ANALYSIS OF BURUNDI'S TRADE FLOWS IN SELECTED FOOD COMMODITIES IN EAST AFRICAN COMMUNITY, 2003-2018

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DECLARATION AND RECOMMENDATION

Declaration

This thesis is my original work and has not been presented in this university or any oth
the award of a degree.

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DEDICATION

This thesis is dedicated to my beloved wife Irakoze Evelyne, my mother, my uncles, my brother and sisters.

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ABSTRACT

Burundi integrated into the East African Community (EAC) in 2007. Since then, trade flows in food commodities has not been given adequate attention in empirical analysis. Few studies done neither focused on bilateral trade flows at commodity level nor identified which country Burundi intensively trades with. Hence, this study was carried out to bridge that gap left by previous studies. Furthermore, it was meant to provide a quantitative information regarding food trade between Burundi and other EAC countries. Specifically, this study characterized the evolution of the patterns of food trade between Burundi and other EAC countries, determined the intensity of food trade and estimated the factors which affect food trade between Burundi and other EAC partner states. To meet these objectives, both descriptive and explanatory design were used. First of all, this study critically analyzed the trends of the patterns of food trade and determined the intensity of food trade between Burundi and other EAC countries. Thereafter, a gravity model was applied to estimate the factors which influence Burundi's food trade with other EAC countries. Before embarking on data analysis, the tests related to the nature of the data used and other tests were performed in order to prevent from obtaining biased estimates. Therefore, the data was tested for stationarity and multicollinearity. In addition, provided that this study used panel data, a Haussman test was used to choose between random and fixed effect models. This study which was limited in time (from 2003 to 2018) involved five EAC countries namely Burundi, Kenya, Uganda, Tanzania and Rwanda. Moreover, only four food commodities suchlike maize, rice, sugar and wheat were concerned. The results indicated that there has not been such a significant increase in the patterns of food trade as a result of Burundi's integration into the EAC. Furthermore, the results showed that Burundi remained a net food importer with few quantities of maize, rice, sugar and wheat exported to other EAC countries. The results clearly evidenced that among other EAC countries, Burundi intensively imported food commodities from Uganda followed by Tanzania. However, it was noted that sugar imports were relatively more intensive with Kenya. The results particularly pointed out that Burundi did not intensively import food commodities from Rwanda. Lastly, the findings revealed that the GDPs, the exchange rates and the distance were the major factors which statistically influenced food trade. Other factors like trade openness and infrastructure development indices influenced trade depending on the commodity and the direction of trade (either imports or exports). Thus, Policy makers in Burundi should set relevant policies to efficiently optimize food trade between Burundi and other EAC countries.

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LIST OF ABBREVIATIONS AND ACRONYMS

AEC	African Economic Community
ASEAN	Association of South-East Asian Nations
BRB	Banque de la République du Burundi
CEPGL	Communauté Economique des Pays des Grands Lacs
EAC	East African Community
CEPII	Centre d'Etude Prospective et d'Information Internationale
CET	Common External Tariff
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization Statistics
GDP	Gross Domestic Product
GDPC	Gross Domestic Product per Capita
ISTEEBU	Institut des Statistiques et des Etudes Economiques du Burundi
MINAGRIE	Ministère de l'Agriculture, de l'Elevage et de l'Environnement
MT	Metric Ton
OBR	Office Burundais des Recettes
PWT	Penn World Table
REC	Regional Economic Community
SITC	Standard International Trade Classification
TAFTA	Thailand-Australia Free Trade Agreement
TO	Trade Openness index
UNCOMTRADE	United Nations Commodity Trade
UNCTAD	United Nations Conference on Trade and Development
UNTRAINS	United Nations Trade Analysis and Information System
USAID	United States Agency for International Development
US	United States of America
USD	United States of America Dollar
VIF	Variance Inflation Factor
WTO	World Trade Organization
WITS	World Integrated Solution Statistics

CHAPTER ONE
INTRODUCTION

1.1 Background Information

The Regional Economic Communities (RECs) have become a strategy that can accelerate the pace of economic growth in modern economies. Ardiyanti (2015) indicates that regional trade agreements have covered more than half of international trade throughout the world since early 1990s. A REC refers to a commercial policy of discriminatively reducing or eliminating trade barriers only among nations joined together, it ranges from preferential trade arrangements to free trade areas, customs unions, common markets and economic unions (Salvatore, 2014). Hence, RECs open a very large space for trade provided that trade barriers are reduced or totally eliminated and this triggers an intensive exchange of goods and services across countries in the world.

Hence, conscious of the benefits a country draws from trade and considering RECs as an engine for accelerating trade, countries throughout the world formed a number of notable economic communities. The establishment of these RECs revived the debate among scholars. Many researchers used different models employing both ex-ante and ex-post approaches, to assess the effect of such RECs on trade. The debate is still alive due to controversial conclusions drawn depending on a country, a commodity or both. According to Jordan and Kanda (2011), empirical researchers had difficulty to reach a firm conclusion about the effect of RECs on trade.

Examining Africa as a continent, countries established commercial links through RECs with an ultimate goal of boosting their economies. The United Nations Conference on Trade and Development (UNCTAD) (2018) indicates that African Union recognizes eight RECs which form the pillars of African economic community. Among the eight RECs, one can mention the Economic Community of West African States (ECOWAS), the Southern African Development Community (SADC), the Common Market for Eastern and Southern Africa (COMESA), the Economic Community of Central African States (ECCAS), the Intergovernmental Authority on Development (IGAD) and the East African Community (EAC) among others. The EAC was originally founded in 1967 but collapsed in 1997 (Karugia *et al*., 2009). It was then re-established in 2000 by three countries namely Kenya, Uganda and Tanzania (Kasaija, 2004).

The treaty that re-established the EAC was signed on 30 November, 1999 and entered into force on 7 July, 2000 following its ratification by the three original partner states (EAC, 2016). Gaalaya *et al*. (2017) indicate that Rwanda and Burundi acceded to the EAC treaty on 18 June, 2007 and became full members of the community on 1 July, 2007. South Sudan acceded to the treaty on 15 April, 2016 and became an effective member on 15 August, 2016 according to the UNCTAD (2018). The East African Community treaty emphasizes that the broad goal of the EAC is to broaden and intensify the cooperation among partner states; the vision is to create wealth in the region and enhance competitiveness through increased production, trade and investment (Angeline, 2014). Therefore, it is evident that the EAC was created in the same context as many other RECs around the world, with the same purpose and vision as many other RECs.

