AN ASSESSMENT OF TRADE EFFECTS OF EAST AFRICAN COMMUNITY CUSTOMS UNION ON AGRICULTURAL TRADE

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE DEGREE IN AGRICULTURAL AND APPLIED ECONOMICS, UNIVERSITY OF NAIROBI

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November, 2014

DECLARATION AND APPROVAL

DECLARATION

This thesis is my original work and has not been previously presented for an award of a degree in this or any other University.

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APPROVAL

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DEDICATION

This thesis is dedicated to my wife Amina Marie Aimée who endured my absence during the whole period of my postgraduate studies.

ACKNOWLEDGMENTS

I would like to thank all people and organizations who contributed in one way or another to the success of this research project.

My sincere gratitude goes to my University Supervisors, Dr Patrick Irungu and Professor Chris Ackello-Ogutu for their invaluable time, dedication, advice and encouragement throughout the whole process.

The research reported in this thesis could not have been possible without the funding from the CMAAE Program of the African Economic Research Consortium (AERC). I appreciate all the assistance provided by them for both my postgraduate studies and the preparation of this thesis.

I would also like to thank Mrs Jane Magoola (UBOS - Uganda), Mr Dominique Ntirushwamaboko and Mr Mukama Antoine (BNR-Rwanda), Officers at Tanzania National Bureau of Statistics (NBS), Ms Kwizera Martine (Burundi), Mr Otim Herbert (Uganda), and other people who facilitated me in the process of getting the secondary data for the study and making it easy for me to move and find my way in the East African region. Many thanks go, as well, to Ms Umutesi Angelique for an introduction to computer applications that enabled the data analysis.

Lastly, the moral and financial assistance provided by my family members, the families of Ngolo Chrispus and of Kanamugire S. and friends are highly appreciated.

ABSTRACT

This thesis investigates the trade effects of East African Community Customs Union (EAC CU) on agricultural trade, focusing on four of a number of products classified as sensitive by the EAC CU, namely, maize, rice, sugar and wheat. Secondary data on EAC member countries' imports, gross domestic product (GDP), population and purchasing power parity (PPP) of both importing and exporting countries covering 2005 and 2011 as well as data on distance between major cities in trading countries and borders between countries were obtained from different sources. A single commodity gravity model was estimated using Ordinary Least Squares (OLS). The objective was to examine the determinants of import flows of those products in the region as well as the trade effects of the EAC Customs Union on their trade. The relevance of the intra-EAC trade in the total EAC import was also analyzed using descriptive statistics. The results show that the intra-EAC import in those products represented very small proportions of the region's total import. Those proportions were 0.5, 26, 3.4 and 5.5 percent on average for wheat, maize, sugar and rice respectively. Further, the gravity model showed that GDP, population, PPP, distance, common border and membership in EAC were important determinants of import flows in the region but the magnitude and signs of their coefficients as well as their level of significance were product and period specific. The coefficient for EACM (import of member from non-member) for both wheat and rice was negative and statistically significant (-6.255 in 2009-2011 for wheat, -7.391 in 2005-2011 and -5.20 in 2009-2011 for rice), suggesting that the EAC CU had gross trade diverting effects on both products. It was positive and statistically significant for sugar in the first period (3.341 in 2005-2008) suggesting that sugar from outside of the region was more preferred to the one produced in the EAC. With its CET set at 100 percent, the results suggest that the EAC does not have a competitive advantage on sugar production, hence consumer continue to pay high prices on both domestically produced and imported sugar.

With regard to maize, the results suggest that the EAC CU had no trade effect on its trade for the coefficient for EACM for maize was not statistically significant in the two periods.

The study recommends that the EAC as a bloc and individual member countries should promote policies that aim at eliminating physical and other non-tariff barriers and hindrances to trade in the region. More specifically all the products under this study should be removed from the list of sensitive commodities for the region contributes relatively little in EAC imports and the relatively higher tariffs on their import makes them relatively more expensive in the region and divert trade for wheat and rice.

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ABBREVIATIONS AND ACRONYMS

AERC: African Economic Research Consortium

APEC: Asian Pacific Economic Community

BNR: *Banque Nationale du Rwanda* (National Bank of Rwanda)

CEFTA: Central European Free Trade Area

CET: Common External Tariff

CEPGL: *Communauté Economique des Pays des Grands Lacs*

CEPII: *Centre d'Etude Prospective et d'Information Internationale*

COMESA: Common Market for Eastern and Southern Africa

CTA: *Centre Technique de Coopération Agricole et Rurale (CTA) (ACP-UE Accord de Cotonou)*

CUSFTA: Canada-United States Free Trade Agreement

EAC: East African Community

EAC CU: East African Community Customs Union

ECCAS: Economic Community of Central African States

ECOWAS: Economic Community of the West African States

EU: European Union

FEM: Fixed Effects Model

FTA: Free Trade Area

GDP: Gross Domestic Product

GNP: Gross National Product

IGAD: Inter-governmental Authority on Development (IGAD)

KRA: Kenya Revenue Authority

LSDV: Least Squares Dummy Variable

MERCOSUR: *Mercado Común del Sur* (Common Southern Market)

MFN: Most Favoured Nations

NAFTA: North American Free Trade Agreement

NISR: National Institutes of Statistics of Rwanda

NTB: Non Tariff Barriers

OBR: *Office Burundais de Recettes* (Burundi Revenue Authority)

OLS: Ordinary Least Squares

PPP: Purchasing Power Parity

PTA: Preferential Trade Area

REC: Regional Economic Community

REM: Random Effects Model

RESET: Regression Specification Error Test

RTA: Regional Trade Agreement

ROW: Rest of the world

SADC: Southern Africa Development Community

TBOS: Tanzania Bureau of Statistics

UEMOA: *Union Economique et Monétaire Ouest Africaine*

UBOS: Uganda Bureau of Statistics

UNECA: United Nations Economic Commission for Africa

USA: United States of America

USD: United States Dollars

USDA FAS: United States Department of Agriculture Foreign Agricultural Services

VAT: Value Added Tax

VIF: Variance Inflation Factor

WLS: Weighted Least Squares

WTO: World Trade Organization

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

1.1.1 The East African Community

The East African Community (EAC) is one of the eight African regional economic communities (RECs) that are currently operational. It is an intergovernmental body which comprises five countries: Kenya, Uganda, Tanzania, Rwanda and Burundi. South Sudan and Somalia have also expressed interest to join. The EAC is characterized by the diversity of countries' economic sizes and overlapping memberships.

The EAC was re-launched in July 2000 by its founding members Kenya, Uganda and Tanzania. These countries had had some cooperation since 1890s. For example, there was the construction of the Kenya-Uganda railway between 1897 and 1901, the establishment of the East African Currency Board (1905) and the East African High Commission (1947-1961) (Mugisa *et al*., 2009). In 1967, the three countries established the EAC for the first time but it collapsed in 1977 following disagreements among the founding countries. The vision of the revived EAC is to create wealth, raise the standards of living of all people of East Africa and raise the competitiveness of the region through increased production, trade and investment (EAC Development Strategy 1997-2000; Mugisa *et al.*, 2009).

The EAC countries consider a customs union as an entry point for future integration into a political federation. The Community wanted to reach a fully-fledged Customs Union between 2005 and 2010, a Common Market by July 2010 and a Monetary Union by 2012. Currently, the step of a Customs Union has been reached with a program that led to a gradual reduction of internal tariffs on asymmetrical basis (that is, the gradual preferential tariff reductions on

different commodities were offered by each country on country-to-country basis), establishment of a Customs Management Act, elimination of non-tariff barriers (NTBs) and trade facilitation; harmonization and development of EAC standards and the application of the Common External Tariff (CET) and the EAC Rules of Origin. Rwanda and Burundi joined the EAC in July 2007 and started implementing the EAC Customs Union (EAC CU) protocol in July 2009.

The EAC member countries formed the Customs Union to liberalize and promote intra-regional trade. Article 3 of the Protocol establishing the EAC CU gives the objectives of the Customs Union as furthering intra-regional trade liberalization, promotion of efficient production within the Community; enhancement of domestic, cross-border and foreign investment in the Community and promotion of economic development and diversification in industrialization in the Community (EAC, 2004).

1.1.2 EAC trade in selected sensitive goods

"Sensitive goods" are commodities of special interest to individual countries or regional blocs that are exempted from the "full application of agreed upon tariff rate formula" (Calpe and Prakash, 2005), in the framework of the World Trade Organization (WTO) negotiations' effort to removing tariff and non-tariff barriers to trade. For the case of the EAC CU, sensitive commodities are listed in the EAC Publication 1[1] and the Community has imposed on them a higher CET to protect domestic producers. These commodities were defined in line with the July 2004 Doha Round of negotiation led by the WTO. Article 41 of the July 2004 Framework for Establishing Agreement in Agriculture provides developing countries with options and responsibilities to define those products in order to designate, in the framework

[1] Annex 1 to the Protocol on the Establishment of the East African Customs Union, CET Version, 2007

of creating a freer world trade, certain agriculture products to be exempted from tariff cuts, based on criteria of food security, livelihood concerns and rural development (Azmal, 2007; WTO, 2004). That is, once those products are defined they are not subject to tariff cuts that were agreed upon in any trade negotiation be it at a particular regional bloc or WTO levels. The EAC CU has dressed a list of commodities classified as "sensitive goods". These include sugar, milk and milk products, rice, maize, wheat, cigarettes and second hand clothes (EAC, 2007).

The EAC is still a net importer of sensitive goods despite the fact that the EAC CU has imposed extra barriers over their imports from the rest of the world (ROW). According to data published in the EAC trade reports between 2006 and 2008, there is no clear declining pattern of import of sensitive goods from non-EAC origin. The only decline was observed in 2008 for goods imported by Tanzania and Uganda where their value decreased by 3.8 percent to 273 million and 7.8 percent to US$ 321.9 million, respectively. The main sensitive goods imported from outside the EAC were wheat, sugar and cement for Tanzania and wheat, meslin, portland cement, worn clothing and sugar for Uganda. In Kenya, the import value of sensitive goods increased by 77.1 percent; that is from about US$ 413 million in 2007 to US$ 732 million in 2008. The increase in Kenya's import of sensitive goods in 2008 was dominated by maize probably due to reduced domestic production, particularly following the 2007/2008 post-election violence.

The reasons for the failure of the CET to prevent the import of sensitive goods into EAC cannot be established by just analyzing the status of imports of sensitive goods in the last few years. However, one could suspect insufficient production and their relatively high cost of production of to be the reasons why the region is still importing them in relatively large quantities. With their CET rates set relatively high compared to other goods imported in the

region, consumers in the EAC continue to pay higher prices for these commodities, whether locally and externally sourced, leading to reduced welfare.

This study sought to assess the effect of the EAC CU on trade patterns for four out of a number of goods designated as sensitive in the EAC context. It focused on trade patterns of maize, rice, sugar and wheat for the period 2005-2011. All the EAC countries are net importers of the four commodities, except Uganda in the case maize. Table 1.2 shows that EAC countries had a trade deficit for the majority of those commodities between 2005 and 2009.

