries like Kenya, Uganda and Tanzania as compared to French speaking countries, namely Rwanda and Burundi. The findings concur with Otten (2013) who found that cross border trade was high between countries with same official languages.

The number of duty-free lines had a significant influence on trade of cereals between countries at 1% significant level. The larger the number of duty-free lines, the larger the trade volumes. Nkoroi (2016), observed that informal cross border trade had a positive correlation with government policies. From Table 20, it was also observed that number of exporters also had positive significant influence on trade of cereals between EAC countries. Zhang *et al.* (2003) indicated that the more open a country is the more trade it will experience. Therefore, countries that have many exporters are likely to have effective trade policies encouraging cross border trade.

### 4.3 Trade and Welfare Effects of Tariff Barriers (TBs) and Non-Tariff Barriers (NTBs)

The objective three results from the global simulation model (GSIM) used to analyze East Africa Community's (EAC) trade policy changes and welfare effects are presented in this section. The initial bilateral trade matrix at world prices and the final bilateral import tariffs in *ad valorem* form were used. The final elasticities of each commodity were calculated for the period. The initial matrix was composed of the average of trade data for the first seven years (pre-liberalization) while the final matrix was composed of the average for the last seven years (post-liberalization).

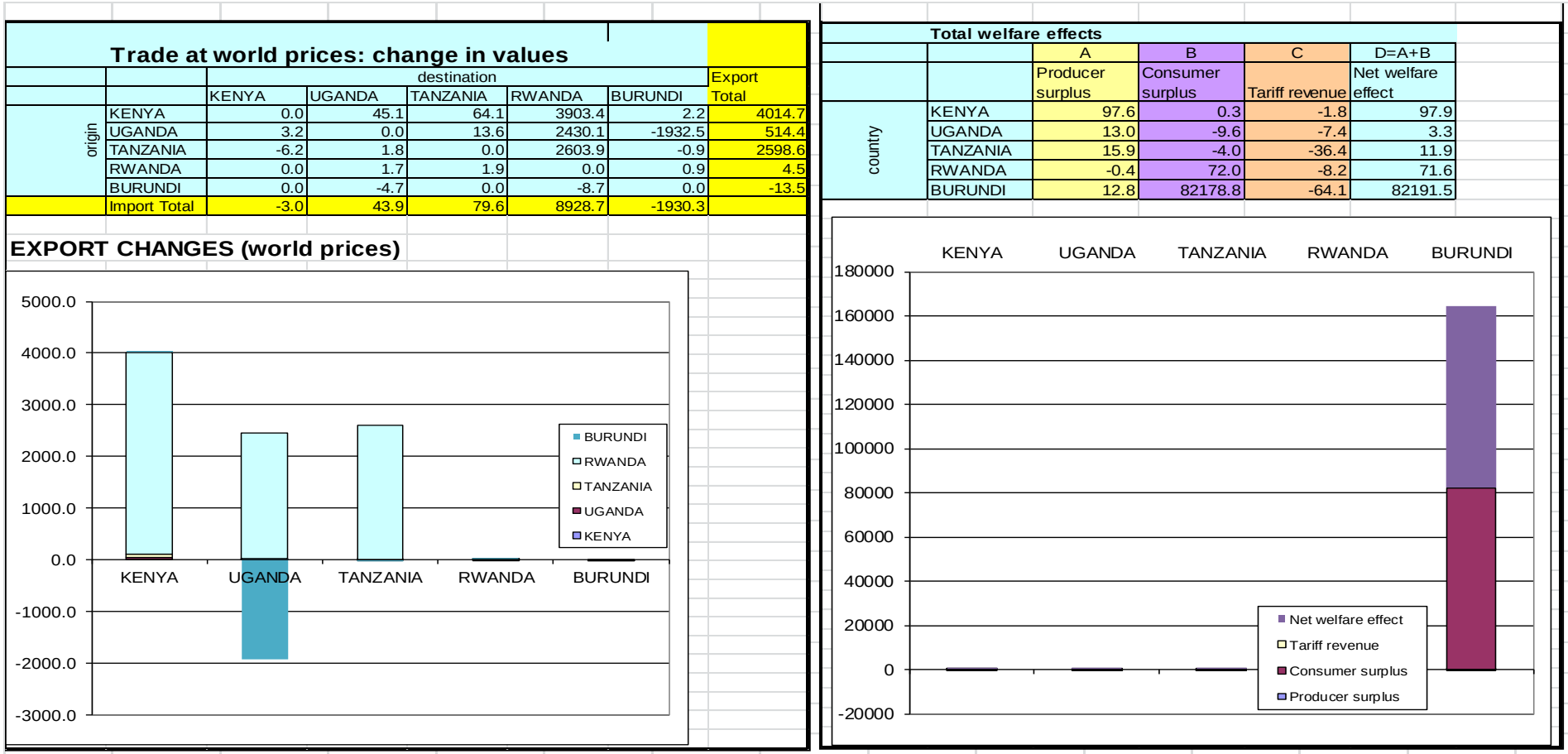
Trade effects, welfare effects (producer surplus, consumer surplus, tariff revenue, and net welfare effects), price and output changes have been presented and discussed. A list of eight commodities in the five East Africa Community (EAC) countries (Kenya, Uganda, Tanzania, Rwanda and Burundi) were analysed, namely: Live animals (HS-01); Meat and edible meat offal (HS-02); Fish and crustaceans, molluscs and other aquatic invertebrates (HS-03); Dairy produce, birds' eggs, natural honey; Edible vegetables and certain roots and tubers (HS-07); Edible fruit and nuts, peel of citrus fruits or melons (HS-08); Coffee, tea, mate and spices (HS-09); and Cereals (HS-10). The results are presented in Figures 3 to 10.

**Live animals (HS-01)**

Tariff reduction in live animals was modeled for East African Community (EAC) countries (EAC secretariat, 2015). The results revealed that Kenya, Rwanda and Burundi had net welfare gains while Uganda and Tanzania had net losses as shown in **Error! Reference source not found.**. Burundi had the highest gains considering reduction of tariffs leading to a relatively high increase in consumer surplus. The tariff reduction was reflected in reduction of tariff revenues for all EAC countries. Kenya gained because of getting access to more markets where it expanded its exports market with most of them going to Rwanda.

Further, Kenya gained a live animal market from all countries. The supply of live animals was highest in Kenya and Uganda at 4014.7 and 2598.6 US Dollars 8928.7 thousand respectively (Figure 3). Muluvi *et al.* (2011) found out that Kenya had a high potential to trade live animals within the East African Community. This can be attributed to high production of live animals in Kenya especially in her Arid and Semi-Arid Lands (ASAL). On the other hand, Uganda diverted its live animals from Burundi and sold a bigger proportion to Rwanda. Similarly, Tanzania diverted its exports from Uganda and Burundi to Rwanda and Uganda. The results further revealed that Burundi is a net importer of live animals while rest of the countries are net exporters.

Rwanda was the most preferred country of export considering that it imports relatively high numbers from most of the countries. Further, Kenya rarely imports live animals as revealed by the results with the only exports coming from Uganda.




**Note:** Values are in US Dollars (in thousand US $)

**Figure 3: Live animals (HS-01) changes in trade and welfare effects**

The graph on export changes (world prices) (Figure 3) reveals that tariff reductions in EAC countries are beneficial to Kenya and Tanzania. That is, for these two countries there are positive percentage changes in prices which may be attributed to expanded market. This implies that the countries producers benefit more from the open markets. Further, there is a general increase in prices in Burundi as indicated by a high consumer and producer welfare gains in Figure 3 total welfare effects graph. Opening the markets benefit consumers in Burundi despite an increase in prices. Overall, there is an increase in prices to Rwanda hence making it the most preferred market as indicated by the high import value of US Dollars 8928.7 thousand (Figure 3).