The EAC is one of 350 RECs in force today (Ouma, 2015). Over the period 2017-2019, it respectively scored an average economic growth of 5.9%, 5.7% and 6.1% per year and this made it the second dynamic REC behind the ASEAN (EAC, 2019). The EAC economic size tripled over 2002-2012 from 32.6 (US$ billions) in year 2002 to 98 (US$ billions) in year 2012 according to the Banque Mondiale (2014). The EAC is characterized by a diversity of countries and overlapping memberships.

In regard to the economic size at country level, Burundi is the smallest economy within the community. Its real GDP ranged between 914.2 and 1013.8 (US$ million) for the period 2012-2016 (Gouvernement du Burundi, 2018). Moreover, statistics show that Burundi lags behind other EAC member states in terms of economic growth. As an illustration, UNCTAD (2018) indicates that Burundi had the lowest economic growth in year 2016 among other EAC partner states whose economic growth was reported as follows: Rwanda (7.9%), Tanzania (6.6%), Uganda (6.4%), Kenya (4.6%) and Burundi (2.7%). Burundi, Rwanda, Uganda and South Sudan are landlocked while Kenya and Tanzania are not. They have access to Indian Ocean which is perceived as a major comparative advantage as far as trade is concerned.

One of the common challenge for EAC countries is that of food insecurity. The EAC countries are often struck by food shortages and trade constitutes one of the key ways to reduce the severity of food insecurity across these countries. The exchange of food commodities among them enhances food availability and hence contributes to food security among their citizens.

Provided the role of trade in reducing food insecurity in the EAC countries, it is more relevant to carry out studies focused on food trade across the EAC countries.

1.1.1 Intra-EAC trade

There is an exchange of goods and services between EAC countries. According to EAC (2014), the value of intra-EAC trade was US$ 5,805.6 million and US$ 5,632.9 million respectively in 2013 and 2014. Intra-EAC trade performance varies over time and by country. Kenya's share of intra-EAC trade is relatively high, accounting for about 32.8% of total intra-EAC trade. That of Tanzania and Uganda respectively accounted for 26.4 % and 23.6% of the total value of intra-EAC trade in 2016.

Intra-EAC imports in Tanzania increased by 7.2%, to US$ 298.8 million in 2016 from US$278.6 million in 2015 (EAC, 2016). At the same time, Burundi's share of intra-EAC imports increased by 4.0 %, to US$157.2 million in 2016 from US$151.1 million in 2015. However, EAC (2016) indicates that Kenya, Rwanda and Uganda registered a decline of respectively 20.5%, 7.2% and 15.9 % in the value of imports (EAC, 2016). As reported by EAC (2014), the mostly traded goods include agricultural commodities such as coffee, tea, tobacco, cotton, rice, maize, sugar, wheat flour and manufactured goods namely, cement, petroleum products, textiles, sugar, confectionery, beer, salt, vegetable fats, vegetable oils, iron, steel, paper, plastics and pharmaceutical products .

1.1.2 Intra-EAC food trade

Agriculture stands as a key pillar of national economies in the EAC. It contributes to an average of 36% of the region's GDP (EAC, 2016). Hence, trade of food commodities between EAC countries takes place as well. Ouma (2015) highlighted that agricultural trade accounts for over 40% of the intra-EAC trade, both food and other non-food agricultural commodities. In the same view, Levard and Louis (2014) argued that intra-EAC trade contributes towards sustained food availability. Hence, food trade within the East African Community enhances food availability. Food trade flows in the EAC vary according to the season and the year. Kenya is the main importer of agricultural commodities, rice and maize from Tanzania and Uganda respectively. Kenya's share of exports to other countries of the region (EAC) consist of manufactured food commodities (EAC, 2017).

Tanzania exports maize and rice to other countries of the region, although it imports rice and sugar from the rest of the World (Levard & Louis, 2014). Through its annual report, Kilimo-Trust (2014) revealed that between 27,000 and 37,000 metric tons (MT) of rice is formally traded across borders within EAC zone and another 17,000 to 25,000 MT is exported outside the regional borders.

1.1.3 Burundi's trade with EAC partner states

The third quarterly statistics report of Burundi revenue authority (from October to December) points out that the share of Burundi's imports from the EAC represented 21.8% of the value of total imports. Compared to 2016, its imports from Tanzania increased by 58% while a decrease of imports from Kenya, Rwanda and Uganda was observed at a level of 7%, 19.4% and 4. 8% respectively. The part of exports to other EAC countries was estimated at 5.3% of the total value of Burundi's exports (OBR, 2017). As mentioned in the report of Burundian central bank , BRB (2017), trade between Burundi and other EAC partner states fall over 2016-2017, from 6.9% to 5.1% with Kenya, 6.7% to 5.1% with Uganda, 2.2% to 1.1% with Rwanda and from 7.2% to 6.6% with Tanzania. While trading with other EAC countries, Burundi uses two corridors: the north corridors (Mombassa-Bujumbura through Kampala and Kigali) and the central corridors (Dar-Es-Salaam-Bujumbura).

1.2 Statement of the Problem

Burundi is a partner state of the East African Community. It largely trades food commodities with other East African Community countries. By joining the East African Community in July 2007, Burundi's main expectation was to boost its economic growth through accelerated trade with other East African Community partner states. However, both theoretical and empirical literature concur that regional economic communities do have either positive or negative effects on trade flows depending on how they are designed and implemented. On one hand, membership in a regional economic community can lead to trade creation. On the other hand, it can result in trade diversion. Moreover, trade creation and trade diversion may vary over time and across commodities within the same regional economic community. In addition, Burundi is a smaller open economy among other East African Community partner states. Nevertheless, theoretical and empirical literature is unclear on how trade of relatively small open economies such as Burundi performs in a regional economic community. Given these controversies, an empirical study is therefore necessary to determine how trade flows of food commodity for a given country perform in a regional economic community.