Table1. 1. Net exports of maize, wheat, sugar and rice from the EAC (nominal USD, 1000)

Country	Item	2005	2006	2007	2008	2009
Burundi	Maize	-10600	-12850	-22200	-4362	-4200
	Wheat	-488	-1121	-2456	0	-12700
	Rice	-937	-4666	-2780	-1160	-9385
	Sugar	43[2]	-4423	-3464	-4636	-5070
Kenya	Maize	-19727	-143108	-101290	-236196	-1504026
	Wheat	-105262	-110776	-170876	-201839	-177319
	Rice	-51946	-62595	-69507	-86127	-94755
	Sugar	-41068	-59165	-94368	-71123	-92196
Rwanda	Wheat	-600	-2300	-2317	-404	-11000
	Rice	-3544	-6128	-7438	-4975	-9142
	Maize	-12997	-2166	-2918	-2991	-10991
	Sugar	-4127	-8838	-13859	-16068	-20428
Tanzania	Maize	1478	-52496	9641	-5458	-8325
	Wheat	-88330	-121087	-202540	-168186	-209076
	Rice	-13436	-21088	-2140	-14709	-10945
	Sugar	-17284	-31440	-40265	-20838	-44503
Uganda	Maize	-2231	4595	7281	394	14359
	Wheat	-104989	-120999	-117124	-122720	-144988
	Rice	-15529	-10464	-13239	-13460	-16511
	Sugar	-17452	-24916	-30674	-22706	-20430

Source: Trade deficit calculated from FAOSTAT data accessed on 20 February 2012

As Table 1.1 shows, the EAC countries continue to be net importers of maize, wheat, sugar and rice even after starting the implementation of the CU protocol.

Isolating the trade effects of the CU from other influences on the nature of growth in trade presents some challenges. First, there is a problem of overlapping membership with countries belonging to different RECs or other trading agreements with some preferential treatments. For example, apart from Tanzania, all the other members of the EAC belong to the Common Market for Eastern and Southern Africa (COMESA). On the other hand, Rwanda and Burundi are members of the Economic Community of the Great Lakes Countries (CEPGL)

[2]Shaded numbers show positive trade balance for the specific products.

while Tanzania belongs to the Southern Africa Development Community (SADC). Kenya and Uganda also belong to the Inter-governmental Authority on Development (IGAD). In addition, there are Kenya-European Union (EU) trade agreements which could influence Kenya's trade behavior, etc. Secondly, there are simultaneous implementation of different policies at the EAC CU level, such as the application of the CET, the gradual elimination of internal tariffs and the reduction of NTBs. This study examined the determinants of import flows and assessed the trade effects of EAC CU on regional agricultural trade.

1.2 Problem statement

The determination of the welfare effects of a regional trade agreement (RTA) is an empirical issue. Theoretically, RTAs could be beneficial or harmful to participating countries because the discriminatory and preferential nature of those trade deals generates both trade creation and/or trade diversion (Viner, 1950, cited by Magee, 2004). With the removal of internal tariffs, imports shift from the most efficient suppliers to producers (or country) receiving preferential treatment which constitutes *trade diversion*. Trade can also go to the most efficient suppliers in the bloc from the country's inefficient ones which is essentially the *trade creation* (Freund and Ornelas, 2010). There are questions which can only be answered by an empirical study for each trade agreement. First, because forming or joining a RTA is a political decision, it is important to find out whether economic considerations, which are expected to be welfare enhancing, influence such political decisions. Second, following the implementation of a RTA or a REC, it is important to find out whether the trade creation effect outweighs trade diversion, or rather, whether the REC is welfare improving or not.

It is clear from the objectives of the EAC CU that the intention of its creation was to improve the welfare of citizens of member states through increased intra-regional trade and promotion of foreign direct investments in the region. However, if intra-regional trade increases as a

consequence of trade-diverting policies, then the EAC CU will not have achieved its welfare-improving objective. Attempts have been made to predict the trade and revenue impacts of the EAC CU (see for instance Castro *et al.*, 2004), and to descriptively evaluate the implementation and impacts of the EAC CU on the three founding members (see for example Mugisa *et al.*, 2009). On the one hand, prospective studies make unrealistic assumptions and are based on past data so that they are not able to provide the right estimation of the impact of joining any given RTA on trade and welfare. On the other hand, while descriptive studies give insights on what is happening within a REC, they lack the capacity to attribute the change observed to the act of joining the RTA. For example, Mugisa *et al.*, (2009) found the increase in intra-EAC trade and tax revenues in the three founding states over the first four years of implementing the CU. In addition, the study also established that trade in agricultural products remained dominant for all partner states except Kenya. However, it was not able to determine the level of change in trade and tax revenues that could be attributed to the implementation of the EAC CU. Although some press and EAC trade reports have depicted the evolution of EAC regional trade, to the best of the author's knowledge, no thorough and systematic empirical analysis has been undertaken so far to specifically document the link between the observed trends in agricultural trade volumes and the implementation of the EAC CU protocol. Among the EAC member countries, virtually no study has been done to understand the effect of the CU on agricultural trade. This study aims at filling this gap in knowledge.

1.3 Purpose and objectives of the study

The purpose of this study was to examine the effects of the EAC CU on regional agricultural trade in four out of a number of sensitive goods, that is, maize, rice, sugar, and wheat. The specific objectives of the study were:

i. To characterize trade in selected agricultural commodities in the EAC since its inception by describing the trends of their imports as well as the market share of member countries and the region as a whole.

ii. To evaluate the trade effects of the EAC CU.

iii. To examine other factors affecting the trade flows for maize, wheat, rice and sugar in the EAC.

1.4 Hypotheses of the study

The following hypotheses were tested in the study:

1. Trading countries' GDP, population, purchasing power parity (PPP), sharing a common border, and distance between trading partners, taken singly, have no effect on trade flow of maize, rice, sugar and wheat in the EAC.

2. The EAC CU has no trade diverting effect on trade flow of maize, rice sugar and wheat in the EAC.

1.5 Justification of the study

The founding members of the EAC as well as the countries which joined later formed the EAC CU with the objective of improving the welfare of their people through increased intra-regional trade. Joining the EAC was considered by countries such as Rwanda as one of the solutions to deal with the challenges of being small and landlocked and with high cost of transport that affected its external trade. After eleven years of integration and six years of implementing the EAC CU protocol, it is important to assess its impact on agricultural trade. Agriculture remains the dominant sector in the economies of each of the five EAC Partner

States in terms of its contribution to the GDP, employment, food security and poverty reduction.

This study focused of four out of a number of sensitive commodities under the EAC CU list. These are wheat, rice, maize and sugar. The EAC CU decided to protect them probably considering them as products fulfilling the WTO criteria of sensitive goods, that is, those contributing to meet the region's and individual countries' food security, livelihood and rural development needs. They are protected with higher tariffs than the standard Common External Tariffs (CETs). According to the EAC Publication 1 (CET Version, 2007), the EAC standard CET is zero-rated for meritorious commodities and raw materials; 10 percent for intermediate goods and 25 percent for final goods originating from outside the region. However, the CET for sugar, maize, wheat and rice are higher than those of other categories of goods as they are set at 100, 50, 60 and 75 percent, respectively. The four sensitive goods are special commodities by virtue of their extra protection in the EAC and some (such as maize and rice) enjoy special attention in national policies (such as agricultural subsidies and tax waivers) due to their importance in food security provision and employment creation. Theoretically, countries produce and sell products for which they are relatively more technically efficient in producing and/or those that intensely use factors of production they abundantly own[3]. With international trade, their producers are able to dispose of some of the surplus amounts of the products in exchange for goods produced abroad that are demanded domestically, thus leading to efficient use of world resources. With the implementation of the EAC CU, the four commodities are subject to relatively free movement in the region but with

[3]Those are two models of international trade: the Ricardian and the Hecksher-Ohlin models. On the one hand, the Ricardian model argues that countries are involved in trade because they have differences in technology, hence comparative advantage in different products which is the source of gains from trade. On the other hand, the Hecksher-Ohlin theory of international trade basically states that productive differences among countries come from differences in factors of production endowment leading to gains from trade (Krugman and Obstfeld, 2009).

higher barriers on similar commodities from outside. They are therefore set apart in comparison to other commodities (such as manufactures) traded in the region with less distortions and trade barriers, thus justifying why they have been selected for this study.

This study provides information on the trade effect of the EAC CU. Implementation of customs unions is expected to have some sort of welfare effects whether negative or positive. This study therefore provides some information on the welfare effects of adopting the EAC CU. In addition, the results of this study provide some of evidence needed for future regional integration and trade policy prescriptions. Policy choices and regional integration negotiations are often based on the prospects of the consequences of regional integration on the welfare of concerned stakeholders, that is, government, consumers, producers and other value chain actors. Further, the study applies one of the international trade policy analysis methodologies in an EAC context and explores its explanatory strengths and limitations with regard to analyzing the effect of a single regional trade agreement on trade flows. This way this study contributes to existing stock of scientific knowledge.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical review

In this subsection the forms of economic integration and the customs union are briefly presented. In addition, the concepts of trade creation and trade diversion are reviewed in the context of the research problem and the stated objectives.

2.1.1 Forms of economic integration

The theory of economic integration refers to commercial policy of discriminatively reducing or eliminating trade barriers only among collaborating nations (Gandolf, 1987). Trade barriers include tariffs, quotas and other non-tariff obstacles such as long administrative procedures (for instance the issuance of licences and multiplicity of compliance requirements); corruption, roadblocks, etc. Economic integration is a process that combines separate economies into large economic regions Geda (2006). The types of economic integration include the preferential trade area (PTA), the free trade area (FTA), the CU, the common market and economic union (Gandolf, 1987; Geda, 2006). The PTA provides lower barriers to trade among participants as member countries give each other preferential trade concessions. In the FTA, all barriers are removed on trade among members but each member country maintains its own barriers to trade with the ROW. This is the case for the North American Free Trade Agreement (NAFTA) consisting of Canada, the United States of America (USA) and Mexico that came into force in January 1994.

The CU is the FTA which imposes a CET against non-members while in the Common Market, barriers among members are removed, the CET imposed and there is free movement of factors of production (Geda, 2006). The protocol establishing the EAC Common Market

was signed in July 2010 but at the implementation level, the EAC is still a CU. The economic union goes beyond the common market by harmonizing or even unifying the monetary and fiscal policies of member countries. The EU is at the stage of an economic union with free movement of labour, capital and goods and services. In addition, the majority of countries in EU use a common currency, the Euro, and there are European policies such as the Common Agricultural Policy (CAP), that have been decided at European central level and implemented in member countries.

2.1.2 Theories of customs union and concepts of trade creation and trade diversion

The formation of a CU is likely to open trade among members of a given REC and imposes CET on non-members. The theory of customs union has mainly concentrated on the net welfare effects on member countries given its potential to create trade among members and divert trade from non-members (Geda, 2006).

Trade creation occurs when lowering or removing internal tariffs allows a partner country to import from another member country to replace high cost domestic production (Geda 2006, Sarker and Jayasinghe, 2007, Recalde and Florensa, 2008; Viner, 1950). In other words, when tariffs are removed, new flows of commodities amongst member countries replace non-efficient (high cost) domestic production, which improves the welfare especially of consumers in importing country. *Trade diversion*, on the other hand, occurs when the removal of tariffs causes trade to be diverted from a third country to the partner state despite the fact that, were the countries treated equally, the third country would be the low cost producer of imports. Hence, trade diversion has negative welfare effects especially on consumers in importing country. The net effect of a trade agreement (such as a CU) is given by the difference between the trade creation and trade diversion (Sarker and Jayasinghe, 2007).

Following the partial equilibrium analytical framework (also known as Viner-Lipsey-Meade approach), the net effect of a CU depends on the level of barriers imposed on goods from the ROW and the circumstances in which it was formed. Factors such as the pre-integration structures of demand and supply, levels of tariffs and of competitiveness or complementarity of the economies of countries forming the union, have an influence on possible outcomes of formation of a CU (Gandolf, *op.cit.).* For further details on the analysis of the welfare effects of a CU a graphical illustration of the partial equilibrium analytical framework of the net welfare effects of a CU is presented in Appendix I.