**Meat and edible meat offal (HS-02)**

Reduction of trade tariff on meat and edible meat offal in East Africa leads to a net welfare gain for Kenya only while all the rest of the countries experience net welfare loses (**Error! Reference source not found.**). That is, Kenya producers experienced the highest gains in surplus which is attributed to increased market for meat products. However, open trade increased the consumer surpluses in Tanzania and Burundi as well as small gains for producers, but the losses in tariff revenues were quite high that overall the countries experienced net losses in welfare. On the other hand, Uganda and Rwanda experience net losses for producer and consumer surpluses as well as a reduction in tariff revenue. The results revealed that Tanzania experienced the highest tariff revenue losses.

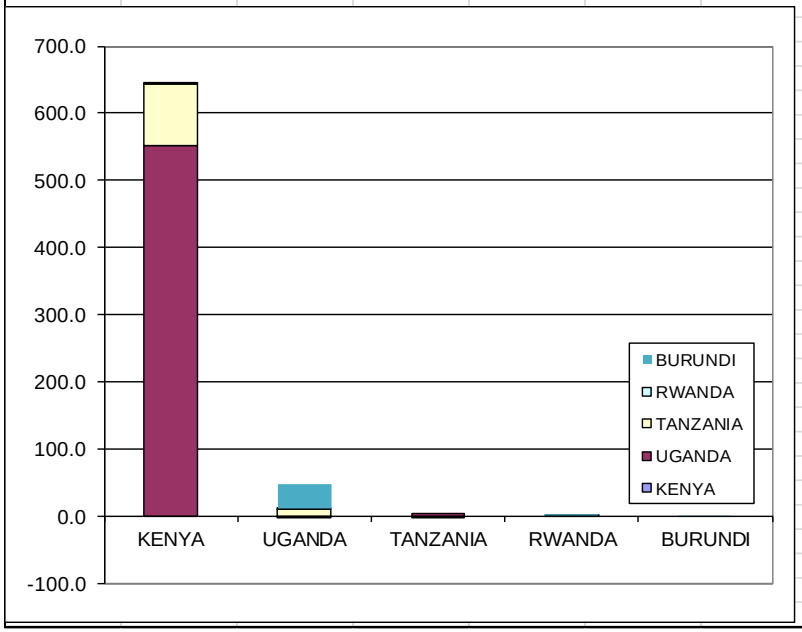
Overall, there was a positive change in new market prices for Kenya and Uganda and a decrease in prices for all other EA countries. The price changes for meat and edible meat offal was congruent with that of live animals. Further, there was an increase in demand for all countries except Burundi where there were no changes. There was an increase in overall supply for all countries except Tanzania and Rwanda where supply decreased and remained constant respectively. Overall, the only negative excess demand was in Kenya.

There were mixed price changes between the countries. In Kenya, all prices increased by more than 3% but in Tanzania prices slightly decreased. All prices for Uganda and Burundi with all countries decreased. Prices between Tanzania and other countries increased except with Uganda. Contrary, prices between Rwanda and other countries decreased except the one with Burundi. A positive change in price is beneficial to the producers and bad for consumers. Overall composite prices at the destination countries decreased for all countries except Uganda and Rwanda.

**Trade at world prices: change in values**

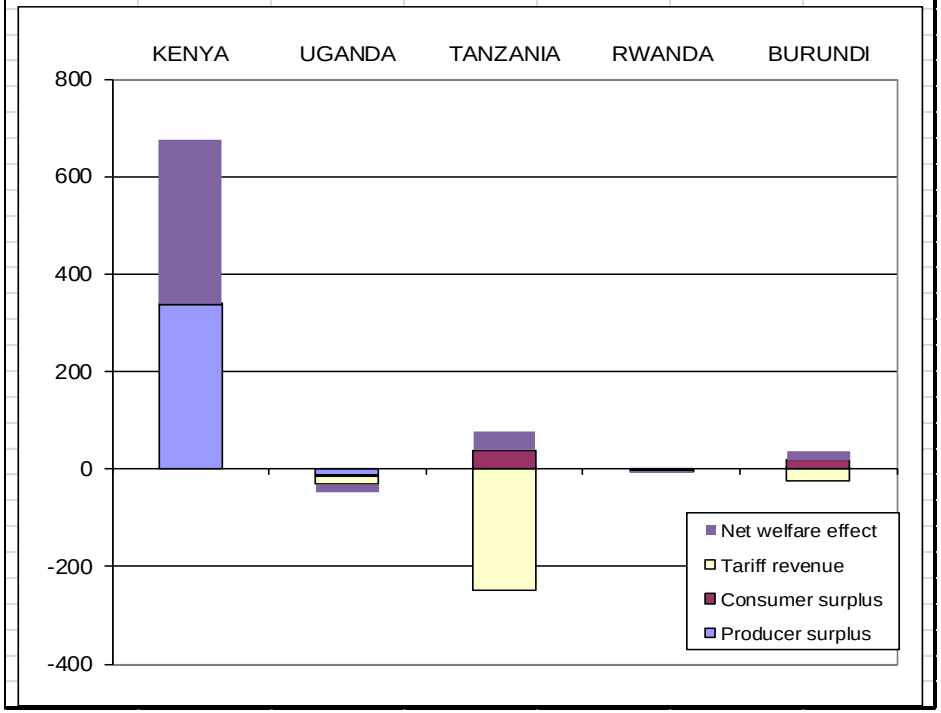
| | | destination | | | | | Export |
|---|---|---|---|---|---|---|---|
| | | KENYA | UGANDA | TANZANIA | RWANDA | BURUNDI | Total |
| origin | KENYA | 0.0 | 552.4 | 90.8 | 2.4 | 0.0 | 645.7 |
| | UGANDA | -0.1 | 0.0 | 10.5 | 0.9 | 36.4 | 47.8 |
| | TANZANIA | -0.1 | 3.0 | 0.0 | 0.0 | 0.0 | 2.9 |
| | RWANDA | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 |
| | BURUNDI | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Import Total | -0.1 | 555.4 | 101.3 | 3.3 | 36.6 | |

**EXPORT CHANGES (world prices)**




**Total welfare effects**

| | | A | B | C | D=A+B |
|---|---|---|---|---|---|
| | | Producer surplus | Consumer surplus | Tariff revenue | Net welfare effect |
| country | KENYA | 337.1 | 0.1 | 0.0 | 337.3 |
| | UGANDA | -10.9 | -4.8 | -15.3 | -15.6 |
| | TANZANIA | 0.1 | 39.0 | -248.8 | 39.1 |
| | RWANDA | -0.1 | -1.8 | -3.2 | -1.9 |
| | BURUNDI | 0.0 | 17.8 | -24.0 | 17.8 |




**Note:** Values are in US Dollars (in thousand US $)

**Figure 4: Meat and edible meat offal (HS-02) changes in trade and welfare effects**

The results showed that trade quantities from Kenya were diverted from Tanzania and Rwanda to Uganda. Further, Uganda increased its trade quantities for all EAC countries. Tanzania diverted its trade from Kenya to Uganda with no changes in other countries. Rwanda increased its export to Tanzania and Burundi whereas Burundi basically decreased its internal trade. Overall, Kenya benefited more with larger export share while Uganda had the largest share of imports for the EAC community. All countries but Kenya were net importers with Burundi not exporting any meat and edible meat offal.

**Fish and crustaceans, molluscs and other aquatic invertebrates (HS-03)**

Reduction of tariffs in EAC countries resulted in an increased Fish and crustaceans, molluscs and other aquatic invertebrates' net welfare effects for Kenya and Rwanda only while the rest had decreased net welfare (**Error! Reference source not found.**). All EAC countries but Burundi experienced decreased producer surplus. This could be attributed to a larger market access for fish producers in Burundi. Further, all countries experienced decreased tariff revenues collection. There was general improvement in consumer welfare for all countries but Uganda and Burundi. The results also revealed that the number of exports increased for all countries but Kenya while imports also increased for all but Uganda.