Since Burundi integrated into the East African Community, trade in food commodities has not been given adequate attention in empirical analysis. Few studies done in line with food trade are more general; they neither focused on bilateral trade flows between Burundi and other East African Community countries nor have been carried out at commodity level. Furthermore, they did not determine which countries, among East African Community partner states, Burundi trades intensively with. Thus, little is known about food trade between Burundi and other East African Community partner states. This study was proposed to be carried out in order to determine factors affecting trade flows between Burundi and other EAC countries and documented how food trade flows between Burundi and other East African community partner states performed for the period 2003-2018.

1.3 Objectives of the Study

1.3.1 General objective

The general objective of this study was to contribute towards improved performances of food trade between Burundi and other EAC partner states.

1.3.2 Specific objectives

i. To characterize trade patterns between Burundi and other EAC partner states for maize, rice, sugar and wheat.

ii. To determine the intensity of trade between Burundi and other EAC partner states for maize, rice, sugar and wheat.

iii. To determine the factors that influence trade flows between Burundi and other EAC partner states for maize, rice, sugar and wheat.

1.4 Hypotheses

i. There is no significant difference in the patterns of trade between Burundi and other EAC partner states towards maize, rice, sugar and wheat, in 2003 -2018.

ii. There is no significant difference in the intensity of trade between Burundi and other EAC partner states towards maize, rice, sugar and wheat.

iii. Country's GDP, exchange rate, distance and infrastructure do not significantly influence Burundi-EAC trade flows in maize, rice, sugar and wheat.

1.5 Justification of the Study

Burundi is a net food importer which largely imports food commodities from the EAC region. It is therefore of paramount importance to evaluate trade performance over time and determine the critical factors that are likely to influence Burundi's food trade with other EAC countries. This makes it possible to adopt strategies aimed at improving or thwarting these factors. Furthermore, as the gap between local food production and local food needs widens in the case of Burundi, there is a need to know what are the EAC countries with which Burundi intensively trades and for which commodity. This may guide the country in setting policies meant to maximize trade flows of a particular commodity in a given country.

By providing an empirical study on Burundi's trade flows with other EAC countries, the results serve to inform policy makers, in Burundi and across other EAC countries, on how bilateral food trade can be more accelerated than before to sustain food access among EAC citizens. Moreover, the results feed in the literature of bilateral trade across countries in the world and contribute to the prevailing debate on the effects of RECs, as far as trade performances are concerned.

1.6 Scope and Limitations of the Study

This study was carried out on selected food commodities and not all commodities. The selected food commodities are maize, rice, sugar and wheat. The reason behind the selection of these commodities is threefold: they play a major role in a typical Burundian diet; they are easily tradable and they are generally grown in all EAC countries. Moreover, this study did not involve South Sudan reason being that it joined the EAC recently (in 2016). In addition, this study was limited in time to the period 2003-2018. The reason behind the choice of this period is twofold: on one hand, 2003 corresponds to the period when the country recovered peace after more than a decade of civil war. On the other hand, year 2018 corresponds to the first decade since Burundi integrated into the EAC. Again, this period of time was chosen due to the availability of data.

1.7 Definitions of terms

Commodity: In this study, commodity refers to any traded product.

Food commodity: Food products traded across countries.

Food trade flows: The movement of food commodities from (to) a foreign country.

Patterns of trade: The volume (or value) of commodities exported (imported) to (from) a foreign country and the evolution over time.

Bilateral trade: Exchange of commodities between two countries.

Intra-EAC trade: Trade within the EAC, trade between members of EAC.

EAC partner states: Each country (or State) which belongs to the EAC regional bloc.

EAC countries: EAC partner states (the two concepts were used interchangeably in this study). Those countries are namely Burundi, Kenya, Tanzania, South Sudan, Uganda and Rwanda

Trade policies: Rules and regulations set by trading partners to favor a fair trade between them.

Small open economy country: A country with relatively small gross domestic product but trades with other countries.

International trade: Trade between two or more different countries.

CHAPTER TWO
LITERATURE REVIEW

2.1 Theories of International Trade

There are many theories of international trade developed so far. These theories can be split into two groups: country-based theories and firm-based theories. In the context of this study, country-based theories are more appropriate provided that this study concerns trade between Burundi and other EAC countries. Country-based theories evolved from mercantilism to factor endowment theory through absolute and comparative advantage theories. The theoretical framework grounding this study was that of comparative advantage theory, country similarity theory and the theory of regional integration. Each of these theories is in line with the objectives of this study.

2.1.1 The theory of comparative advantage

It was developed by David Ricardo in 1817 (Watson, 2017). According to the law of comparative advantage, a country should specialize in the production and export of the commodity in which its absolute disadvantage is smaller (this is the commodity of its comparative advantage) and imports the commodity in which the absolute disadvantage is greater (this is the commodity of its comparative disadvantage).This theory holds that trade should exist between two countries no matter how one is more technologically advanced than the other. This theory is more relevant to this study since trade takes place between Burundi, a relatively less technologically advanced country and other EAC countries, relatively more technologically developed than Burundi.

There are strict assumptions underpinning the theory of comparative advantages which include: only two nations, two commodities and labor are considered, inexistence of trade barriers, labor is perfectly mobile within each nation but immobile between the two nations and existence of constant cost of production. Looking at gains, the theory of comparative advantage is a positive sum-game theory that is, all trading partners benefit from trading each other. Krugman *et al.* (2012) indicates that trade in the context of comparative advantage can benefit a country in two ways. First, trade is an indirect method of production, second, the benefits of mutual trade in the context of comparative advantage theory can be evidenced when looking at how trade affects each country's possibility for consumption.

2.1.2 Country similarity theory

This theory was developed by Steffan Linder in 1961 (Neculita & Sarpe, 2018). The theory stresses that a nation exports those manufactured products for which a large domestic market exists. In other words, the theory indicates that trade takes place between countries with the same level of development. The similarity can be seen in the aspects of location, culture, political and economic interests and natural resources among other aspects. The relevance of this theory to this study can be explained as follows: countries involved in this study are somewhat similar in one way or another. Apart from Kenya which is slightly ahead when compared to other EAC countries, the rest of the countries involved in this study are around the same level in terms of development. Therefore, the theory of country similarities is appropriate to this study.