As the decision to form an RTA such as CU is a political one, other factors than welfare improvement can influence it. The theoretical political economy arguments about the reasons why governments can choose a non-efficient trade policy (protectionism or policies other than free trade) focus on the lobbying of pressure groups and the relationship between voters and politicians (Krugman and Obstfeld, 2009). Grossman and Helpman (1995) argue that governments that find campaign contributions from interest groups have more weight than the median voters' in their objective function will choose more protectionist, hence more trade-diverting RTAs (Freund and Ornelas, 2010). Other reasons such as those related to food security (or food self-sufficiency) as well peace and security, can influence the government's decision to join a RTA that promotes protectionist policies such as higher CET. In the later cases, governments may choose to join a RTA for other political gains at the expense of welfare improvements in the society in terms of efficiency in production and higher consumer surplus that a country would benefit in a free trade setting.

The potential of a CU to generate both negative and positive welfare improving effects as well the possibility for governments to make decisions to join an RTA for reasons other than welfare considerations, call for empirical studies to establish the effects of regional groupings

or trade agreements. It is in this line that this study was done for the case of agricultural trade in EAC CU.

2.2 Empirical review

Empirical studies on the trade effects of RTAs have used different approaches depending on the context or the RTA under the study and the nature and availability of data and tools of analysis. Studies on the *ex ante* effects of RTAs simulate what would happen to trade, imports or exports, welfare and government revenue if a trade agreement was adopted. *Ex post* studies use different methods to examine the effects of those trade agreements especially on trade. Because the current study used an *ex post* approach, a number of *ex post* studies are reviewed below. The studies are divided into two main approaches: the gravity equation and the trade (import or export) variation model.

2.2.1 Empirical studies using import variation model

Clausing (2001) used the import variation model to estimate the trade creation and trade diversion effects of the Canada-United States Free Trade Agreement (CUSFTA). In the first equation, the yearly variation in percentage change of imports from Canada was regressed against the variation in tariff, the share of imports from Canada in the US total imports and a year dummy to capture the influence of other variables such as income and exchange rate that may change each year. That equation was used to estimate the effect of the change in tariff due to CUSFTA on the variation in the US imports from Canada. In the second equation, the percentage change of yearly imports from the ROW was regressed against the same variables as in the first equation including the variation of tariff on goods from the ROW.

The regression results showed that the elimination of tariffs had a statistically significant, positive and large effect on imports from the CUSFTA zone. Further, imports from Canada were 26 percent higher, owing to CUSFTA. Comparing this with the actual growth in U.S

imports from Canada, the study found that over half (54 percent) of the US$ 42 billion increase in US imports from Canada was due to CUSFTA. However, the share of imports from Canada was negatively related to the variation of imports from that country. This was contrary to the hypothesis that when a RTA is signed between natural trading partners the trade between them is more likely to increase much more than the one formed between non-natural trading countries. The authors attributed the finding to tariff liberalization that gave Canadian producers preferential treatment relative to those in other countries. Thus, Canadian firms were able to increase their exports where their initial share of the market was smallest (Clausing, 2001). With regard to the possibility of trade diversion, the study found no discernible relationship between the extent of Canadian tariff liberalization and import growth from the ROW.

Milner and Sledziewska (2007) used the same approach as Clausing (2001) to capture the effects of European Trade Agreement on Poland's manufactured imports in the presence of other trade effects such as those from the expansion of China and other trade agreements in which Poland is a member. The study estimated a dynamic log-linear equation with nominal variation as dependent variable instead of using the percentage change of imports from both the EU and the ROW as in the case of Clausing (2001). Two equations (one on import growth and the other on trade diversion) were estimated following Clausing (2001) on Poland's manufactured imports using time series data covering 1995-2002. To isolate the other complications such as the emergence of China as an important trading partner and other RTAs (for example the Central European Free Trade Area, CEFTA), the equation for the ROW was estimated with and without China and other RTA. The study found that the EU tariff was negatively related to Polish import growth from the EU and that the ROW tariff had a negative effect on the Polish imports from the ROW. Further, cross-tariff elasticities showed that a percentage fall in EU tariff led to, *ceteris paribus*, 0.95 percent increase in

imports from EU and 1.28 percent decrease in imports from the ROW while a percentage point fall in the ROW tariff led, *ceteris paribus*, to a 3.33 percent increase in imports from the ROW. The magnitude of absolute values of coefficients obtained by regressing tariff variation on variables hypothesized to influence imports in EU in the trade growth equation and the ROW in the import response from the ROW equation suggested that the growth of Poland's imports was dominated by trade-creation effects. That is, the growth of Poland's imports from the EU was dominated by its domestic production being replaced by more efficiently produced EU manufactured goods.

The trade variation models have the advantage of being able to include tariff as the main variable in determining the evolution of bilateral trade. In addition, a time-specific dummy helps to isolate the effect of other variables such as income and exchange rate from the effect of tariff variation on bilateral trade. However, it has some limitations. First, the approach is based on the assumption that equilibrium price and quantities prevail in the market. This assumption implies that the most important determinant of bilateral trade variation is the variation of tariff such that other variables like income and exchange rate can be captured by the period-specific dummy variable (Clausing, 2001). In other words, it is assumed that there are no other price distortions which can make the price to be different from the equilibrium price. However, this assumption does not always hold because markets are often imperfect due to the presence of oligopolistic behaviours, transaction costs and state action (either subsidies or taxes). Further, past studies seem not to take into account the evolution of trade agreements. For instance, Milner and Sledziewska (2008) start the analysis from 1995 while the agreement was signed in 1991 and came into force in 1992, while Clausing (2001) analysed the trade effects since the year of the creation of CUSFTA in 1989. There is, therefore, no consensus on which period the analysis should start. Finally, the approach considers tariff variation as the main policy instrument in trade agreement. This can lead to

misspecification of the model because in a trade agreement other policies such as elimination of internal tariffs, the application of CET and the elimination of NTBs can influence the volume of trade.

2.2.2 Empirical studies using gravity model

Many studies have used the gravity model to estimate either potential or real effect of trade agreements on trade (imports and exports). *Ex post* studies have used three distinct approaches to estimate changes in trade flows due to formation of a RTA. Musila (2005) surveyed studies that used gravity models and highlighted their common features and weaknesses.

Generally, the gravity model is analyzed using two approaches. The first approach estimates the gravity equation in its original form in which international trade flow is regressed against the size of the economy variables (GDP or GDP per capita, size of the population) and resistance variables (such as distance between countries, commonness of official languages, etc). The second approach estimates trade flows during the pre-integration period and compares them with those during the integration period. Another version of that approach tries to dynamically estimate trade flows which hypothetically would have taken place if integration had not occurred, also called the counterfactual or the *antimonde* (Recalde and Florensa, 2008). When structures of the *monde* (estimates of trade flows with integration) and of *antimonde* are statistically different, the impact of the trade agreement is estimated by calculating the difference between them. The third approach introduces dummy variables in the gravity equation for each trade origin, defined according to the membership status of the trading partner, to capture the trade creation and trade diversion effects of the agreement.

Jayasinghe and Sarker (2004) and Sarker and Jayasinghe (2007) used the dummy variable approach of the gravity equation to estimate the trade effect of the regional trade agreements

in agri-food products for the NAFTA and the EU respectively. Both studies used disaggregated data for six selected agri-food products (red meat, grains, vegetables, fruits, sugar and oilseeds) to estimate a log-transformed gravity model for each category of products for the period 1985-2000, divided into five three-year intervals. In these models, the total value of bilateral trade between two countries was regressed against each country's GDP, GDP per capita, population, and distance between them. Two dummy variables were used to capture membership status of each trading partner and time intervals. To account for heteroskedasticity, the generalized least squares (GLS) method was used. The study found that the standard gravity variables (GDP, GDP per capita and distance) were consistent with the prediction of the gravity model in estimating bilateral trade among the study countries. For EU and NAFTA, the level of trade between countries was positively related to the size of their economies (or GDP) and negatively related to the distance between them. Considered separately, NAFTA and EU members traded more with each other than they traded with non-members for five out of six commodities (red meat, vegetables, sugar, grains and fruits for NAFTA, and red meat, vegetables, sugar, fruits and oilseeds for the EU). This suggested that both trade agreements had a greater positive effect on trade between members than on trade with the ROW. In addition, the studies emphasized the necessity to examine the trade effects of RTAs for each commodity separately instead of aggregating them.

A number of limitations and weaknesses can be raised with regard to the application of the approach used in Jayasinghe and Sarker (2004) and Sarker and Jayasinghe (2007). This approach only shows evidence of the presence of trade diversion and trade creation effects without providing their magnitude. In addition, the authors of both studies found that using the summation of imports and exports as the dependant variable and imposing identical coefficients across countries as they did, may lead to model misspecification. They

recommended that future studies should consider using either imports or exports as a dependant variable and use country-specific fixed effects in the estimation.

Musila (2005) introduced dummy variables into the gravity model to assess the intensity of trade creation and trade diversion in COMESA, ECCAS and ECOWAS. Like in the case of Jayasinghe and Sarker (2004) and Sarker and Jayasinghe (2007), the trade effects were captured by the intra-group trade and member/non-member import and export dummies.

Musila's study is a bit different from the two previously reviewed studies in that it used total exports as the dependant variable instead of total trade (the sum of exports and imports). It also introduced two dummy variables to capture export and import diversions. A positive coefficient of intra-RTA trade dummy would suggest that member countries of respective groups traded more than the hypothetical trade as normally predicted by the standard gravity variables (the size and resistance variables). A negative coefficient of the dummy variable that captures imports from non-member states to members would indicate import trade diversion. Likewise, a negative coefficient of the dummy variable that captures exports from members to non-member states would indicate export trade diversion. Other important variables such as common border, language and membership to the CFA Franc Zone were also included in the model. The model was estimated using a log-transformed weighted least squares (WLS) regression. The results showed that exports in all of those regional integrations were positively related to their economic size (GNP), their degree of connectivity (common border, official language and the CFA Franc Zone) but negatively related to the distance between them. Further, based on calculated elasticities, the study concluded that joining ECOWAS and COMESA had a net welfare gain to member countries. However, there was no evidence to suggest that ECCAS had either trade creation or trade diversion.

Karemera *et al*. (2009) used a single commodity gravity equation to examine factors affecting trade flows, and evaluate the effects of different regional trade agreements on vegetables and fruits exports from the USA. The usual gravity equation economic variables, that is, income, population and exchange rates, and trade facilitation variables such as distance, were used, including the dummy variables to capture the gross trade creation of three trade agreements namely the Asian Pacific Economic Community (APEC), EU and NAFTA. The OLS method was used to estimate the gravity model because the panel data used exhibited a short time series (6 years from 1996 to 2002) and large cross-section units. The study found trade creation effects of NAFTA and APEC that were significantly greater than those of EU. In addition, the Asian Pacific Rim was found to be a significant destination of many vegetables and fruit from the USA. The study used an innovative methodology, namely, the State agricultural GDP instead of national (USA) GDP. Free trade variables were meant to capture gross trade creation instead of both trade creation and trade diversion. The last aspect is interesting in that the study recognized that there are trade diversion effects to consider before calculating the net trade creation effects. The study also demonstrates that the gravity model is an important tool to assess trade effects of regional trade agreements. However, the question remains whether the USA vegetables and fruits were being given preferential treatment in the EU (like removing trade barriers compared to goods from other non-EU countries) such that the positive sign of the EU dummy variable could be interpreted as trade creation.

Recalde and Florensa (2008) applied the *monde-antimonde* version of the gravity model (the projection approach) to assess the impact of "*Mercado Común del Sur*", MERCOSUR or the Latin American's Common Southern Market on Argentina's international trade in manufactured products. The results from the gravity model showed that income, population and distance were important determinants of bilateral trade flows. However, language

(having Spanish as official language) had no effect on bilateral trade. The study applied the Kalman filter technique to provide a statistically optimal estimator for the *antimonde*.