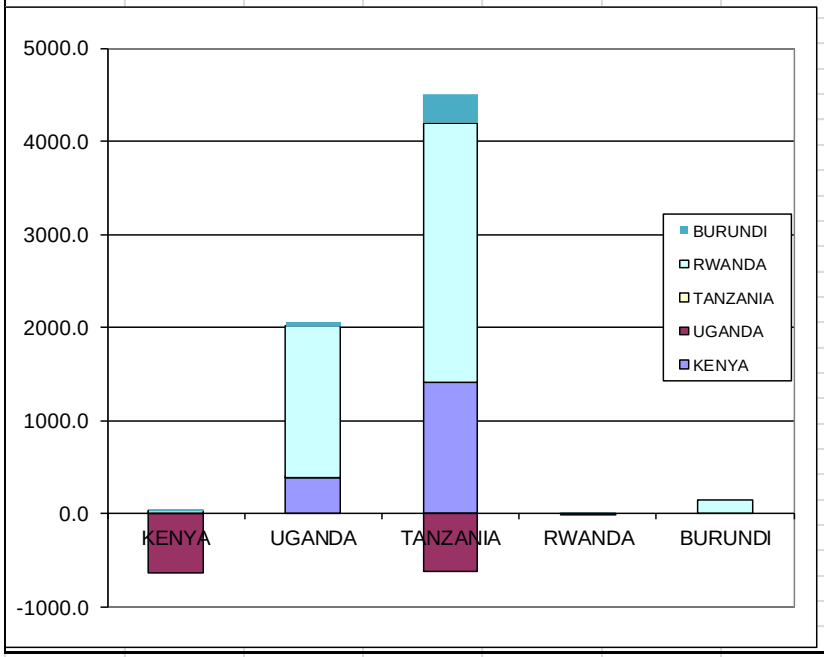
Market clearing prices decreased in all countries but Kenya and Tanzania. There was an increase in consumer demand for all countries but Kenya and Rwanda. However, all countries experienced decreased supply with the exception of Uganda and Rwanda. The results further revealed that the internal prices for HS-03 products increased only in Uganda and Burundi.

Kenya decreased its trade quantities with all its partners except with Rwanda which increased. Uganda on the other hand increased its trade quantities for all its partner countries. Burundi only increased trade quantities with Rwanda which in turn reciprocated but went further to decrease trade flow to Uganda. Lastly, Tanzania increased its trade flow to all partner countries but Uganda.

**Trade at world prices: change in values**

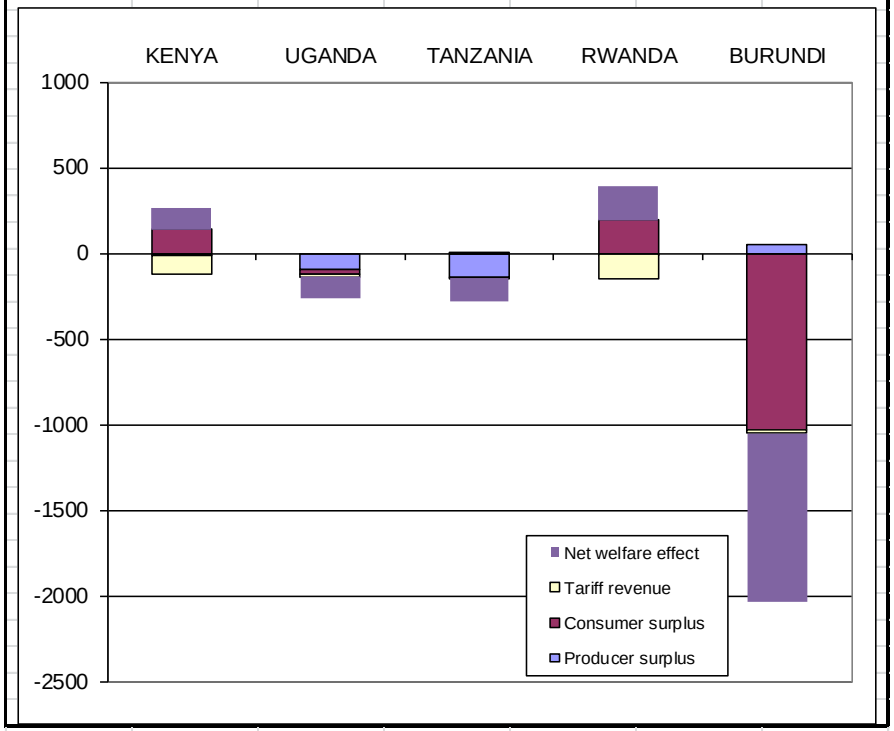
| | | destination | | | | | Export |
|---|---|---|---|---|---|---|---|
| | | KENYA | UGANDA | TANZANIA | RWANDA | BURUNDI | Total |
| origin | KENYA | 0.0 | -633.9 | 0.9 | 26.2 | 0.0 | -606.8 |
| | UGANDA | 378.5 | 0.0 | 3.2 | 1628.3 | 41.4 | 2051.3 |
| | TANZANIA | 1414.1 | -623.9 | 0.0 | 2781.6 | 308.8 | 3880.6 |
| | RWANDA | 0.0 | -0.3 | 0.0 | 0.0 | 0.4 | 0.2 |
| | BURUNDI | 0.0 | 0.0 | 0.0 | 141.4 | 0.0 | 141.4 |
| | Import Total | 1792.6 | -1258.0 | 4.1 | 4577.5 | 350.6 | |

**EXPORT CHANGES (world prices)**




**Total welfare effects**

| | | A | B | C | D=A+B |
|---|---|---|---|---|---|
| | | Producer surplus | Consumer surplus | Tariff revenue | Net welfare effect |
| country | KENYA | -9.6 | 136.9 | -109.4 | 127.3 |
| | UGANDA | -98.8 | -20.8 | -21.2 | -119.6 |
| | TANZANIA | -140.6 | 0.6 | -5.6 | -140.1 |
| | RWANDA | -0.2 | 193.7 | -153.1 | 193.5 |
| | BURUNDI | 46.3 | -1027.9 | -22.5 | -981.6 |




**Note:** Values are in US Dollars (in thousand US $)

**Figure 5: Fish and crustaceans, molluscs and other aquatic invertebrates (HS-03) changes in trade and welfare effects**

**Dairy produce, birds' eggs, natural honey, edible products of animal origin (HS-04)**

The reduction of dairy produce, birds' eggs, natural honey and edible products of animal origin tariffs in EAC counties resulted in an increase in net welfare only for Burundi and a decreased welfare for all other countries (**Error! Reference source not found.**). However, all countries experienced an increased producer surplus and a decreased tariff revenue collected from HS-04 commodities. Further, the consumer surplus increased significantly for all Burundi implying that there was a decreased price making the products affordable. This is further supported by the findings that there were significantly large decreases in prices where in some instances they decreased by more than 250%. The results also revealed that the overall composite internal price changes in the countries slightly decreased for all countries but Uganda.