2.1.3 Theory of regional economic integration

The framework of the theory of economic integration was developed by Jacob Viner (1950). Kimbugwe *et al*. (2012) indicate that the theory of economic integration begun with the classic customs unions theories developed by Viner (1950), Meade (1956) and Lipsey (1957). Viner (1950) introduced two concepts (trade creation and trade diversion) which are basically used to assess the effect of an economic integration on a country's welfare. Salvatore (2014) defines trade creation as a situation whereby some domestic production in a member of a customs union is replaced by lower-cost imports from another member-nation. Trade diversion on its hand is described as a scenario whereby lower-cost imports from outside the union are replaced by higher-cost imports from another union member. Apropos of the definition, Caporaso (2018) defines regional economic integration as a process by which a group of countries form closer economic links with each other than with third countries or the rest of the world.

The literature of economic integration theory was summarized by Balassa in the 1960s. Balassa (1994) defines economic integration as a process and a state of affairs. Seen as a process, it encompasses measures designed to abolish discrimination between economic units belonging to different national states; viewed as a state of affairs, it can be represented by the absence of various forms of discrimination between national economies. Robson (2002) highlights that economic integration targets the promotion of efficiency in resource use at region level.

Its fullest attainment includes the elimination of all barriers to the free movement of goods and factors of production and the abolition of discrimination on the basis of nationality amongst the members of the bloc. Referring to economic integration process, Tinbergen (1965) distinguishes between a negative integration which denotes those aspects of regional integration that simply involve the removal of discrimination and restrictions on the movement of goods, services and people and a positive integration which designate the modification of existing instruments and institutions and the creation of new ones for the purpose of enabling the market to function effectively**.** Economic integration can take several forms that represent varying degrees of the integration. These forms are namely a free-trade area, a customs union, a common market, an economic union, and a complete economic integration (Balassa, 1994).

Andic *et al*. (2010) summarize these stages in three main stages: the first is the establishment of some form of a customs union or a free trade area; the second involves tax union that is, the harmonization of taxation policies; the third stage is the formation of a common market. Examining the benefits of an economic integration process, Balassa (2013) indicates four ways through which the economic welfare is positively affected by an economic integration: change in the quantity of commodities produced, change in the degree of discrimination between domestic and foreign goods, redistribution of income between the nationals of different countries and income redistribution within individual countries. The theory of economic integration is more relevant to this study in such way that one of the objectives (more precisely the first objective) of this study is to assess the effect of the EAC on the patterns of Burundi's food trade.

2.2 Empirical Literature

2.2.1 Empirical studies using gravity model

Ndayitwayeko *et al*. (2014) analyzed agri-food import dependency of Burundi for the period 2000-2010, using the gravity model. Findings from the study revealed that Burundi's GDP, its trade partners' populations, the exchange rate, the distance, the common colonial history and membership in a REC are the main factors influencing food imports. Moreover, the findings showed that a 1% increase in the importer's GDP increased food imports by about 3.71%. However, the results from this study are more general and the study was not rigorously focused on food commodities. The study considered commodities in an aggregated way and mixed both food and non-food commodities.

Therefore, the study did not capture the effect of factors which influence trade of a single food commodity between Burundi and other EAC countries. In addition, the study considered Burundi trading with EAC, COMESA and EU as whole blocs and did not focus on country to country trade. Furthermore, the study drew conclusions on a short time (two years); however there are some variables which require more than two years to influence the volume of imports and/or exports. Lastly, the study of Ndayitwayeko *et al*. (2014) was focused on imports only.

In order to address the limitations of the study done by Ndayitwayeko *et al*. (2014), this study analyzed factors affecting trade between Burundi and each of EAC countries, considered a two-sided trade, used disaggregated data (single commodity), covered a long period and included another variable which is the infrastructure development index. To this end, this study is then expected to provide further evidence on Burundi-EAC food trade than previous studies.

Konstantinos *et al.* (2010) carried out a ten year review of the empirical literature on the gravity models, highlighted the best practices and provided an overview of free trade agreement effects on international trade as reported by relevant gravity model-based studies. Findings from the study showed that over 55 papers published, the gravity model was used as a major instrument for analyzing trade flows and variables like GDP, GDP per capita, exchange rate and distance were mostly used.

Angeline (2014) assessed the EAC regional trade agreement on Kenya's exports in agri-food products in 2000-2012, using a gravity model. Explanatory variables used were the GDP, per capita income, the distance, the exchange rate, adjacency, language and the effect of EAC. The findings revealed that a 1% increase in the importer's GDP resulted in increased trade of maize by 0.22%, while the same percentage induced a 0.40% increase in trade of wheat. Both importer and exporter population were positive and statistically significant for maize flour and meat. The study however did not deepen into econometric test analysis to prove accuracy of estimates. Like Ndayitwayeko *et al.* (2014), this study ignored infrastructure although it is theoretically known that infrastructure affect trade in one way or another. Patcharee (2012) assessed the impacts of free trade agreements on Thailand dairy imports through the implementation of THNZCEP (Thailand-New Zealand Closer Economic Partnership) and TAFTA (Thailand-Australia Free Trade Agreement) in 1991-2009.

The study sets import volume as a dependent variable and population, GDP per capita, bilateral distance, intra-THNZCEP trade bias, extra-THNZCEP trade openness, intra-TAFTA trade bias and extra-TAFTA trade openness as independent variables. The findings revealed that the estimated exporter population coefficient was negative and statistically significant at 1% level of significance in concentrated milk and cream, buttermilk and yogurt whey, butter, cheese and curd and total dairy products.

The estimated exporter population coefficient for non-concentrated milk and cream was positive and statistically significant at 1% level of significance. However this study used aggregated data although an analysis at commodity level would be more appropriate to capture the effect of a REC on trade of a particular commodity. Martínez-Zarzoso and Nowak-Lehmann (2003) applied the gravity model to assess Mercosur-EU trade over 1988-1996. The model was tested in 20 countries.

A panel data analysis was used to choose between the fixed and random effects models. They included infrastructures as an additional independent variable. Their findings are such that importer and exporter income have a positive influence; exporter population has a large negative influence whereas importer population has a large positive influence; infrastructures, exchange rates and income difference were significantly positive except for importer's infrastructures which was not significant.