The Kalman filter considers the projection of the structure of the gravity equation to be static for the pre-integration period. In that sense, the structure of the gravity equation does not take into account the development of trade over time. It assumes that factors such as penetration of exports in foreign markets, efficiency of firms, economies of scale in production, evolution of non-tariff barriers, and economic cycles remain unchanged or their effects on international trade are exactly compensated (Mayes, 1978, cited by Recarde and Florensa, 2008). The results of the comparison between the projected *antimonde* and the estimated *monde* suggested that MERCOSUR started having impact on the Argentina's trade in 1994 instead of 1991 the year when the agreement was signed. In addition, the study found that trade creation was the main effect, that is, by far higher than trade diversion. The weakness of the *monde-antimonde* approach, like other methods that use the pre-integration data, is that it relies on "pre-integration periods that have long since passed" (Endoh, 1999).

2.2.3 Summary

The determination of the effects of a RTA on trade and welfare is an empirical issue. Theoretically, a RTA is considered to be welfare improving if its trade creation effects outweigh its trade diversion effects. Past *ex post* empirical studies have used gravity and import variation models to evaluate trade diversion/creation effects of different trade agreements.

The import variation model mainly focuses on effect of tariffs on variation of imports. It however fails to estimate and isolate the effects of other policy instruments implemented by the RTA on trade. The gravity model, on the other hand, estimates the trade effects of a trade agreement on import, export or total trade by estimating the difference between current level

of trade and the hypothetical trade as predicted by the gravity variables. The gravity variables relate to size of the economy (GDP, GDP per capita, population size, etc), while resistance factors include distance between trading countries and commonality of official languages. Empirical studies have applied different approaches such as creating a counterfactual by forecasting the pre-integration trade pattern (gravity equation) or introducing membership status dummy to capture the effect of RTA on trade. For the first gravity model approach, the difference between forecast pre-integration estimates and the actual gravity equation estimates serves as a basis for determining the trade effects while the second approach relies on coefficients of membership status dummy variables to determine the same. This study used the gravity model with membership dummy variables to assess the effects of EAC CU on agricultural trade.

CHAPTER THREE

METHODS AND DATA

3.1 Research Design

This study used a quantitative research method based on time series secondary data. It is based on both the Vinerian theory of customs unions and the gravity model of international trade.

The Vinerian theory of customs unions states that a CU has both positive and negative welfare effects if compared to a situation in which every member state is practicing protectionism. Viner (1950) demonstrated that the removal of trade barriers among CU members increases welfare by replacing expensive domestic products by inexpensive ones (that is, trade creation). However, because in the formation of a CU new trade barriers (such as CET) are imposed on products from outside the region, expensive products from within the region replace inexpensive products from without (that is, trade diversion) a phenomenon which negatively affects community welfare.

Appendix 1 presents the partial equilibrium analytical framework for the welfare effects of a customs union while the gravity model is briefly presented in this chapter.

3.2 Data type and sources

Annual secondary data for the five EAC member countries and their trading partners for the period from January 2005 to December 2011 were used to estimate the gravity model. The period was selected because the EAC CU started in January 2005. Secondary data on countries' annual total imports for the four products (HS 1006 Rice, HS 1001 Wheat or Meslin, HS 1005 Maize and HS 1701 Sugar) were obtained from the *"Office Burundais de Recettes (OBR)",* Tanzania National Bureau of Statistics (NBS), Kenya Revenue Authority (KRA), National Bank of Rwanda (BNR), and Uganda Bureau of Statistics (UBOS). The data

on GDP at current US$, PPP (conversion factor local currency per international US$), and total population were obtained from the World Bank Database (http://data.worldbank.org/). The database of CEPII ("*Centre d'Etude Prospective et d'Information Internationale*") (http://www.cepii.fr/) provided data on distance in kilometres between major cities of trading countries. Table 3.1 gives the summary of total observations by country pairs and EAC partners used for econometric model for each selected commodity.

Table 3. 1 Summary of observations among selected commodities

Item	Wheat		Maize		Sugar		Rice	
	2005-8	2009-11	2005-8	2009-11	2005-8	2009-11	2005-8	2009-11
Total Observations[4]	308	291	128	180	292	291	244	279
Country pairs	77	97	32	60	73	97	61	93
EAC Partners	36	41	20	28	38	40	30	39

Source: Author's compilation, 2013

3.3 Data analysis

3.3.1 Descriptive statistics

Quantitative secondary data were first analyzed using descriptive statistics in Microsoft Excel. Emphasis was given to trends of intra-EAC imports in comparison with total EAC imports, as well as the share of different EAC country members in regional trade. Those data were further transferred to Stata 10 where the econometric model specified below was estimated to examine the effects of different factors on trade flows of the four selected products in the EAC.

[4] The number of total observations reflects the number of total yearly transactions that took place during the period specified in Table 3.1 between the EAC CU countries and their respective trading partners. The number of country pairs reflects the number of partnerships between the EAC member countries and their respective trading partners during the specified period without taking into account how many times in terms of years the transactions in individual partnership took place. The econometric model was run using the "observations", that is, country pairs as reflected in different years in which the transactions between the two trading partners took place.

3.3.2 Econometric model

A gravity model was used to determine the factors influencing trade flows of the four selected agricultural products and to analyze the import effects of the EAC CU on them following Sarker and Jayasinghe (2007), Musila (2005) and Karemera et al. (2009). The gravity model was chosen because of its strong explanatory power and simplicity in estimating economic integration effects.

The EAC CU adopted a combination of policies that can simultaneously influence the change in trade patterns between EAC members and their trading partners. These policies include CET, a gradual reduction of internal tariffs and elimination of NTBs. The combined implementation of more than one policy instrument justifies the use of the gravity model with dummy variables on membership status instead of using the trade variation model as in the case of Clausing (2001).

The gravity model postulates that the volume of bilateral trade flow between countries *i* and *j* is positively related to the size of the economies (S_{ij}) and inversely related to the resistance or trade barriers between them (R_{ij}). The national income (GDP), the size of the population and sometimes the GDP per capita are often used as proxies for the size and wealth of the economies (S_{ij}). The distance between countries, commonality of official languages and sharing a common border are some of the variables considered as either aiding or resisting trade (R_{ij}). Distance between markets is often used as a proxy for transportation and transaction costs that influence the costs of imports and exports (Krugman and Obstfeld, 2009).

Following Karemera et al. (2009), Musila (2005) and Sarker and Jayasinghe (2007), a reduced traditional gravity was used to capture the key factors (see Equation 3.1). In this case, GDP, PPP and population size were used as proxies for the size of the economies of trading partners while sharing a common border dummy and distance between trading

partners were considered resistance variables to capture, respectively, the ease and effects of transport costs on bilateral trade. A free-trade variable, EACM, was included to examine whether membership in the EAC CU was aiding or resisting trade flows in terms of gross trade diversion. The empirical commodity-specific gravity model of bilateral trade fitted into the data was specified as:

$$imp_{ijt} = \beta_o gdpimp_t^{\beta_1} gdp\exp_t^{\beta_2} popimp_{it}^{\beta_3} pop\exp_{jt}^{\beta_4} dist_{ij}^{\beta_5} ppp\exp_t^{\beta_6} pppimp_t^{\beta_7}$$

$$EXP(\beta_8 border_{ij} + \beta_9 eacm)\delta_{ij} \qquad (3.1)$$

where:

imp_{ijt} : Total value in USD of imports by country *i* from country *j* in year *t*

$gdpimp_t$: Importing country GDP in current USD in the year *t*

$gdp\exp_t$: Exporting country GDP in current USD in the year *t*

$popimp_t$: Size of population of importing country in year *t*

$pop\exp_t$: Size of population for exporting country in year *t*

$dist_{ij}$: Distance[5] in kilometers between major commercial cities of two trading countries

$border_{ij}$: Dummy variable equal to 1 when two trading countries share the border and 0 otherwise

$pppimp_t$: Purchasing Power Parity of importing country in year *t*

$ppp\exp_t$: Purchasing Power Parity of exporting country in year *t*

[5] Distance was used as a proxy for transportation and transaction costs because it was difficult to find data on the two for each transaction made. The distance between commercial cities was preferred to the one between capitals because some countries' administrative capitals are not necessarily their economic capital. For example, Johannesburg is the economic capital of South Africa while Pretoria is its administrative capital. EAC members traded with more than 20 countries outside the EAC for each product.

$eacm$: Dummy variable capturing the trade effect of EAC CU; it is equal to 1 when the EAC CU member imports from a non-member and 0 otherwise.

Equation (3.1) was linearized by taking logarithms to become:

$$\log imp_{ijt} = \log \beta_o + \beta_1 \log gdpimp_t + \beta_2 \log gdp\exp_t + \beta_3 \log popimp_{it} + \beta_4 \log pop\exp_{jt} + \beta_5 \log dist_{ij} + \beta_6 \log ppp\exp_t + \beta_7 \log pppimp_t + \beta_8 border_{ij} + \beta_9 eacm + \delta_{ij} \quad (3.2)$$

Pooled time series and cross-section regressions for each product were estimated for two intervals (that is, 2005-2008 and 2009-2011). The whole period of implementing the CU protocol was divided into two periods. In the first period, the EAC CU had three members (Kenya, Tanzania and Uganda), while in the second period they become five as Rwanda and Burundi started implementing the protocol in July 2009. The expected signs for the coefficients of various variables are given in Table 3.2.

Table 3. 2 Description of variables in the empirical model and their hypothesized signs

Variable	Meaning	Expected signs	Relevant literature and comments
Total bilateral import (in monetary value)	Dependent variable	N/A	Musila (2005)
GDP exporting country	Independent Variable	Positive	Sarker and Jayasinghe (2005); Musila (2005). The higher the income the larger the export supply capacity
GDP importing country	Independent variable	Positive	Sarker and Jayasinghe (2005); Musila (2005). High income determine the level of import demand
Population exporting	Independent variable	Negative	Musila (2004). Large population means a large market and less dependence on international markets
Population importing	Independent variable	Indeterminate	Musila (2005). It can be either positive or negative. A larger population allows all producers to realize economies of scale. For domestic producers the realization of economies of scale would allow them to lower the cost of production thus competing with imports (negative) while it would allow exporters to find a sufficiently large market that enables them to compensate for transaction costs (positive).
Distance	Independent variable	Negative	Jayasinghe and Sarker (2005); Sarker and Jayasinghe (2007); Musila (2005). Long distance is likely to increase transportation and transaction costs

Variable	Meaning	Expected signs	Relevant literature and comments
Border	Dummy/independent variable	Positive	Musila (2005). Common border increases connectivity between countries
PPP[6] Importing country	Independent variable	Positive	The increase in the purchasing power in the importing country's currency stimulates exports from exporting country
PPP exporting country	Independent variable	Negative	Increase in purchasing power of exporting country's currency leads to producers selling in the domestic market instead of exporting their goods
EACM	Dummy/independent Variable	Negative	Musila (2005). A negative sign for this variable indicates gross trade diversion effects, that is, expensive products from the region are replacing similar inexpensive ones from outside because of the implementation of CU policies

Source: Author's compilation from different studies with similar research objectives

The magnitude and the signs of the regional dummy variable (EACM) indicate the level of gross trade diversion.

[6] PPP here is used as a proxy to bilateral exchange rate (see Agbodji, 2008) for the use of real exchange rate in assessing the impact of regional integration on bilateral trade;

3.4 Diagnostic tests for the econometric model

3.4.1 Choice of estimation method

There are different possibilities to estimate panel equations depending on the nature of available data and assumptions made about intercept, slope coefficients, and the error term (Gujarati, 2007). Following Greene (2003), consider the following single explanatory variable model:

$$y_{it} = \alpha_i + \beta x_{it} + \mu_{it} \quad , i = 1,2 \ldots \text{I and } t = 1,2,\ldots, \text{N} \qquad (3.3)$$

where y is the dependent variable, i stands for the i^{th} cross-section unit and t for the t^{th} time period; x is the explanatory variable, μ the error term and β is the coefficient to be estimated.