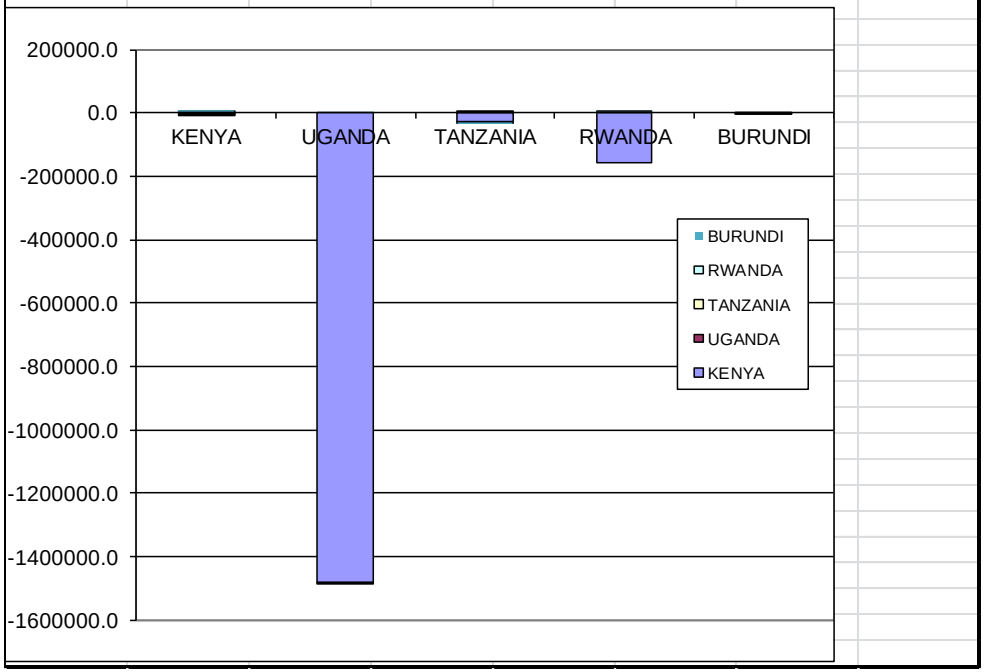
The tariff reduction further resulted in slight increases in supply for Kenya and Tanzania while there were slight decreases for all other countries. This is attributed to the response in price changes. However, all countries also experienced different magnitudes in demand changes. Further, it is worth noting that the greatest demand changes were experienced in Rwanda and Uganda which could be attributed to decreased prices.

The results also revealed that there are huge trade quantities and value changes especially for Kenya, Tanzania and Rwanda as destination countries since they experienced decreased exports from their trade partners. Uganda and Burundi also were impacted by the tariff reduction gaining through increased product flow to the country. A key finding was that there were high tariffs initially in Kenya among other countries with its trade partners aimed at protecting the products of animal origin sector. However, reduction of tariffs seems to have increased the supply of the produce which could be attributed to higher market access. The results support findings by Busse and Shams (2003) where they predicted that Kenya was to benefit most from trade liberalization in East Africa.

**Trade at world prices: change in values**

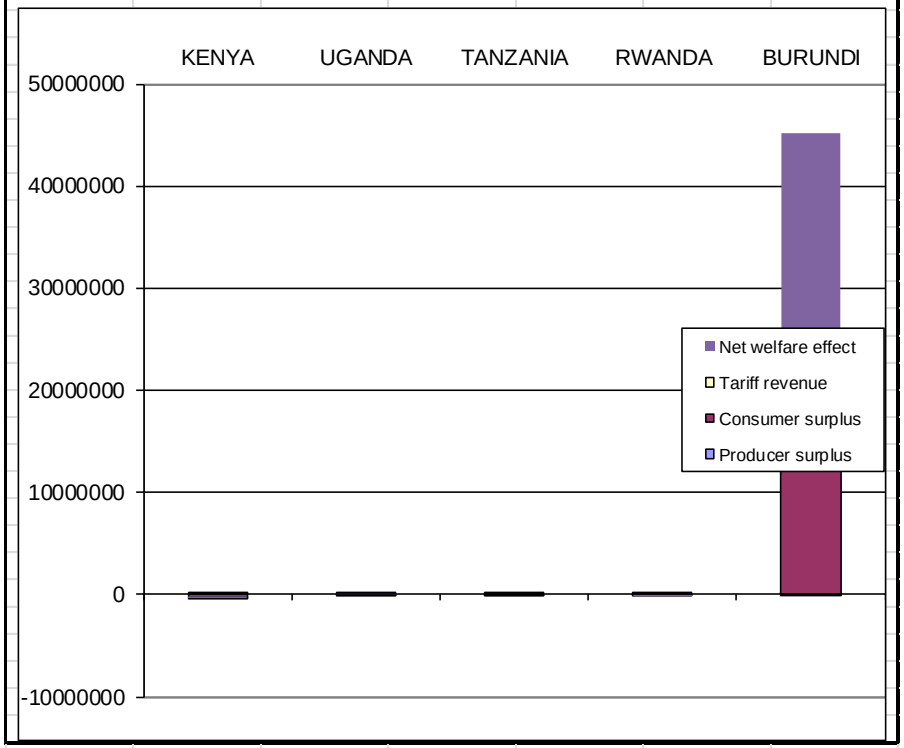
| | | destination | | | | | Export |
|---|---|---|---|---|---|---|---|
| | | KENYA | UGANDA | TANZANIA | RWANDA | BURUNDI | Total |
| origin | KENYA | 0.0 | 1383.8 | -6147.7 | -791.6 | 331.9 | -5223.5 |
| | UGANDA | -1482009.8 | 0.0 | -623.3 | 0.0 | 232.6 | -1482400.5 |
| | TANZANIA | -27956.4 | 8.6 | 0.0 | -1971.7 | -1.3 | -29920.8 |
| | RWANDA | -156939.8 | 2.0 | 0.0 | 0.0 | 10.9 | -156926.9 |
| | BURUNDI | 0.0 | -14.0 | 0.0 | -66.3 | 0.0 | -80.4 |
| | Import Total | -1666906.0 | 1380.4 | -6771.0 | -2829.6 | 574.1 | |

**EXPORT CHANGES (world prices)**




**Total welfare effects**

| | | A | B | C | D=A+B |
|---|---|---|---|---|---|
| | | Producer surplus | Consumer surplus | Tariff revenue | Net welfare effect |
| country | KENYA | 1116.5 | -185339.4 | -1128.9 | -184222.9 |
| | UGANDA | 1422.9 | -35.8 | -85.6 | 1387.2 |
| | TANZANIA | 36.0 | -36.8 | -608.6 | -0.8 |
| | RWANDA | 12.7 | -107.4 | -73.2 | -94.6 |
| | BURUNDI | 8.6 | 22571642.7 | -132.1 | 22571651.3 |




**Note:** Values are in US Dollars (in thousand US $)

**Figure 6**: **Dairy produce, birds' eggs, natural honey, edible products of animal origin (HS-04)** changes in trade and welfare effects

**Edible vegetables and certain roots and tubers (HS-07)**

All countries in East Africa experienced decreased tariff revenues and net welfare effects with reduction of tariff for HS-07 products as shown in Figure 7. Further, all countries but Uganda and Rwanda experienced improved producer welfare. Similarly, all countries but Tanzania and Rwanda experienced decreased consumer welfare. Overall, all countries decreased their total value in HS-07 product exports and imports except for Uganda which increased it import values.