Henri *et al.* (2004) studied the institutional determinants of trade patterns. They focused on trade patterns of 100 countries. They used the indicators of perceived institutional quality constructed by Kaufmann *et al*. (2002) and run a gravity model supplemented with institutional quality. The findings from the study revealed that both quality and similarity of institutions positively influence bilateral trade. For instance, findings reveal that the similarity of institutions raises trade by 16%. Their findings further hypothesized that the variation in institutions led to informal trade barriers.

2.2.2 Trade creation, trade diversion and trade patterns

Clausing (2001) indicates that the unilateral removal of a tariff generally increases imports, consumption and reduces domestic production. Viner (2014), however, indicates that trade creation or trade diversion may occur once a customs union is achieved in a REC. Trade creation occurs when imports are substituted for domestic products as a result of tariff reductions that reduce the price of member imports below that of home-produced goods.

Trade diversion occurs with a shift in imports from an efficient non-member exporter to a more expensive producer from the country's REC partners due to preferential tariff treatment (Salvatore, 2014). Meade (1955) extended the concepts of trade creation and trade diversion to include trade expansion, which occurs whenever demand is highly price-responsive. Empirically, Lin and Michael (2010) assessed agricultural trade creation and trade diversion effects of the most important free trade agreements across the world.

The findings from their study showed significant trade creation for the EU-15, EU-25 and SADC agreements which are found to increase intra-trade among members by 71.6%, 56.8% and 166.4% respectively. Significant export diversion was found for the EU-15 and for NAFTA (North American Free Trade Agreement) exports to outside non- member countries. Moreover, significant import diversion was found for only the EU-15 which reduced its imports from outside countries by 8.6% and significant pure import creation was found for only the SADC which increased its imports from outside countries by 28.4%.

Urata and Okabe (2010) assessed trade creation and trade diversion effect of trade agreements in 67 countries for 20 commodities over 1980-2006. They used the gravity equation to capture trade creation or diversion effect. Findings showed trade creation for 18 commodities with agricultural commodities having relatively less coefficients. In attempt to characterize the patterns of trade flows in NAFTA, Krueger (1999) described the patterns of trade for U.S, Mexico and Canada.

Findings revealed that U.S exports to Mexico constituted 6.9% of all U.S exports in 1980; they stood at 7.2% of U.S exports in 1990 and rose to up 11.6% in 1998. Findings further indicated that: Mexico's share of U.S imports doubled between 1980 and 1990; from 1993 Mexico's share of U.S market increased by 50%; Canada trade constitutes 16% of U.S imports and exports in 1980; Canadian goods accounted for 22.7 % of U.S exports and l8.8 % of American imports; Canadian imports from Mexico increased from about l.2 % in l990 to about 2.5 % by l998.

2.2.3 Overview of regional economic communities in Africa

African countries created commercial links as a key pillar of development since their independence. Hartzenberg (2011) indicates that in the immediate post-colonial period, the ambition of African leaders was to develop Africa through integration. In June 1991, via the Organization of African Unity (AUO), Heads of states signed the Abuja treaty establishing the African Economic Community (AEC) (Genge, 2000). The aim was to promote economic, social and cultural integration of the African continent. Kayizzi-Mugerwa *et al*. (2014) reveal that there are currently seventeen regional trade blocs throughout Africa of which eight are officially recognized by the African Union.

According to International Monetary Fund (2014) the eight RECs officially recognized by the African Union are: the Economic Community of West African States (ECOWAS) established in 1975; the Economic Community of Central African States (ECCAS) established in 1983; the Arab Maghreb Union, (UMA) established in 1989; the Southern African Development Community (SADC) established in 1992; the Common Market for Eastern and Southern Africa (COMESA) established in 1993; the Intergovernmental Authority on Development (IGAD) established in 1996; the Community of Sahel-Saharan States (CEN-SAD) established in 1998 and the East African Community (EAC) established in 1967.

However, a major challenge hampering the establishment of fruitful economic communities among African countries lies in overlapping membership. Tavares and Vanessa (2011) indicate that although the African union identified 8 RECs as champion sub-regional economic communities in the five African sub-regions, there is a proliferation of several other competing regional blocs resulting in duplication and overlapping of activities. Overlapping membership in many RECs is known as the spaghetti bowl phenomenon (Wang, 2014).

Countries belonging to more than one REC find themselves burdened with undue technical, administrative and financial costs (Tavares & Vanessa, 2011). Regarding EAC countries, they are too concerned with the phenomenon of spaghetti bowl. All EAC countries belong to more than one REC. For instance, UNCTAD (2018) indicates that Burundi and Rwanda belong to EAC, COMESA and CEPGL; Kenya and Uganda belong to EAC, COMESA and IGAD and Tanzania belongs to EAC, COMESA and SADC.

Looking ahead, the famous plan to establish a tripartite bloc (EAC-COMESA-SADC) would be a noble aim towards solving the issue of overlapping membership. In line with policy implementation and overlapping membership, Lunogelo and Mbilinyi (2009) highlight the impossibility to legally and technically implement a common external tariff (CET) policy when a country belongs to more than one customs union.

2.2.4 Overview of intra-EAC trade policies

Intra-EAC trade for goods and services operates under rules and regulations to foster exchange conditions and to ensure a fair free trade. Notable progresses in free movement of goods and services within EAC have been achieved so far. The EAC partner states ratified a common market protocol with the aim to increase trade among member states (EAC, 2010).

Other actions taken by the EAC include immediate elimination and gradual reduction of tariffs, removal of tariff equivalent charges on internal trade, exemption of selected products, establishment and maintenance of a common external tariffs and removal of Non Tariffs Barriers (NTBs). Such policies were successfully implemented through establishment and commissioning of the National Monitoring Committees (NMCs) on NTBs in all partner states (Ouma, 2015).

Regarding the EAC external trade, the establishment of the Customs Union (CU) allowed EAC countries to set common tariffs *vis-à-vis* non-EAC countries. Thus, a 3-band common external tariff was established namely 0% for raw materials and capital goods, 10% for intermediate goods and a maximum rate of 25% for finished goods. Higher rates, ranging from 35% to 100%, apply to 58 tariff lines of sensitive items (Levard & Louis, 2014).