There are different techniques to estimate Equation (3.3). Both Gujarati (2007) and Greene (2003) give details on estimation techniques used depending on assumptions made. For instance, if the intercept and coefficients (α and β) are assumed to be constant across both time and space and that the error term captures differences over time and individuals, Equation (3.3) is estimated using the OLS (pooled) regression. If β is constant but α varies across individuals (that is α_i), the Fixed Effects Model (FEM, also known as the Least Squares Dummy Variable, LSDV) is used. In other words, each individual's intercept does not vary over time, it is time invariant. In case α_i is treated as a random variable rather than a fixed constant, the Random Effects Model (REM, also known as the Variance Components Model (VCM) or Error Component Model (ECM)) is used. The FEM allows unobserved individual effects to be correlated with included variables while REM is used when unobserved individual effects are strictly uncorrelated with included variables and are modeled as randomly distributed across the cross-sectional units (Greene, 2003).

In this study, two tests were used to decide which model to apply on each individual dataset. The Hausman test was used to choose between FEM and REM while Breusch and Pagan Lagrange Multiplier test was used to confirm existence of random effects and decide between using the REM or the Pooled OLS. The Hausman test was essential for the study because, as observed by Judge et al. (1982) (cited by Gujarati, 2007), the estimates obtained by the two methods (FEM and REM) can differ significantly when the number of cross-sectional units (*n*) is large and the number of time series (*T*) is small, in which case if the assumptions underlying REM hold, REM estimators are more efficient than FEM estimators.

3.4.1.1 The Hausman test

The Hausman test was used to assess the validity of fixed versus random effects models. The hypothesis tested was that the differences in coefficients estimated using the random and fixed effects models were not systematic against the alternative that they were, that is:

H_0: α_i are not correlated with x_{it}

H_1: α_i are correlated with x_{it}

Under H_0, the GLS estimator would be consistent and efficient and would call for the use of a random effects model. The Hausman test statistic has an asymptotic χ^2 distribution. Rejection of the null hypothesis would call for the use of FEM rather than a REM in which case the statistical inferences would be conditional on the error term of the sample (Gujarati, 2007).

3.4.1.2 Breusch and Pagan Lagrangian multiplier test for random effects

According to Maddala (2005) and Greene (2003), the Breusch and Pagan Lagrangian test for random effects tests the hypothesis that the error term, $\delta_\alpha{}^2 = 0$. This is the case where individual components do not exist; therefore the use of OLS method would be appropriate. The test statistic is given by:

$$\lambda = \frac{nT}{2(T-1)}\left[\frac{\sum_{i=1}^{n}\left[\sum_{t=1}^{T} e_{it}\right]^2}{\sum_{i=1}^{n}\sum_{t=1}^{T} e_{it}^2} - 1\right]^2 = \frac{nT}{2(T-1)}\left[\frac{\sum_{i=1}^{n}(T\bar{e}_{it})^2}{\sum_{i=1}^{n}\sum_{t=1}^{T} e_{it}^2} - 1\right]^2$$

where T and n are time and cross-section units respectively. Under H_0, λ is distributed as a χ^2 with one degree of freedom. If H_0 is rejected, OLS is not the appropriate method of estimation, hence the use of the REM with GLS.

Both the Hausman and Breusch and Pagan Lagrangian tests were used to determine the method of estimation for each of the equations. The p-values for the χ^2 from the Hausman test varied between 0.20 and 1 while those of the Breusch and Pagan Lagrangian test varied between 0.07 and 0.78 (see Appendix II). This meant that none of the tests showed statistical significance at five percent confidence level. The results led to the conclusion that neither FEM nor REM was appropriate for use. Therefore, a pooled OLS was used to estimate the gravity model for each product and period under the study.

3.4.2 Model specification errors test

To test whether the models were misspecified by omission of important variables, the Ramsey Regression Specification Error Test (RESET) was used. The Ramsey RESET uses an F-statistic calculated using the difference between R^2 obtained from the original model (old R^2) and the R^2 calculated from an extended model for which the estimated Y_i (that is $\hat{Y}_i$) is used as one of the independent variables (Gujarati, 2005). If F is statistically significant, the null hypothesis that the model is misspecified cannot be rejected (Gujarati, 2005).

In this study, the adjusted R^2 ranged from 0.257 to 0.078 (see Appendix III). According to Karemera et al. (2009), such values of R^2 are typical of cross-sectional-dominated series.

The results for the Ramsey RESET indicated that the models were adequately specified as the p-values for the F calculated ranged from 0.13 to 0.87 (Appendix III). Therefore, the null hypothesis that the model was misspecified could not be sustained.

3.4.2.1 Testing for heteroscedasticity

One of the assumptions of OLS is the presence of homoscedasticity or equal variance of the error terms (μ_i). In case this assumption is violated (which implies heteroscedasticity), the least squares estimators are still unbiased but inefficient with the variance estimates being also biased, thus invalidating the test of significance leading to type I error (Maddala 2005). The Breusch Pagan test was performed to detect the presence of heteroscedasticity in the data. The H_O for this test was equal variance (homoscedasticity) among the error terms. Where H_O was rejected, the OLS with robust standard errors was used.

The Breusch Pagan test suggested the absence of heteroscedasticity for all products except maize during 2005-2008 and sugar during 2009-2011. The p-values for the calculated χ^2 in the Breusch Pagan test were 0.0049 and 0.007 for maize in 2005-2008 and sugar in 2009-2011 respectively. Those for the other products ranged from 0.079 to 0.835.. The H_0 (homoscedasticity) was rejected for maize 2005-2008 and sugar 2009-2011. The inherent heteroscedasticity in maize and sugar series was resolved by running regressions with robust standard errors. The rest of the results of the Breusch-Pagan test for homoscedasticity are presented in Appendix V.

3.4.2.2 Testing for multicollinearity

The Variance Inflation Factor (VIF) for each variable was calculated to assess the presence of multicollinearity between independent variables. Where the VIF of a variable was found to be higher than 10, which happens when a variable is highly collinear (Gujarati, 2007), the

correlation coefficient was calculated to detect which independent variable the former was highly correlated with.

As shown in Appendix IV, the problem of multicollinearity was suspected between *gdpimp* and *popimp* in wheat 2009-2011, maize 2005-2008, sugar 2009-2011 and rice 2009-2011. It was also detected between *gdpexp* and *popexp* in maize 2005-2008. Apart from *gdpexp* in maize 2005-2008 for which the VIF was around 11.5, the VIF for other previously mentioned variables varied between 23.2 and 31.30 with correlation coefficients for various variable pairs being around 0.95. The problem was resolved by dropping *popimp* for most of the cases apart from Maize 2005-2008 and Rice 2009-2011 where GDP per capita of exporting countries (*pcgdpex*) and the GDP per capita of importing countries (*pcgdpim*) were used in place of *gdpexp* and *popimp* respectively. After corrective measures were undertaken, there was no problem of multicollinearity as all the calculated VIF were less than 10.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Description of agricultural trade in EAC

4.1.1 Import shares of countries in total EAC imports

As shown in Table 4.1, Kenya was the largest importer of maize, rice, sugar and wheat in the region. Its import share ranged between 51 and 93 percent of total EAC imports between 2005 and 2011. Tanzania and Uganda had less than 50 percent of imports, while Rwanda and Burundi imported relatively small amounts of the four commodities. It is worth noting that Uganda imports relatively small amounts of maize as it is the major maize exporter in the region. The same applies to Tanzania in the regional rice trade. Apart from Tanzanian wheat imports in both periods which represented 28.6 and 30.9 percent respectively, no other country imported more than 20 percent of all EAC imports.

Table 4. 1 Import share of selected commodities by country (in percentage)

Country	Wheat		Maize		Sugar		Rice	
	2005-08	2009-11	2005-08	2009-11	2005-08	2009-11	2005-08	2009-11
Kenya	51.9	51.4	79.9	93.1	64.3	52.3	81.4	76.5
Tanzania	28.6	30.9	16.3	2.9	17.8	18	7.9	2.9
Uganda	19.4	14.7	3.7	0.2	17.8	19.3	10.7	12.3
Burundi	N/A	0.4	N/A	1.2	N/A	2.1	N/A	2.6
Rwanda	N/A	2.6	N/A	2.5	N/A	8.3	N/A	5.7

Source: Author's computation

4.1.2 Intra-EAC share in total EAC imports

Table 4.2 presents the share of intra-EAC imports in total regional imports for the four commodities. The EAC member countries imported more food stuff from outside the region than they did within the bloc. Intra-EAC average imports in the seven years studied were less than 5 percent for wheat, rice and sugar and less than 26 percent for maize. Maize stands out as the most imported product in the region compared to others. Its intra-EAC imports varied

between 6.8 and 30 percent of the total with the exception of 2007 when they reached 88.5 percent. As for the other products, member countries export relatively very little to each other, a share below one percent of total EAC imports, perhaps due to low production which is hardly sufficient for domestic consumption.

Table 4. 2 Share of intra-EAC trade in total EAC imports (in percentage)

Commodity	2005	2006	2007	2008	2009	2010	2011	Average
Wheat	1.7	0.2	0.5	0.0	0.3	0.4	0.2	0.5
Maize	19.7	10.4	88.5	6.8	2.0	25.2	29.7	26.0
Sugar	3.8	2.3	3.3	1.3	3.2	5.5	4.6	3.4
Rice	1.1	0.4	5.1	4.2	4.6	13.3	9.9	5.5

Source: Author's computation

The trends of the share of intra-EAC exports in the EAC imports can be observed from Table 4.2. As it can be seen, with the exception of the unprecedented increase of maize imports in 2007, the intra-EAC share in the total import portfolio experienced a relatively small increase in 2007, then a decrease in 2008 to a steady increase in 2009 and 2010 with a relatively small decrease in 2011.

Table 4.2 also shows that intra-regional trade share of maize imports increased to more than 80 percent in 2007 while it had always been less than 30 percent before and after 2007. From the observation, this can be explained by the fact that 93.2 percent of Kenya's maize imports came from both Uganda and Tanzania with intra-EAC imports for the same product representing 82.4 percent of the total EAC imports during that year. In 2006 Kenya and Tanzania imported 45.4 and 49.1 percent, respectively, of total EAC maize imports, while imports from the region represented 15.9 and 6.1 percent of their total maize imports respectively.

4.1.3 Country export share in intra-regional imports

Individual EAC member country shares in intra-regional trade of the four commodities are presented in Table 4.3. It is clear that Tanzania dominated intra-regional market for rice in both periods (2005-2008 and 2009-2011) and of both sugar and wheat in the first period. The Tanzanian exports to the region accounted for 88.7 and 86.3 percent for rice in the first and second periods respectively and for 82 and 64.9 percent for sugar and wheat respectively in the first period. Tanzania was also a major contributor in the intra-regional export in maize, wheat and sugar in the second period, as its exports accounted for 33.3, 39.5 and 31.1 percent of the total intra-regional imports for the three products, respectively. Uganda dominated intra-regional maize market in both periods and sugar trade in the second period. Its shares were the highest in both periods with maize accounting for 48.3 and 61.7 percent in the first and second periods respectively. Sugar accounted for 66.8 percent of the total intra-regional export in the second period. Kenya was a major contributor in the wheat market with its exports accounting for 35.1 and 60.5 percent of intra-EAC imports in the first and second periods respectively.

Table 4. 3 Country export shares in intra-regional imports in percentage

Country	Sugar		Maize		Rice		Wheat	
	2005-8	**2009-11**	**2005-8**	**2009-11**	**2005-8**	**2009-11**	**2005-8**	**2009-11**
Burundi	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0
Kenya	17.4	1.9	10.5	4.7	8.6	6.5	35.1	60.5
Rwanda	0.0	0.1	0.0	0.3	0.0	0.1	0.0	0.0
Tanzania	82.0	31.1	41.1	33.3	88.7	86.3	64.9	39.5
Uganda	0.6	66.8	48.3	61.7	2.7	7.0	0.0	0.0

Source: Author's computation

In general, Table 4.3 gives a clear picture of the major sources of intra-regional imports for the four commodities. It is clear that Tanzania dominates intra-EAC imports in all products and that both Kenya and Uganda are major actors in the regions. The Table also shows that Burundi and Rwanda export very small quantities of some of the four commodities in the regional market.