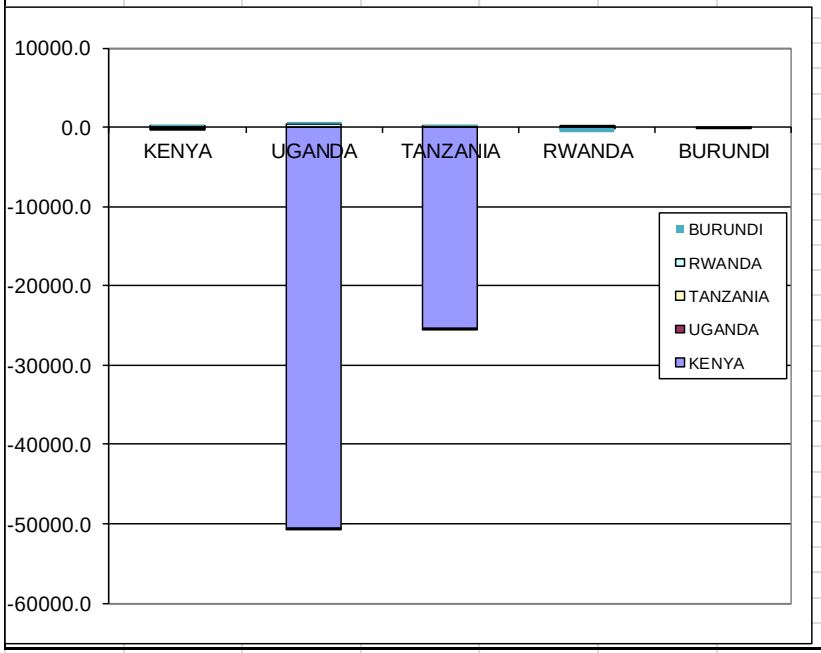
There were mixed changes in market clearing conditions with prices decreasing for all countries but Kenya and Tanzania. Furthermore, all counties showed decreased supply except for Tanzania. Similarly, all countries with exception of Rwanda and Burundi decreased their demand for HS-07 products. Overall, all internal prices decreased except for Uganda.

The results revealed that Kenya diverted trade from Tanzania and Rwanda to Uganda and Burundi. Similarly, all countries decreased their trade to Kenya, Tanzania and Rwanda except for trade flow from Uganda to Rwanda. All countries increased their trade quantities to Uganda except Burundi which made no changes in trade. All countries increased trade quantities with Burundi except for Rwanda that decreased its trade quantity. These findings are in line with other research work that found East Africa to have a high potential for vegetables and fruit trade among its member states and other countries (Lubinga *et al.,* 2014)

**Trade at world prices: change in values**

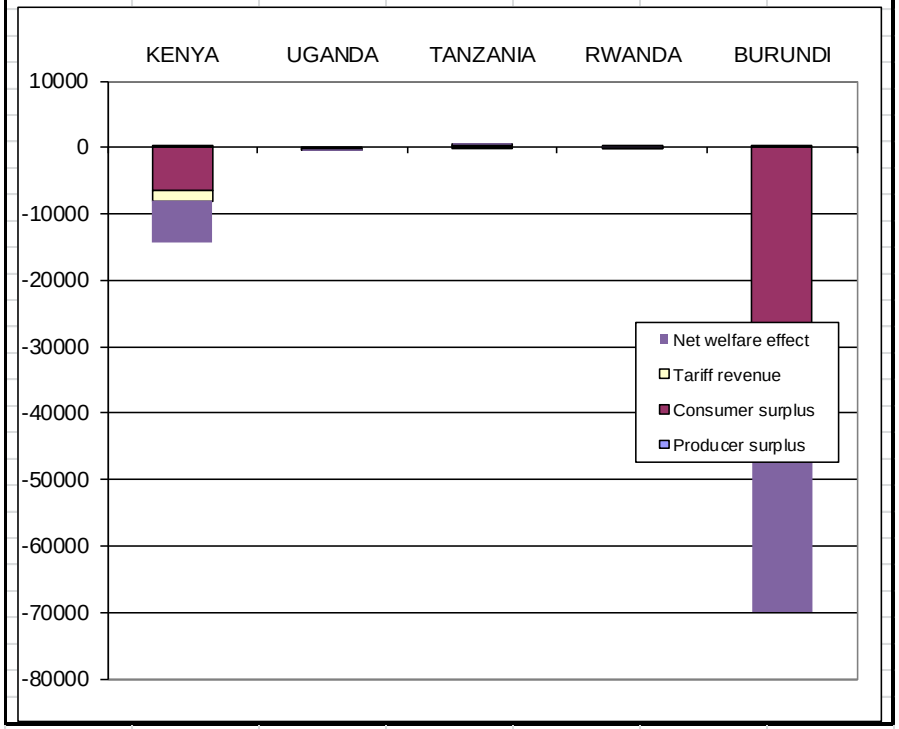
| | | destination | | | | | Export |
|---|---|---|---|---|---|---|---|
| | | KENYA | UGANDA | TANZANIA | RWANDA | BURUNDI | Total |
| origin | KENYA | 0.0 | 150.5 | -82.7 | -302.8 | 2.5 | -232.5 |
| | UGANDA | -50551.5 | 0.0 | -26.3 | 427.7 | 77.8 | -50072.2 |
| | TANZANIA | -25441.0 | 156.4 | 0.0 | -75.6 | 44.7 | -25315.4 |
| | RWANDA | -0.1 | 40.8 | -13.3 | 0.0 | -539.1 | -511.7 |
| | BURUNDI | 0.0 | 0.0 | 0.0 | -55.4 | 0.0 | -55.4 |
| | Import Total | -75992.6 | 347.8 | -122.3 | -6.0 | -414.1 | |

**EXPORT CHANGES (world prices)**




**Total welfare effects**

| | | A | B | C | D=A+B |
|---|---|---|---|---|---|
| | | Producer surplus | Consumer surplus | Tariff revenue | Net welfare effect |
| country | KENYA | 141.3 | -6425.1 | -1643.5 | -6283.8 |
| | UGANDA | -124.9 | -13.3 | -38.4 | -138.3 |
| | TANZANIA | 335.6 | 15.6 | -28.8 | 351.2 |
| | RWANDA | -15.5 | 51.0 | -90.7 | 35.4 |
| | BURUNDI | 154.6 | -35001.4 | -212.7 | -34846.8 |




**Note:** Values are in US Dollars (in thousand US $)

**Figure 7: Edible vegetables and certain roots and tubers (HS-07) changes in trade and welfare effects**

**Edible fruit and nuts, peel of citrus fruits or melons (HS-08)**

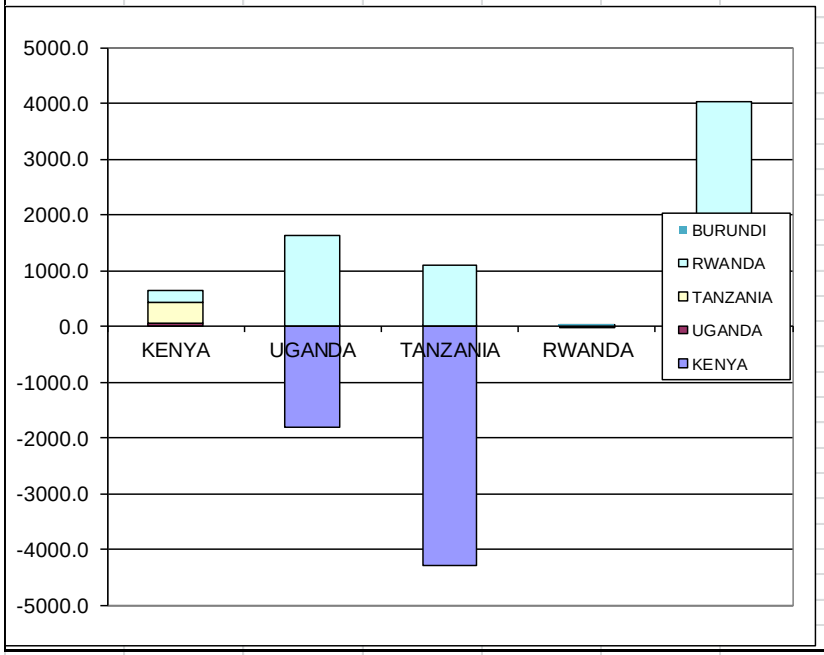
All countries but Kenya experienced net welfare gains with a reduction in trade tariffs for edible fruits and nuts (Figure 8). Further, all countries had improved producer welfare and decreased consumer welfare except for Rwanda that had a decreased producer surplus. Kenya, Uganda and Tanzania had decreased tariff revenue with Rwanda increasing its revenue collection for edible fruits and nuts. Overall, all countries but Kenya increased their import values. Similarly, all countries but Kenya and Burundi decreased their import values for HS-08 products.