Although efforts are devoted to ease trade, some forms of impediments are yet to be removed mostly NTBs. Non-harmonized technical regulations, sanitary and phytosanitary requirements, customs procedures and documentation, rules of origin and police road-blocks are among the major NTBs in the EAC (UNCTAD, 2018). Most of the cases, foods trade remains under some particular rules set by countries. Trade in food commodities at any level of cooperation, from bilateral, regional, inter-region to multilateral remains complex than any other sector and varies across agreements (Aksoy & Beghin, 2004).

2.3 Overview of Maize, Rice, Sugar and Wheat production in Burundi

Figure 2.1 below provides a view of the evolution of Maize, Rice, Sugar and Wheat production in Burundi for the period 2003-2018.

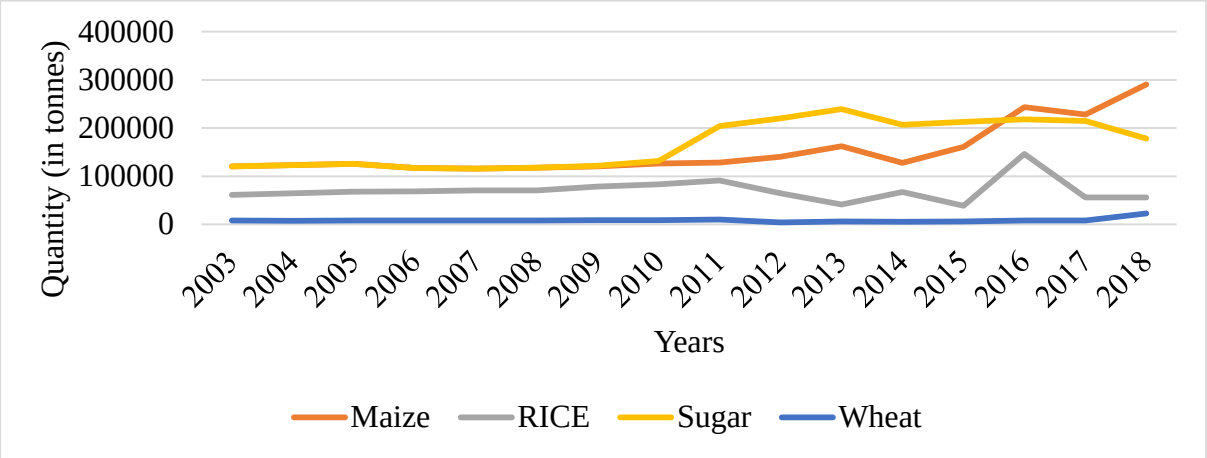

Figure 1: Evolution of the production of maize, rice, sugar and wheat in Burundi

Source: FAOSTAT (2019)

The figure above shows that Burundi's production in maize, rice and sugar followed an upward trend except for wheat whose production remained almost constant over time. Despite this increasing trend, the local demand in these commodities remained high and imports step in to offset the local needs. In other words, food trade alleviate the severity of food scarcity. The increasing consumption in these commodities could be attributed to high population growth coupled with an expansion of urban centers in the country.

2.4 Conceptual framework

This study focused on four food commodities namely maize, rice, wheat and sugar. Moreover, five countries namely Burundi, Kenya, Rwanda, Tanzania and Uganda were involved in this study, Burundi being at the centre of the game. These commodities are bilaterally traded between Burundi and each of the EAC countries. This existing bilateral food trade flows constituted a basis to meet the first and second objectives of this study (respectively the patterns and the intensity of food trade between Burundi and each of the EAC countries). Food trade flows between Burundi and EAC countries are subjected to factors which do have either a positive, neutral or negative effect. These factors are grouped into two categories: macroeconomic and cost factors.

The influence of these factors is represented by unidirectional arrows in Figure 2.2. Estimating such factors led to meeting the third objective of this study. Imports and exports values between Burundi and each of the EAC countries corresponded to the dependent variables. The explanatory variables were Gross Domestic Product, Gross Domestic Product per capita, trade openness, exchange rate, distance between trading countries, sharing a colonial history, sharing a physical border, sharing an official language and infrastructure. The Figure 2.2 provides a synthesis of the conceptual framework of this study.