4.1.4 Discussion

The descriptive statistics results suggest that despite the introduction of CET as part of the implementation of the EAC CU, EAC member countries import more maize, wheat, rice and sugar from outside than from within the region. The plausible explanation for this situation is the existing low productive capacity and, more importantly, the relatively high cost of production of the four commodities in EAC compared to global producers. For example, Kilimo Trust (2013) showed that Tanzanian rice, the major intra-EAC rice exporter with more than 85 percent of all intra-EAC rice export, is 20 percent more expensive than imported rice despite a 75 percent protective tariff. In addition, recent projections by United States Department of Agriculture (USDA) Foreign Agricultural Services indicated that Kenya needed to import from outside EAC between 200 and 300 million tons (with the total needs being estimated at 600 million and EAC likely to offer 200 to 300 million tons) of maize in 2013 (USDA FAS, 2012). As for sugar, it is reported that intra-EAC imports are affected by a combination of factors such as low levels of cane production due to erratic weather patterns,

cane poaching and anti-free trade practices such as dumping in Kenya (CTA, 2013). Dumping has led Kenya to block sugar imports from Tanzania, Uganda and Zambia. The same report showed that the current situation is such that the estimated current sugar production cost in Kenya is 138 percent higher than the most efficient COMESA sugar suppliers.

4.2 Factors affecting imports of maize, wheat, rice and sugar in the EAC

This Section presents and discusses the results of fitting the gravity model (Equation 3.2) using the pooled OLS. It addresses the remaining two specific objectives of the study which are to (1) examine the factors affecting the trade flows of wheat, maize, rice and sugar in the EAC, and (2) evaluate the trade effects of the CU on trade flows of the four commodities.

Table 4.4 presents the estimated coefficients of Equation 3.2 for maize, rice, sugar and wheat in the two periods studied. The results show that the significance, the magnitude and the possession of the expected signs of the estimated coefficients are product and period specific.

Table 4. 4 Gravity model parameter estimates for selected commodities in the EAC

Variable**	Wheat		Maize		Sugar		Rice	
	2005-8	**2009-11**	**2005-8**	**2009-11**	**2005-8**	**2009-11**	**2005-8**	**2009-11**
Gdpimp	-2.406 (0.39)	1.592 (0.093)	-6.711 (0.027)	0.492 (0.31)	-1.873 (0.43)	1.77 (0.00)	1.844 (0.43)	*pcgdpim* 3.764 (0.04)
Popimp	-3.818 (0.45)	pcgdpim 3.400 (0.27)	22.169 (0.00)	*	1.925 (0.64)	*	-5.544 (0.186)	-0.741 (0.31)
Gdpexp	-0.15 (0.72)	.6720 (0.083)	pcgdpex 2.804 (0.00)	1.061 (0.04)	-0.22 (0.49)	0.212 (0.58)	0.311 (0.39)	-0.452 (0.25)
Popexp	1.217 (0.010	0.066 (0.86)	2.23 (0.00)	-0.100 (0.83)	0.796 (0.013)	0.607 (0.07)	0.837 (0.008)	1.012 (0.002
Pppexp	-0.183 (0.41)	-0.049 (0.84)	1.062 (0.002)	0.538 (0.077)	-0.827 (0.000)	0.119 (0.57)	0.569 (0.004)	0.160 (0.38)
Pppimp	-0.496 (0.39)	0.928 (0.089)	-0.307 (0.617)	-0.472 (0.22)	-0.449 (0.37)	0.004 (0.98)	0.052 (0.915)	0.716 (0.08)
Dist	4.87 (0.00)	2.511 (0.03)	-5.91 (0.00)	-1.963 (0.065)	-6.583 (0.00)	-3.63(0.00)	-1.087 (0.27)	0.247 (0.79)
Border	6.91 (0.06)	0.318 (0.92)	0.185 (0.937)	2.682 (0.049)	-6.78 (0.00)	-4.561 (0.00)	-8.958 (0.006)	-2.870 (0.09)
Eacm	-4.16 (0.17)	-6.255 (0.07)	1.235 (0.56)	0.299 (0.85)	3.341 (0.09)	2.207 (0.28)	-7.391 (0.016)	-5.20 (0.017
Cons	78.10 (0.19)	-89.912 (0.000)	-235.2 (0.004)	-12.74(0.38)	68.33 (0.16)	-191 (0.13)	54.47(0.26)	-10.10 (0.40)

Source: Author's computation

*Dropped due to multicollinearity

**All variables were converted into their natural logs apart from the dummy variables (common border and EACM)

Numbers in parentheses are p-values for the t-ratios.

4.2.1 Effects of income, population and purchasing power parity on trade flows of maize, wheat, rice and sugar in the EAC

4.2.1.1 Effects of GDP on imports

GDP was statistically significant at different levels and had the expected positive signs for wheat ($p = 0.093$), sugar ($p = 0.00$) and rice (replaced here by the per capita GDP, $p = 0.04$) in the second period for importing countries but negative and statistically significant ($p = 0.027$) for maize in the first period. GDP in the exporting countries was statistically significant with a positive sign for wheat ($p = 0.083$) and maize ($p = 0.04$) in the second period. In the first period, the GDP per capita (used to replace GDP that was dropped because of multicollinearity) in exporting countries was statistically significant for maize ($p = 0.00$).

These results suggest that a rise in income of importing countries or of the productive capacity[7] of exporting countries led to increased trade flows of all the commodities except maize. The negative sign on GDP of importing countries for maize in the first period suggests that the increase in income in the EAC founding member countries led to a decrease in maize imports. This may be due to the fact that increased income may lead to internal productive capacity if the resources are reallocated to the production of that specific commodity thus decreasing imports. Another plausible reason is the fact that maize is an inferior good whose consumption decreases with increase in income (McConnell *et al.*, 2003), a factor that is corroborated by observed decrease in the trend of maize consumption in the EAC and COMESA, with countries increasingly switching to rice (Irungu, 2013).

[7]As income is one of the proxy variables to indicate the economic size of a country, its growth can indicate that the country is able to increase its production capacity. This is because increased income enables a country to invest in different factors of production such as human capital, research and development, and infrastructure, thus increasing its production and exporting capacity. An income increase could also lead to a substitution effect on consumption patterns.

4.2.1.2 Effects of population on imports

Population was an important determinant of trade flows of the products under this study. The coefficients of the variables representing population (that is, *popimp* and *popexp*) were positive and statistically significant for maize in importing countries and for all commodities in exporting countries during the first period. Similar results were obtained for sugar and rice in both periods for *popexp*. The variable *popimp* was dropped for maize in the 2009-2011 period because it was highly correlated with *gdpimp*.

The positive sign on *popimp* for maize suggests that maize is a staple food and preferred in the importing countries thus as the population grows in those countries, maize imports increases. In other words, the results suggest a percent increase in the EAC population translated into 22.16 percent increase in maize import demand (market size and absorption capacity).

It had been hypothesized in this study that the coefficient on *popexp* would be negative because an increase in exporting countries' population should lead, *ceteris paribus,* to an increase in consumption and hence increased domestic demand. This was, however, not the case in this study. The estimates obtained in this study suggest that a one percent increase in population in exporting countries led to 1.21 and 2.23 percent increase in trade flow of wheat and maize, respectively, in the first period and an increase of trade flow of rice (0.83 and 1.01 percent) and sugar (0.79 and 0.60 percent) in both periods. Hilburn (2006) and Karemera *et al.*, (2009) found similar results for trade flows of agricultural products for NAFTA and USA respectively. Karemera *et al*. (2009) suggested that the positive signs may be viewed as "commodity-specific and reflecting production scale and less domestic absorption effect". Both explanations (production scale and less domestic absorption effect) can be made on the results on maize. However, the positive signs for rice and sugar can probably be explained

by the production scale of both commodities in exporting countries. In the EAC, Uganda dominates as the major exporter in the intra-EAC maize market, with banana plantain being the major food staple. Thus, its maize surplus is mainly exported to Kenya, which is the largest net maize importer in the EAC.

4.2.1.3 Effect of purchasing power parity on imports

The estimated coefficients for PPP for importing countries (*pppimp*) were positive and statistically significant for wheat (p = 0.08) and rice (p = 0.089) in the second period. Likewise, the PPP for exporting countries were positive and statistically significant for maize (p = 0.002) and rice (p = 0.004) in the first period and positive and statistically significant for maize (p = 0.077) in the second period. It was however negative and statistically significant for sugar in the first period (P = 000). These findings suggest that a unit increase of the purchasing power of the currencies in both importing and exporting countries would, *ceteris paribus,* increase of import flow between them for maize and rice. It would however decrease the import flow of sugar. A percent increase in PPP for exporting country led to 1.06 and 0.56 percent increase in the import of maize and rice, respectively, in the first period, to 0.53 percent increase in the import of maize in the second period and to a 0.82 percent decrease in the import of sugar in the first period.

Theoretically, as the PPP in importing countries increase, all else being constant, exporters find it profitable to sell their goods where the PPP is higher. The converse is true. As stated earlier, the results corroborate theory only for coefficients of PPP for importing countries. The positive signs on PPP for exporting countries may be due to the fact that exporting countries for maize in both periods, and of sugar and rice in the first period, are countries with large scale production such that the large quantities produced cannot be absorbed in their domestic markets. In other words, international trade provides a "vent for surplus"

production, that is, "an outlet for surplus product above domestic market requirements" (see Myint, 1958).

4.2.2 Effects of distance and common border on trade flow of maize, wheat, rice and sugar

4.2.2.1 Effect of distance on imports

The distance between commercial capitals (*dist*) and sharing a common border (*border*) were included in the gravity model as factors resisting and aiding trade, respectively. The coefficients for distance were negative but statistically significant for maize ($p = 0.00$ and $p = 0.065$) and sugar ($p = 0.000$ and $p = 0.00$) in both periods and positive and statistically significant for wheat in both periods ($p = 0.00$ and $p = 0.03$).

These results suggest that the quantity of maize and sugar imported by EAC countries decreased as the distance from the exporting countries increased as expected. Karemera *et al.* (2009) and Sarker and Jayasinghe (2007) found similar results for US vegetable and fruits and EU's agri-food products respectively. On the other hand, the quantity of wheat imported into the EAC seemed to increase as the distance increased. The plausible explanation for this finding is that the cost of production of wheat is higher in EAC countries and its neighbors than in the major exporting countries. Kilimo Trust (2013) illustrates a similar pattern in the case of Tanzanian rice. The authors found that Tanzanian rice is 20 percent more expensive than the rice imported from Pakistan in spite of a 75 percent protective tariff already in place. Tanzanian rice would be 250 percent more expensive if the 75 percent tariff and Value Added Tax (VAT) were removed. The same explanation follows in the case of wheat. More of it is imported from cheaper sources outside the EAC irrespective of distance, transportation and other transaction costs.

4.2.2.2 Effect of common border on imports

Theoretically, a common physical boundary between two trading countries facilitates trade between them as there is the likelihood of having close cultural ties and natural relationships between their populations. However, the existence of an administrative boundary may impede trade because of border formalities that take time and probably money (Krugman and Obstfeld, 2009). Therefore, when countries share an administrative boundary the transaction costs are lower compared to countries without common borders because of the cost of transit. In this study, the estimated coefficients were positive and statistically significant for wheat in the first period (p=0.06) and maize in the second period (p=0.049). However, they were negative but statistically significant for sugar (p=0.00 and p=0.00) and rice (p=0.006 and p=0.09) in both periods.