Decreased tariffs resulted in decreased market clearing prices for all East African countries except for Kenya and Tanzania. Further, all countries but Uganda and Burundi experienced increased supply of HS-08 products. The demand decreased for all countries except in Kenya and Burundi. Overall, all countries but Uganda and Tanzania had a decrease in internal prices for the edible fruit and nuts. Uganda, Tanzania and Rwanda decreased their trade volumes to Kenya while Burundi decreased its volume to Uganda. Apart from the above decreases, all other countries increased trade volumes with most of their partners. These findings support other studies that argued all EAC countries would benefit from decreased tariff and possible liberalization (Ouma, 2017).

**Trade at world prices: change in values**

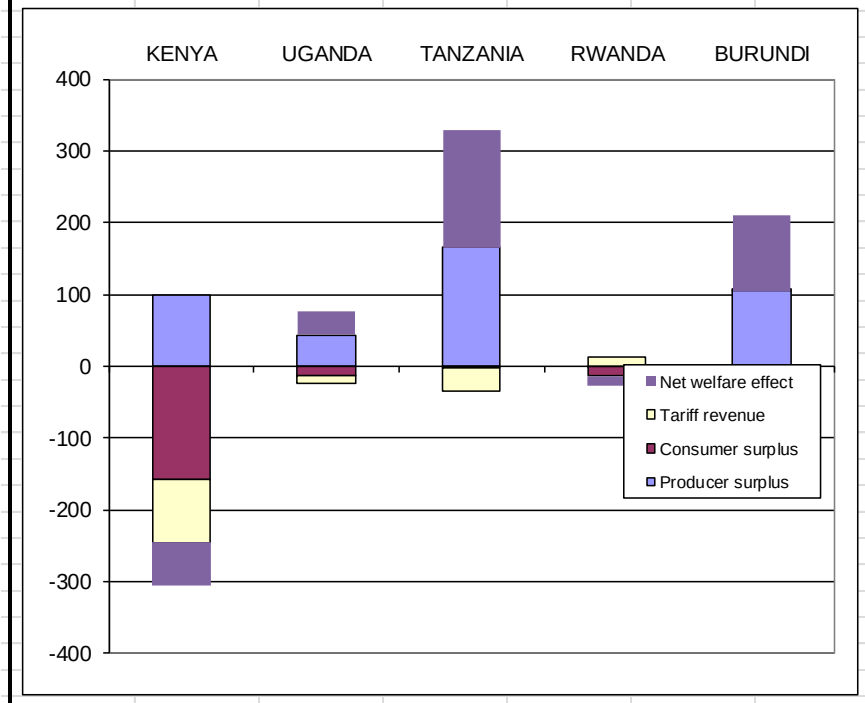
| | | destination | | | | | Export |
|---|---|---|---|---|---|---|---|
| | | KENYA | UGANDA | TANZANIA | RWANDA | BURUNDI | Total |
| origin | KENYA | 0.0 | 54.3 | 385.6 | 197.9 | 0.0 | 637.8 |
| | UGANDA | -1814.5 | 0.0 | 3.1 | 1618.1 | 0.0 | -193.3 |
| | TANZANIA | -4296.6 | 3.5 | 0.0 | 1082.6 | 0.0 | -3210.5 |
| | RWANDA | -5.8 | 3.1 | 0.0 | 0.0 | 0.0 | -2.7 |
| | BURUNDI | 0.0 | -0.7 | 0.0 | 4020.7 | 0.0 | 4020.0 |
| | Import Total | -6116.9 | 60.2 | 388.7 | 6919.4 | 0.0 | |

**EXPORT CHANGES (world prices)**




**Total welfare effects**

| | | A | B | C | D=A+B |
|---|---|---|---|---|---|
| | | Producer surplus | Consumer surplus | Tariff revenue | Net welfare effect |
| country | KENYA | 99.4 | -158.3 | -86.8 | -58.9 |
| | UGANDA | 43.9 | -11.7 | -12.8 | 32.2 |
| | TANZANIA | 165.5 | -1.3 | -32.8 | 164.2 |
| | RWANDA | -0.2 | -12.7 | 13.4 | -12.9 |
| | BURUNDI | 105.0 | 0.0 | 0.0 | 105.0 |




**Note:** Values are in US Dollars (in thousand US $)

**Figure 8: Edible fruit and nuts, peel of citrus fruits or melons (HS-08) changes in trade and welfare effects**

**Coffee, tea, mate and spices (HS-09)**

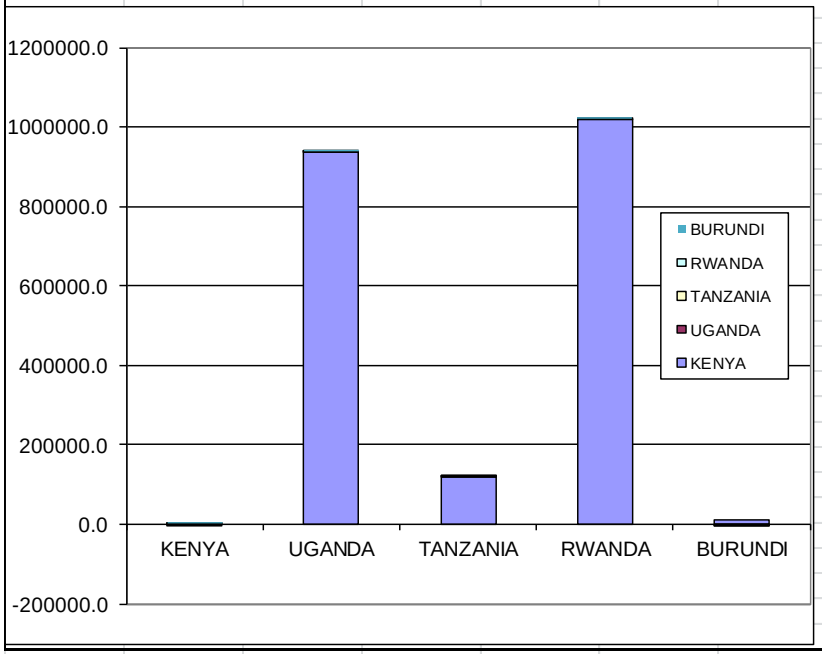
All East African countries improved the producer welfare as well as the net welfare effect in trade of coffee, tea, mate and spices with reduction of trade tariffs (Figure 9). Further, only Kenya and Rwanda had improved consumer welfare resulting from trade. All countries also experienced a decrease in tariff revenue collection with Kenya experiencing the highest. This may be because for products such as tea and coffee, Kenya hosts the largest auction market at Mombasa which taps into all East African countries. Therefore, the large increase in imports of coffee, tea, mate and spices can be attributed to the auction. The same case applies to the large export values by all countries but Kenya.