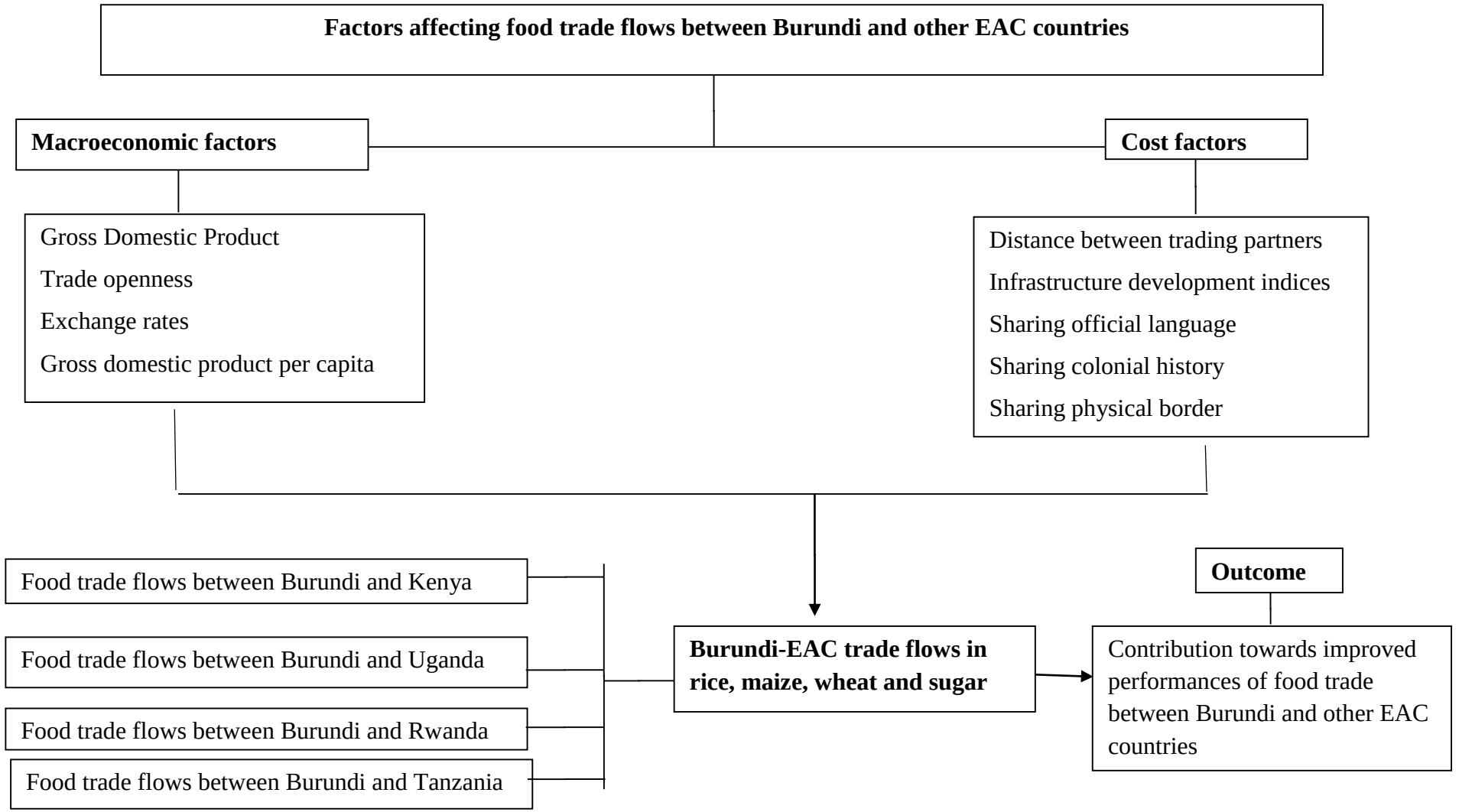

Figure 2: Conceptual Framework

CHAPTER THREE
METHODOLOGY

3.0 Introduction

This chapter develops the methodology which was followed to achieve the objectives of this study. It includes the research design, the study area, the theoretical framework, the model specification, the definition and measurement of variables, data source, data collection, diagnostic tests and data analysis techniques.

3.1 Study area

This study was carried out in Burundi. Burundi is a small open economy which largely trades food commodities with other EAC partner states. It is a net food importer which counts for imports, particularly cereals, to offset local food needs. Domestic food needs follow an upward trend while domestic production system does not follow such a trend. To this end, trade steps in as an alternative to compensate domestic food needs. Burundi is a landlocked country located in the eastern part of Africa. It is situated at 1,200 km from the coast of the Indian Ocean and at 2,000 km from the coast of the Atlantic Ocean (Nzeyimana, 2016). It covers an area of 27834 km^2 (PND-Burundi, 2018) of which 2,000km^2 is occupied by water (lakes, rivers and other water points) and 2,350km^2 is of arable land (Nzeyimana, 2016).

Burundi shares borders with Rwanda in North, Democratic Republic of Congo (DRC) in West and Tanzania in East and South. Burundi has two capital cities: the political capital city which is Gitega and the economic capital city which is Bujumbura. Burundi citizens majorly consume cereals as diet or other products from cereals. In Burundi, maize, rice, sugar and wheat count among the mostly consumed cereals according to national statistics. The Figure 3.1 illustrates the map of the study area (Burundi, Kenya, Rwanda, Uganda and Tanzania).

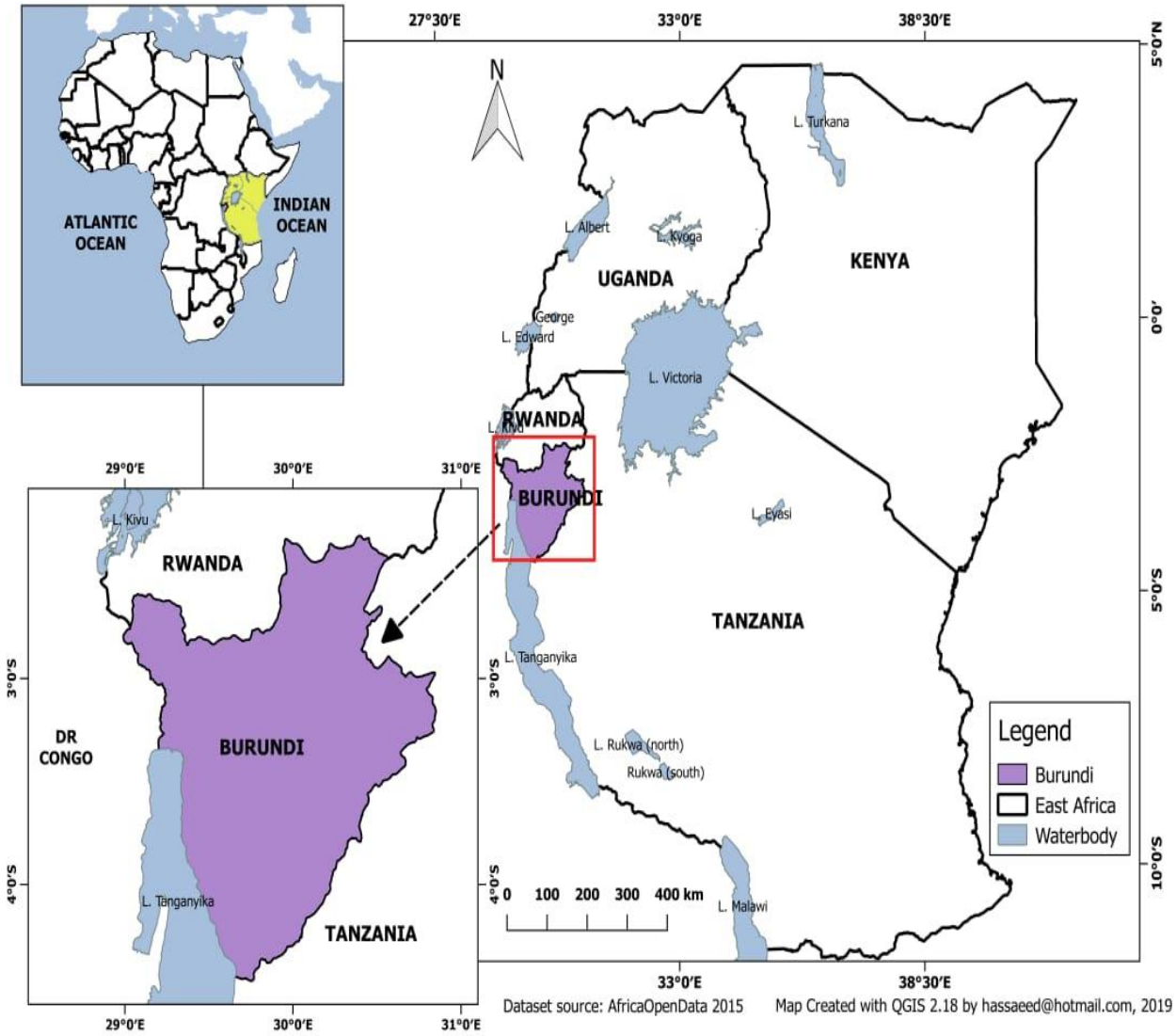

Figure 3: The map of the study area
Source: Africa open data (2019)