The results suggest that a common border facilitated import of maize and wheat between neighboring countries in the respective periods. However, they also suggest that EAC member countries traded less with their neighbors in rice and sugar than they traded with the ROW. In monetary terms, the values of sugar and rice imported from either countries in the region (EAC members) or its neighboring countries accounted for only 5.9 and 6.6 percent of the total EAC imports respectively. The probable explanation is that the EAC and its neighbors have a competitive advantage in the production of both commodities as illustrated previously with the findings of Kilimo Trust (2013) for the case of the Tanzanian rice.

4.2.3 Effects of EAC customs union on trade flow of maize, wheat, rice and sugar

4.2.3.1 Effect of customs union on imports

To account for the effects of the CU on intra-EAC trade, two dummy variables, EAC (representing the trade between EAC members) and EACM (representing trade between a member and a non-member) were empirically examined in equation (3.2). Variable EAC was

however dropped due to its perfect correlation with EACM. In addition, due to the problem of multicollinearity, it was impossible to separate trade creation from trade diversion. The coefficient on EACM assessed whether the implementation of the EAC CU was diverting trade, encouraging extra-EAC trade or was neutral. The results in Table 4.4 indicate that EACM was negative and statistically significant for rice in 2005-2008 ($p = 0.016$) and in 2009-2011 ($p = 0.017$) and for wheat 2009-2011 ($p = 0.07$). However, EACM was positive and statistically significant for sugar during the first period only ($p = 0.09$).

4.2.3.2 Discussion

The results suggest that EAC member countries traded less with non-members for rice and wheat. As the use of variable EAC in the model generated the same coefficients but with positive sign, the results suggest that the EAC CU significantly boosted trade among its members but displaced trade in rice and wheat with the ROW, which is trade diversion. This finding enforces the idea that discriminatory trade agreements between countries have the potential to both boost trade between members and to divert trade from non-members (Geda, 2006). Therefore, to obtain the net welfare effects of those agreements the difference between the magnitudes of both measures (trade creation and trade diversion) has to be calculated. Sarker and Jayasinghe (2007) and Jayasinghe and Sarker (2004), respectively, found similar results with regard to the effects of EU and NAFTA on agri-foods trade flows.

The positive sign on EACM coefficient for sugar in the first period suggests that sugar from outside of the region was more preferred to the one produced in the EAC. With the CET for sugar set at 100 percent, the results suggest that the EAC does not have a competitive advantage on sugar production; hence consumers in the EAC continue to pay high prices for domestically produced and imported sugar. Sarker and Jayasinghe (2007) found a positive

influence of EU on trade flows of red meat, vegetables, fruits, sugar and oilseeds but with declining trends to the point of negatively influencing them for some cases.

The EAC CU had no trade effects on maize (in both periods) and sugar (in the second period). Additionally, when the EAC variable was included in alternative models, that is, EAC was used in place of EACM, its coefficients exhibited the same magnitude as EACM with the same level of significance but with different signs. This suggests that although the coefficients obtained from EACM may be viewed as gross trade diversion (or gross extra-import creation for sugar 2005-2008), there is no indication that there was trade (import) creation in the region due to the implementation of the EAC CU among the four commodities considered in this study. In other words, the results suggest that the increase in the intra-EAC imports of rice and wheat could be attributed to the decrease of imports from more competitive non-partner countries (that is trade diversion) and not to the replacement of high cost production from one partner country by a relatively low cost production from another EAC member (trade creation)[8].

[8]The issues of trade creation and trade diversion are understood in the context of the origins and quantities of import. There is trade creation when a country imports more from the region to replace high cost products from the domestic market while trade diversion occurs when the high cost products from the region replace cost efficient products from outside the region because of the barriers (CET, NTBs) imposed on them (Geda 2006, Sarker and Jayasinghe, 2007, Recalde and Florensa, 2008; Viner, 1950).

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The purpose of this study was to examine the determinants of import flows and the agricultural trade effects of the East African Community Customs Union (EAC CU). Secondary data on imports of maize, wheat, sugar and rice in EAC countries and their trading partners were obtained from relevant public institutions in the region and analyzed using descriptive statistics and a gravity model.

The data entry and descriptive statistics were done in Microsoft Excel. The data were later transferred into STATA 10 for econometric analysis. A gravity model for each commodity for the periods of 2005-2008 and 2009-2011 was estimated using the Ordinary Least Squares (OLS).

The OLS was chosen as the appropriate method of estimation based on the results of the Hausman and the Breusch Pagan Lagrangian Multiplier tests. In addition, the results of the Ramsey RESET showed that the models were well specified. Furthermore, the tests for multicollinearity and heteroscedasticity were performed and due measures taken such as dropping, transforming some variables and running regressions with robust standard errors.

The descriptive analysis of the data showed that EAC member countries import by far more from outside of the region than they do within the bloc and that the way each country tends to dominate the intra-EAC market share is highly commodity-specific. In the total EAC imports, the highest intra-EAC import for wheat was 1.7 percent in 2005 and never reached one percent for the whole period of the study. The share of intra-EAC imports fluctuated between 0.4 and 13.3 percent for rice and between 1.3 and 5.5 percent for sugar during 2005 and 2011.

With regard to maize, it fluctuated between 2.0 and 29.7 percent over the same period with arguably an unusual increase in 2007 where it reached 88.5 percent. The descriptive analysis showed also that Tanzania and Uganda dominated, in both periods, the intra-EAC markets for rice and maize respectively while Kenya was a major contributor in the wheat market in the first period and dominated it in the second. The intra-regional market for sugar was shared between Tanzania and Uganda with the former dominating it in the first period (88.7 percent) and the latter in the second (66.8 percent).

Based on the analysis, Kenya is the largest importer of the four sensitive commodities in the region as its import share in the total EAC imports ranged between 51 and 93 percent between 2005 and 2011. Apart from imports of wheat by Tanzania, which represented 28.6 and 30.9 percent in first and second periods respectively, no other country imported more than 20 percent of the total EAC imports in any of the three remaining commodities. Burundi and Rwanda contributed relatively very little to regional trade be it in total imports or in t intra-regional exports.

The results for the single commodity gravity model showed that the influence of various hypothesized factors and of the EAC CU was commodity-specific. The economic size factors (GDP, population and PPP) in both importing and exporting countries, and the factors aiding or resisting trade (distance between trading partners and sharing of a common border) were found to be important determinants of the EAC imports. However, the magnitude, significance and signs of their coefficients were commodity-specific. The same observation applied for the free trade variable EACM. It was found that the EAC CU had gross trade diverting effect on rice and wheat while at the same time increasing extra-EAC imports of sugar in the first period only.

5.2 Conclusion

This study demonstrated that economic size variables (income, population and PPP) as well as the trade facilitating (common border for example) and trade resisting (for example distance between trading partners) variables are important determinants of agricultural imports in EAC member countries. In addition, it demonstrated that a RTA can affect trade flows of different products in that bloc. The main finding of this study is that the EAC CU had a trade diversion effect for rice and wheat, while at the same time increasing the extra-EAC imports of sugar over the study period. However, the magnitude of the impact of the change in all the variables considered in this study varied from product to product. This emphasizes the need to study the impact of all those variables on each individual commodity's regional trade.

From the methodological viewpoint, the study demonstrated that the gravity model is an important tool to study international trade in general and specifically the trade effects of different RTAs. The results of this study led to the rejection of both hypotheses that all the cited factors taken singly have no impact and that the formation of the EAC CU has no trade diverting effects on the trade flow of the four products considered in this study. However, their impact and trade effects were commodity-specific.

5.3 Recommendations

Based on the findings, the study recommends the following actions that are aimed at improving the regional trade for agricultural products in the EAC CU:

1. The level of intra-EAC trade is still very low especially for wheat, rice and sugar compared to extra-EAC trade. The formation of a regional grouping is an important move toward removing barriers to trade between member countries. However, with the trend of intra-regional trade growth observed for the four sensitive commodities, it

is clear that, although they are protected against those from outside, especially with the implementation of higher EAC CU CET, there are still trade hindrances and their production capacities are still very low. Individual governments and the EAC as an organization should promote policies that enhance specialization so as to increase agricultural production and commercialization as well as help countries work together to eliminate non-tariff barriers.

2. The economic size variables were found to be important determinants of the flow of imports of the four sensitive agricultural commodities. This indicates that as the economy and the population grow, the demand for these commodities, with the exception of maize, is expected to grow for they are necessity staple foods. The EAC and member countries should promote policies that enhance the economic growth and improve physical (production and market) access to those commodities. Demographic policies that check the growth of their populations should also be emphasized.
3. Distance and the presence of a common border between trading partners were found to influence the trade flow in the region. The trade flows of maize and sugar in particular were negatively related to distance as expected. This indicates that EAC and individual country members should invest more in communication and transport infrastructure so as to reduce the transport and other transaction costs. At the same time, they should work with their development partners and other regional groupings to improve infrastructure.
4. The EAC CU was found to be trade (import) diverting especially for rice and wheat. Currently, the CET for those two products is 75 and 60 percent respectively while the highest for non-sensitive goods is 25 percent. The fact that intra-regional imports represent less than one percent for wheat and less than ten percent for rice is a clear indication that the region does not have the production capacity to satisfy the existing

demand and that EAC consumers are being obliged to buy expensive products from within the EAC at the expense of cheap products from outside of the bloc. The EAC should revise its policy on protection accorded to those products by removing the four commodities from the list of sensitive goods and probably apply a zero rate CET just as the raw material goods are being treated. This will enable consumers in the EAC to enjoy efficiently produced (relatively cheaper) imports. Alternatively, EAC member countries should invest in productivity-enhancing technologies in order to produce these commodities more competitively.

5.4 Limitations of the study and areas for future research

This study did not manage to estimate the trade creation effect of the EAC CU and consequently its net trade effect. The reason for that failure is two-fold, namely: lack of adequate methodology and lack of data on some variables. Most of the studies on trade use two dummy variables to capture the trade effect of the RTA. According to those studies a negative sign on a statistically significant coefficient of extra-regional trade (between member and a non-member) indicates trade diversion while the positive sign of the intra-regional dummy indicates trade creation (see for example Jayasinghe and Sarker 2004). Different magnitudes and levels of significance of those variables are only found in studies where there were many RECs under consideration, in which a third category of membership in the REC could be found, that is, trading partners for which neither of them was a member. That is, contrary to the case of the present study in which there were only two categories of country pairs: a member to a member (intra-regional trade) and non-member to a member (extra-regional trade, that is, *eacm* in the present study). In that case, the two variables would be perfectly collinear and impossible to fit in the same model. This brings the question of interpretation given to such variables in other studies. These variables were fitted in alternative model and found that the two have the same magnitude and level of significance

with the only difference found on their signs. It is therefore argued that the coefficient to extra-regional trade should be interpreted as gross trade diversion if it is negative and extra-regional import or export openness indicator if it is positive. The same interpretation should be applied for opposite signs on the intra-regional trade variable's coefficient. This interpretation is based on the definitions of trade creation and trade diversion. The trade creation effect happens when a member country's expensive products are being replaced by cheap products from the region (that is national products versus regional products). It is between individual country's products and the regional products while the trade diversion concerns regional products and those from outside. Neither data on domestic trade of the four commodities in each individual country nor the right methodology could be found to capture the trade creation effects of EAC CU. Future research should take that into account and find an appropriate methodology to achieve that objective which will allow the estimation of the net trade effect. In addition, future research should also estimate the welfare impacts of the EAC CU on economic agents other than the consumers, such as its effects on government revenues and producer surpluses.