All countries but Kenya experienced an increase in demand for coffee, tea, mate and spices. However, only Kenya and Tanzania had improvement in prices as well as positive changes in supply. Overall, the internal prices decreased for Kenya and Rwanda while they increased for all other countries with notable increases for Burundi. Tariff reduction resulted in changes in trade quantities to Kenya from other East African countries. Trade flow is also notably changing from the landlocked countries to those with a shoreline. The findings supported findings by Ouma (2017) who argued that border liberalization among EAC member states would enhance intra-regional agricultural trade

**Trade at world prices: change in values**

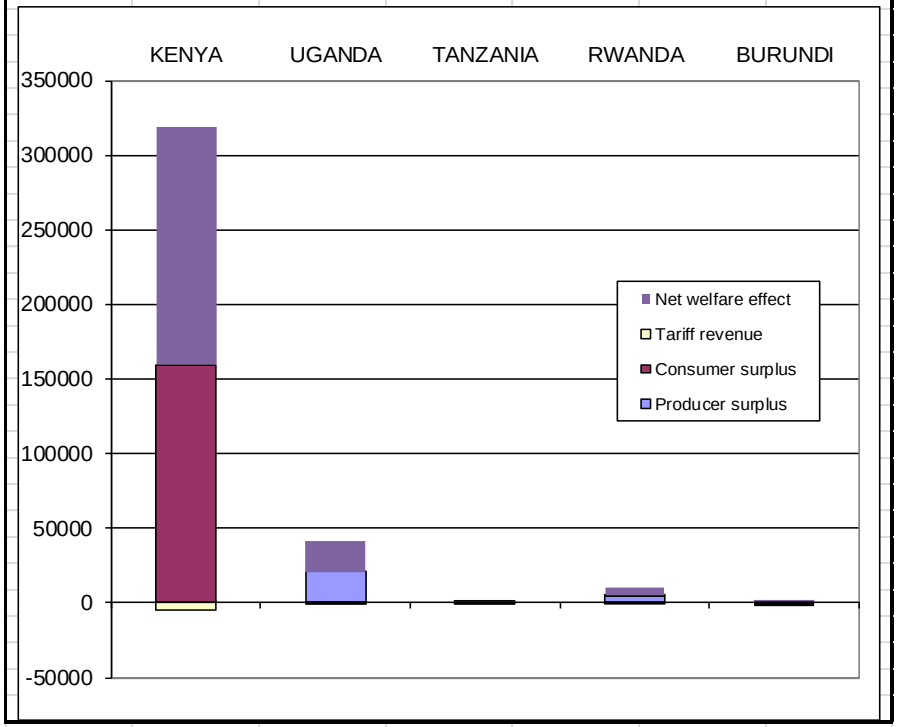
| | | destination | | | | | Export |
|---|---|---|---|---|---|---|---|
| | | KENYA | UGANDA | TANZANIA | RWANDA | BURUNDI | Total |
| origin | KENYA | 0.0 | -138.6 | 16.6 | 22.6 | 2.3 | -97.1 |
| | UGANDA | 937560.7 | 0.0 | 0.9 | 74.8 | 1.5 | 937638.0 |
| | TANZANIA | 118426.0 | 3.4 | 0.0 | 0.3 | -0.1 | 118429.6 |
| | RWANDA | 1019964.9 | 187.1 | 0.1 | 0.0 | 0.4 | 1020152.4 |
| | BURUNDI | 9500.5 | -25.0 | 0.0 | -1259.1 | 0.0 | 8216.4 |
| | Import Total | 2085452.1 | 26.9 | 17.6 | -1161.3 | 4.1 | |

**EXPORT CHANGES (world prices)**




**Total welfare effects**

| | | A | B | C | D=A+B |
|---|---|---|---|---|---|
| | | Producer surplus | Consumer surplus | Tariff revenue | Net welfare effect |
| country | KENYA | 198.5 | 159185.2 | -4900.0 | 159383.7 |
| | UGANDA | 20870.6 | -29.4 | -77.6 | 20841.2 |
| | TANZANIA | 230.6 | -1.7 | -21.7 | 228.9 |
| | RWANDA | 4915.8 | 176.3 | -6.5 | 5092.1 |
| | BURUNDI | 465.2 | -334.4 | -2.8 | 130.7 |




**Note:** Values are in US Dollars (in thousand US $)

**Figure 9: Coffee, tea, mate and spices (HS-09) changes in trade and welfare effects**

**Cereals (HS-10)**

Cereals form one of the main food staples for East African countries particularly maize which is one of most traded commodities (FSNWG, 2017; Ihle *et al.,* 2010). Figure 10 shows that a reduction of cereals tariffs led to increased net and improved consumer welfares for all countries but Uganda and Burundi. Further, all countries but Uganda and Rwanda experienced improved producer welfares. However, all countries had a decrease in tariff revenue collected for cereals. The results also revealed an increase in export values for all countries as well as increased import values with exception of Uganda which had a decrease in imports. Cereals trade has been improving in the region with support from Eastern Africa Grain Council (EAGC) that monitors and facilitates exchange through farmer training, capacity building and market creation (EAGC, 2016).

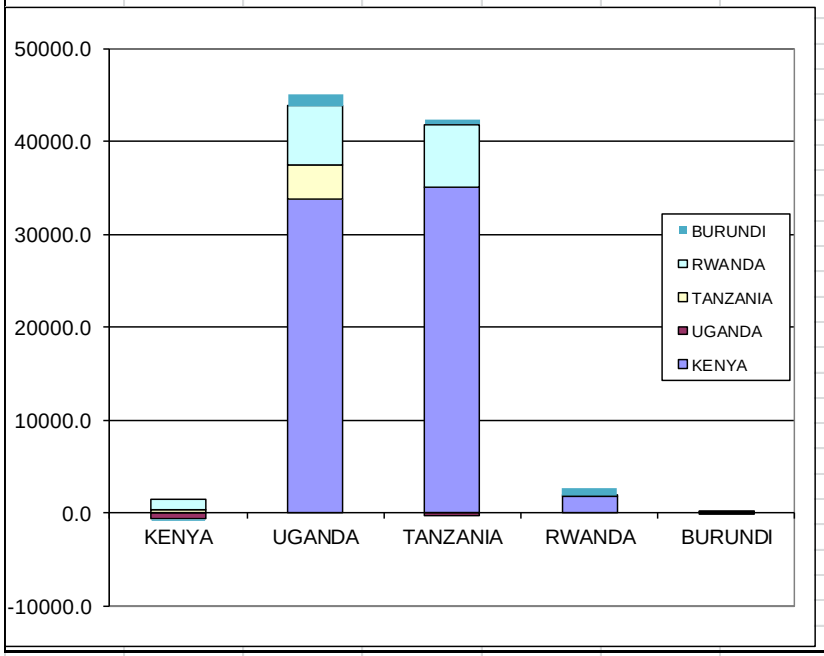
There were increased market clearing prices in Kenya and Tanzania while all other countries had decreased prices. Further, all countries had an increased demand for cereals attributed to population increases. However, only Kenya and Tanzania had improvement in supply of cereals which could be attributed to favorable climatic conditions. Overall, all countries had demand increase more than supply with the exceptions of Kenya. The proportional changes in internal prices saw an overall decrease in all countries but Uganda and Burundi.

Uganda and Rwanda increased their trade quantities to all their trade partners. The results further revealed that Tanzania and Burundi decreased their trade quantities to Uganda despite increasing (trade creation) to other trading partners. On the other hand, Kenya diverted cereals trade from Uganda and Burundi to Tanzania and Rwanda. Similar findings have been reported by FSNWG, 2017 where they summarize the changes in volumes and prices of cereals across Eastern Africa.

**Trade at world prices: change in values**

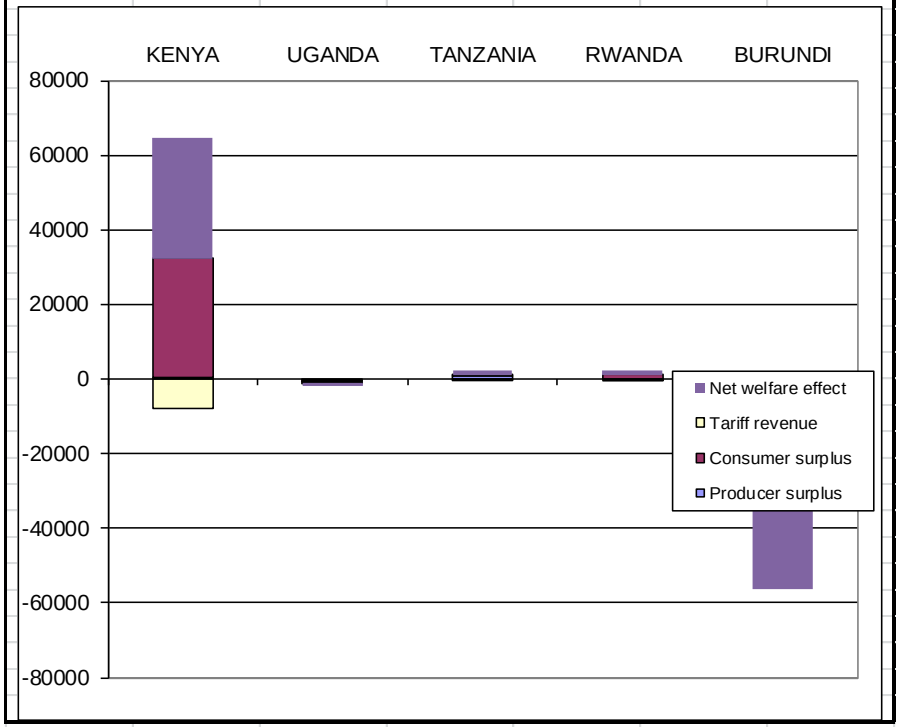
| | | destination | | | | | Export |
|---|---|---|---|---|---|---|---|
| | | KENYA | UGANDA | TANZANIA | RWANDA | BURUNDI | Total |
| origin | KENYA | 0.0 | -662.0 | 351.5 | 1071.1 | -3.5 | 757.1 |
| | UGANDA | 33804.0 | 0.0 | 3615.2 | 6393.9 | 1232.6 | 45045.7 |
| | TANZANIA | 35113.4 | -396.3 | 0.0 | 6659.7 | 589.0 | 41965.9 |
| | RWANDA | 1783.0 | 0.7 | 0.0 | 0.0 | 920.6 | 2704.2 |
| | BURUNDI | 0.0 | -9.8 | 2.7 | 63.8 | 0.0 | 56.7 |
| | Import Total | 70700.4 | -1067.4 | 3969.3 | 14188.5 | 2738.7 | |

**EXPORT CHANGES (world prices)**




**Total welfare effects**

| | | A | B | C | D=A+B |
|---|---|---|---|---|---|
| | | Producer surplus | Consumer surplus | Tariff revenue | Net welfare effect |
| country | KENYA | 394.2 | 31824.8 | -8012.7 | 32219.0 |
| | UGANDA | -580.3 | -323.8 | -75.3 | -904.1 |
| | TANZANIA | 763.1 | 315.1 | -127.5 | 1078.3 |
| | RWANDA | -6.1 | 1094.0 | -525.6 | 1087.8 |
| | BURUNDI | 42.8 | -26063.6 | -4083.8 | -26020.8 |




**Note:** Values are in US Dollars (in thousand US $)

**Figure 10: Cereals (HS-10) changes in trade and welfare effects**

# CHAPTER FIVE
# CONCLUSIONS AND RECOMMENDATIONS

## 5.1 Conclusions

The following are the conclusions of the study:

1. There is a general decrease in tariff barriers (TBs) and non-tariff barriers (NTBs) in the trade agricultural food commodities in the East African Community (EAC) across the 16 years study period (1999-2014).

2. Sharing a border, being landlocked, number of duty-free and *ad-valorem* lines, and the official language of trading partners significantly influenced the level of trade between and among EAC countries. Reduction of tariffs, opening and diversifying the import markets led to a relatively high increase in consumer surplus, despite rise in prices, to the importing country as shown by the effects on commodities like live animals. On the other hand, higher prices and expanding the export markets is not only beneficial to producers of the exporting countries but also to the EAC community at large as indicated by higher cumulative net gains.

3. Opening trade by lifting trade TBs and NTBs in EAC has net welfare gains across most of the commodities. Overall, introduction of TBs and NTBs attracted counter measures by the affected trading partner countries. This relatively reduced traded quantities leading to a net welfare loss for both trading partners.

## 5.2 Recommendations

The study recommends the following based on the conclusions:

1. EAC countries can consider reducing NTBs through increasing the number of duty-free and *ad-valorem* lines, reducing distance and time taken to deliver bulk products. This can be done through investing in common high-speed transport networks like the standard gauge railway and renovating highways connecting these countries especially where the trading partners do not share a common border or involves a landlocked partner.

2. The EAC can consider promoting a common language especially English and Kiswahili which are more widely spoken by most of the EAC countries. On the other hand, despite the need to attract more trade by reducing TBs, they should be reduced carefully as they are a source of government revenue. Additionally, each country seeking to gain more from exports, should lobby for more markets within and outside the EAC.

3. Finally, countries should identify the agricultural food products they have a comparative advantage in producing or with a reliable big export market to maximize the net welfare gains from trade. For example, Kenya can invest more in producing and exporting live trees and other plants, bulbs and roots; and meat and edible meat offal products. Tanzania can consider producing and exporting edible fruit and nuts, peel of citrus fruits or melons; and cereals. Kenya and Uganda can consider producing and exporting coffee, tea, mate and spices. On the other hand, Kenya can consider importing more of cereals and buying more coffee, tea, mate and spices from her neighbors to add to its export volumes since these products attract relatively high consumer surplus. Rwanda, which is landlocked country, can gain more consumer surplus from importing fish and crustaceans, molluscs and other aquatic invertebrates. Burundi would be at better welfare gains if it imported more of live animals, and dairy produce, birds' eggs, natural honey, edible products of animal origin. However, Burundi should consider low cost local production of fish and crustaceans, molluscs and other aquatic invertebrates; edible vegetables and certain roots and tubers; and cereals to reduce the high consumer losses.

### 5.3 Further Research

1. Future research can consider evaluating the net growth in trade and welfare gains, over a period of years, not only between EAC countries but also with the rest of the world, to inform more global solutions and ways of promoting trade.

2. Future research work can also consider empirical evaluation of deadweight losses due to changes in TBs and NTBs so as to determine levels of trade policy inefficiencies that cause losses to consumers, producers and the government in the trade in agricultural food commodities.

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## APPENDIX 1

**Table 21: Food commodities Harmonized System (HS) product codes**

*(HS classification found in the International Standard Industrial Classification (ISIC) Revision Four (4) of the Agricultural and Food Sector)*

| HS product code (2-digit level) | Product name | Examples of foods |
|---|---|---|
| HS-01 | Live animals | Cattle, goats and sheep |
| HS-02 | Meat and edible meat offal | Meat and unprocessed milk from cattle, sheep and goat |
| HS-03 | Fish and crustaceans, molluscs and other aquatic invertebrates | Tuna, calamari, prawns, shark, octopus, Nile perch, tilapia |
| HS-04 | Dairy produce, birds' eggs, natural honey, edible products of animal origin, not elsewhere specified or included | Milk, honey, eggs and meat from ducks, geese, chicken, turkey, ducks |
| HS-07 | Edible vegetables and certain roots and tubers | Cabbages, eggplants, carrots, potatoes |
| HS-08 | Edible fruits and nuts, peel of citrus fruit or melons | Avocadoes, bananas and plantains, mangoes, pineapples, grapefruit, oranges, lemons, tangerines, cashew nuts, coconuts, olives, oil palms |
| HS-09 | Coffee, tea, mate and spices | Coffee, tea, chilies, peppers, ginger, nutmeg, cloves |
| HS-10 | Cereals and grains | Wheat, maize, rice, beans |