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APPENDICES

Appendix I. PARTIAL EQUILIBRIUM ANALYTICAL FRAMEWORK FOR THE WELFARE EFFECT OF A CUSTOMS UNION[9]

The static partial equilibrium effects of forming a customs union are measured in terms of trade creation and trade diversion. Trade creation occurs when some domestic production in a nation that is a member of the customs union is replaced by lower cost imports from another member nation. Trade diversion, on the other hand, occurs when lower cost imports from outside the customs union are replaced by higher cost imports from a union member.

Assumptions:

- All economic resources are fully employed before and after formation of the customs union;
- Terms of trade doesn't change as result of joining the CU.

Illustration of a trade creating customs union

- let us denote

  p_W world price

  t non-discriminatory tariff

  p_P the price in the partner country P

  p_H the closed equilibrium price in the home country

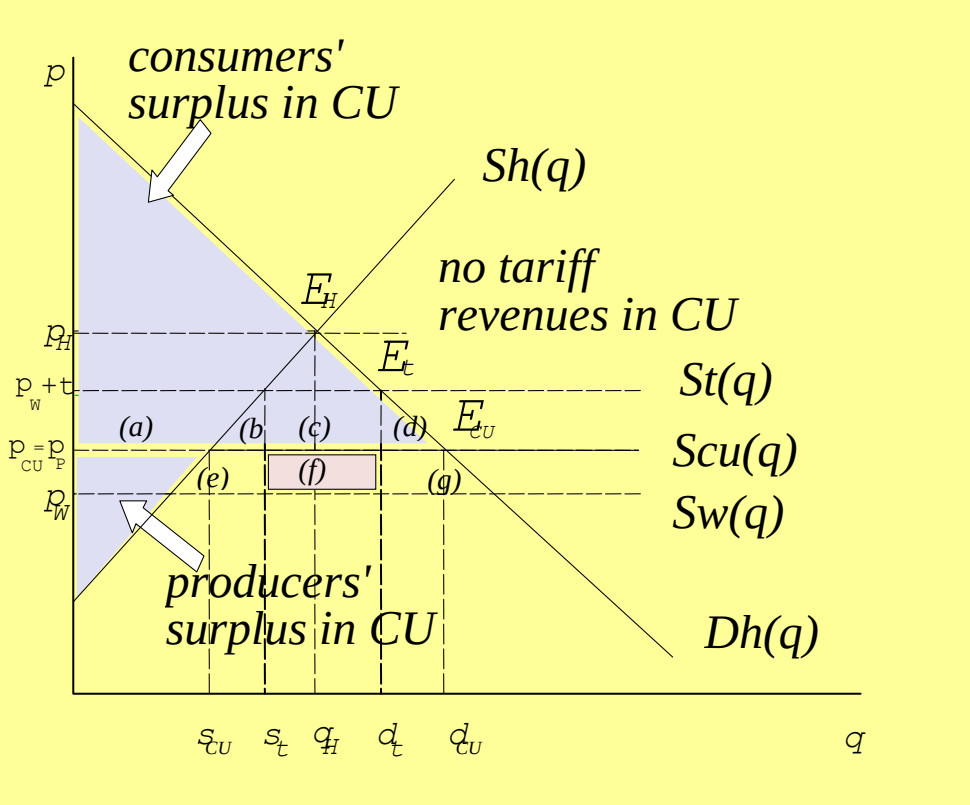
  p_W+t tariff protected price in H

  Sh(q) and Dh(q) : domestic supply and demand curves for country H

Assume that $p_W < p_P < p_W+t < p_H$

9 Adapted from Dr. Wadim Strielkowski Lecture Notes Advanced Economics Of European Integration - Microeconomic Aspects (2012) with inputs from Gandolf, (1987).

- Initial situation: the small country H covers part of its domestic demand by the tariff-protected import from the world market and considers formation of a customs union with big country P.
- It is also assumed that country H is too small to affect prices.



Source: Adapted from Wadim Strielkowski (Lecture notes 2012), with inputs from Gandolf, (1987).

Before the customs union, that is, in the tariff regime, country H imposed the tariff *t*, as the world price, P_w, is lower than the price for goods from country P, that is, P_p, consumers from H were buying quantity S_t from the domestic market and importing $d_t - s_t$ and areas (*c)* and *(f)* represent the tax revenues that the government receives in tax regime. The sum of the triangles *(b)* and *(e)* and *(d)* and *(g)* represent the distortions (or efficiency loss) caused by imposing the tariff on external goods. In other words, when a tariff is imposed, country H will gain in tax revenues *(c)* and *(f*) but nobody (consumer, producer or the government will gain the value of the areas covered by the two mentioned triangle, which is a "dead weight loss" to the society.

Suppose country H decides to form a customs union with country P. As result, tariff *t* will be maintained for goods from outside of the region. The quantities consumed domestically in H will increase from d_t to d_{cu}, with quantities $d_{cu} - s_{cu}$ being imported and s_{cu} produced domestically. Compared to previous scenario, the consumer surplus will increase by the sum of areas *(a), (b), (c)* and *(d);* domestic producers will lose *(a)* on their "producer surplus" and the government will lose tariff revenues *(c)* and *(f)*, with *(c)* adding to consumer surplus while *(f)* is a welfare loss resulting from diverting the initial $d_{t-}s_t$ quantities from the lower cost nation/world market to higher cost nation (P). The sum of areas covered by *(b)* and *(d)* are welfare gains resulting from pure trade creation. The net welfare gain of a customs union is given by the difference between *(b) + (d)* and the (*f*).

Appendix II. Results for Hausman and Breusch and Pagan Lagrangian tests

Commodity	Period	Hausman Test		Breusch-Pagan Test	
		X^2	p-value	X^2	p-value
Wheat	2005-08	0.75	0.99	0.82	0.36
	2009-11	1.11	0.99	0.53	0.46
Maize	2005-08	0.17 (-3.52)[10]	1.00	1.55	0.21
	2009-11	0.01	1.00	1.51	0.21
Sugar	2005-08	4.05	0.85	0.07	0.78
	2009-11	12.18	0.20	3.21	0.073
Rice	2005-08	0.56	1.00	0.74	0.38
	2009-11	0.07	1.00	0.73	0.39

Source: Author's computation

[10] The asymptotic assumptions were not met for the Hausman Test (results in paranthesis), the better results were obtained after PPP was dropped;

Appendix III. Results for Ramsey RESET and Model's goodness of fit tests

Commodity	Period	Adjusted R^2	OVTest
Wheat	2005-08	0.1005	F(3,295) = 1.86 (0.13)
	2009-11	0.0997	F(3, 279) = 0.72 (0.53)
Maize	2005-08	0.2576	F(3, 115) = 0.51 (0.67)
	2009-11	0.1204	F(3, 168) = 0.23 (0.87)
Sugar	2005-08	0.1515	F(3, 279) = 0.80 (0.49)
	2009-11	0.0784	F(3, 279) = 1.56 (0.20)
Rice	2005-08	0.1387	F(3, 231) = 0.37 (0.77)
	2009-11	0.1217	F(3, 266) = 1.45 (0.22)

Source: Author's computation

Appendix IV. Results for Multicollinearity test

Commodity	Period	Variables with high VIF	Overall VIF
Wheat	2005-08	gdpimp = 6.94	3.94
	2009-11	pcgdpim = 6.42	3.78
Maize	2005-08	pcgdpex = 8.71	5.20
	2009-11	dist = 8.95	4.05
Sugar	2005-08	6.42	3.61
	2009-11	gdpexp = 6.18	3.25
Rice	2005-08	Border 8.95	4.71
	2009-11	8.05	14.35

Source: Author's computation

Appendix V. Results for Breusch and Pagan Test of homoscedasticity

Commodity	Period	X^2	p-value
Wheat	2005-08	0.91	0.341
	2009-11	0.04	0.835
Maize	2005-08	7.91	0.004
	2009-11	3.09	0.079
Sugar	2005-08	0.84	0.359
	2009-11	7.28	0.007
Rice	2005-08	1.99	0.158
	2009-11	0.20	0.658

Source: Author's computation

Appendix VI. List of the EAC Trading Partner Countries

No	Wheat 2005 2008	Wheat 2009 2011	Maize 2005 2008	Maize 2009 2011
1	Argentina	Argentina	Argentina	Argentina
2	Australia	Australia	Australia	Australia
3	Belgium	Brazil	Belgium	Brazil
4	Brazil	Germany	Canada	Bulgaria
5	Bulgaria	Kenya	Denmark	Burundi
6	Canada	Netherlands	France	Canada
7	Czech Republic	Pakistan	India	China
8	Egypt	Paraguay	Italy	Congo (DR)
9	Ethiopia	Poland	Kenya	Ethiopia
10	France	Belgium	Malawi	France
11	Germany	Brunei Darusaalam	Mozambique	India
12	India	Canada	Netherlands	Italy
13	Iran	China	Saudi Arabia	Kenya
14	Italy	Cyprus	South Africa	Malawi
15	Kazakhstan	Egypt	Tanzania	Mozambique
16	Kenya	Estonia	Uganda	Pakistan
17	Korea Republic	Ethiopia	UAE	Rwanda
18	Lithuania	France	UK	Saudi Arabia
19	Malta	Germany	USA	Singapore
20	Netherlands	Hungary	Zambia	South Africa
21	Poland	India		Tanzania
22	Romania	Kenya		Thailand
23	Russia	Latvia		Uganda
24	Rwanda	Lithuania		Ukraine
25	Serbia	Malaysia		UAE
26	Singapore	Mexico		USA
27	Slovakia	Netherlands		Zambia
28	South Africa	Pakistan		
29	Switzerland	Panama		
30	Tanzania	Poland		
31	Turkey	Russia		
32	Ukraine	Saudi Arabia		
33	UAE	South Africa		
34	UK	Swaziland		
35	USA	Switzerland		
36	Uruguay	Tanzania		
37		Ukraine		
38		UAE		
39		UK		

40		USA		
41		Uruguay		

Source: Author's compilation

No	Sugar 2005 2008	Sugar 2009 2011	Rice 2005 2008	Rice 2009 2011
1	Belgium	Algeria	Australia	Algeria
2	Brazil	Australia	Bulgaria	Australia
3	Bulgaria	Belgium	Cameroon	Brazil
4	China	Brazil	Canada	Burundi
5	Congo (DR)	Canada	China	Canada
6	Denmark	China	Egypt	China
7	Egypt	Colombia	Germany	Congo (DR)
8	France	Congo (DR)	Hong Kong	Egypt
9	Germany	Denmark	India	Germany
10	Guatemala	Egypt	Italy	Greece
11	India	Egypt	Japan	Hong Kong
12	Italy	France	Kenya	India
13	Japan	Germany	Malaysia	Indonesia
14	Kenya	Hong Kong	Oman	Ireland
15	Malawi	Hungary	Pakistan	Italy
16	Mali	India	Russia	Japan
17	Mozambique	Indonesia	Singapore	Kenya
18	Netherlands	Italy	South Africa	Korea Republic
19	Pakistan	Jordan	Switzerland	Kuwait
20	Poland	Kenya	Tanzania	Malawi
21	Saudi Arabia	Lebanon	Thailand	Netherlands
22	Singapore	Luxembourg	Turkey	Oman
23	South Africa	Malawi	Uganda	Pakistan
24	Sudan	Malaysia	UAE	Rwanda
25	Swaziland	Mauritius	UK	Saudi Arabia
26	Sweden	Mozambique	USA	Singapore
27	Switzerland	Netherlands	Uruguay	South Africa
28	Tanzania	Pakistan	Vietnam	Spain
29	Thailand	Rwanda	Yemen	Sri Lanka
30	Uganda	Saudi Arabia	Zambia	Tanzania
31	UAE	South Africa		Thailand
32	UK	Swaziland		Turkey
33	USA	Switzerland		Uganda
34	Zambia	Tanzania		UAE
35		Thailand		UK
36		Uganda		USA
37		UAE		VENEZUELA
38		UK		VIETNAM
39		USA		YEMEN
40		Zambia		

Source: Author’s compilation