3.2 Research design

The study applied both descriptive and explanatory design with the objective of analyzing Burundi's food trade flows with other EAC partner states. The descriptive design is fundamental to provide the shape and the nature of the problem under study. A descriptive design provides more details of a particular issue. Regarding the explanatory design, De Vaus (2001) argued that it is more appropriate to evaluate a causal relationship between two variables. Therefore, considering the objectives of this study and the nature of the problem, both descriptive and explanatory research designs are more appropriate.

3.3 Data types and sources

The data were sourced from different databases namely Standard International Trade Classification (SITC), UNCOMTRADE (United Nations Commodity Trade), UNTRAINS (United Nations Trade Analysis and Information System), WITS (World Integrated Trade Solution), FAOSTAT, Trade map, World Bank, the "Institut des Statistiques et des Etudes Economiques du Burundi", (ISTEEBU), the "Office Burundais des Recettes" (OBR), the "Banque de la République du Burundi (BRB) and from other EAC trade publications. Moreover, the World Bank dataset provided the data on countries' GDP and the Penn World Table (PWT) provided the data on trade openness indices across countries. Finally, CEPII (Centre d'Etude Prospective et d'Information Internationale) dataset provided data on the distance in kilometers between the capital cities of trading countries. Table 3.1 below provides a summary of the source of the data and related variables.

Table 1: Data source and description

Source	Data
SITC UNCOMTRADE UNTRAINS WITS OBR ISTEEBU EAC reports Trade Map	Data on the value (expressed in $1000) of traded commodities between Burundi and other EAC countries namely Kenya, Tanzania, Uganda and Rwanda
World bank, BRB	Data on the GDPs and Exchange rates
PWT	Data on trade openness
CEPII	Data on the distance, language, border and history
African development bank	Data on Infrastructure development indices (IDI)

3.4 Analytical framework

Objective 1: To characterize trade patterns in selected food commodities between Burundi and other EAC partner states

To achieve this objective, a trend analysis of food trade patterns was carried out. This helped understanding more on how bilateral food trade between Burundi and each of EAC countries evolved over time. Furthermore, this helped analyzing how the patterns of food trade changed in the wake of EAC trade agreements with more emphasize on what has been the effect of Burundi's integration into the East African community on food trade patterns of Burundi.

In order to meet this objective, histograms characterizing food trade patterns over time were generated and a table depicting the growth rate of trade values was generated for the four food commodities. The results were interpreted based on the trends over time. Thereafter, possible reasons behind such trends were discussed.

Objective 2: To determine the intensity of trade in selected food commodities between Burundi and other EAC partner states

To achieve the second objective, the intensity of food trade was determined. This helped understanding how intensively Burundi trades with each of the EAC countries. According to Ambrose and Sundar (2014), the trade intensity technique was developed by Kojima in 1964. Mikic and Gilbert (2007) define the intensity of trade as the ratio of two export shares. The numerator is the share of the destination of interest in the total exports. The denominator is the share of the destination of interest in the exports of the world as a whole.

In the context of this study, the world was substituted by the EAC provided that this study is limited within the EAC borders. This objective compared how intensively Burundi trades with EAC countries not all countries in the world. Ambrose and Sundar (2014) argued that the intensity of trade does not suffer from any size bias and one can compare the statistic across regions and over time. Many empirical studies on the intensity of trade have been carried out across countries. To determine the intensity of trade, this study adopted Ambrose and Sundar (2014) for a reason that it is the recently improved formula of trade intensity. However, this study focused on Burundi's imports due to the availability of data.

The formula of the intensity of trade indicates that trade takes place between two countries denoted by subscripts i and j. In the context of this study, the subject of analysis (Burundi) is given and fixed. Thus, the subscript i denoting Burundi was left out; trade only varies by recipient country j. Therefore the expression of the intensity of Burundi's food imports from each of EAC countries was given by equation (3.1) below:

$$MTI_{jt}^{k} = \frac{\left[\frac{M_{jt}^{k}}{M_{tt}^{k}}\right]}{\left[\frac{X_{jt}}{X_{EACt}-X_{t}}\right]} * 100 \qquad (3.1)$$

In (3.1) above;

j refers to one of EAC countries; k refers to either maize, rice, sugar or wheat; t refers to time.

MTI_{jt}^{k} denotes the intensity of Burundi's imports from country j at time t.

M_{jt}^{k} denotes Burundi's imports (in values) from country j in commodity k at time t.

M_{tt}^{k} denotes Burundi's total imports (in values) in commodity k at time t.

X_{jt} denotes total exports (in values) to EAC at time t.

X_{EACt} denotes total export (in values) at time t.

X_t denotes Burundi's total exports (in values) at time t.

In equation (3.1), X_t was subtracted from X_{EACt} for a reason that a country cannot export goods to itself. The only share it can meaningfully have in total world trade is a share in the imports of all other countries (Peter & Ross, 1982). The value of the intensity of trade ranges between 0 to + ∞ (Mikic & John, 2007). Theoretically, a value of more (less) than 1(or 100 if expressed in percentage) indicates a bilateral trade flows which are larger (smaller) than expected, given the partner country's importance in world trade.

Objective 3: To determine the factors that influence trade flows between Burundi and other EAC partner states in selected food commodities

To achieve the third objective of this study, a gravity model was applied to determine the estimates fitting the gravity model. The gravity model and the computable general equilibrium (CGE) are basically two models mostly used to perform a quantitative analysis in the area of trade policy (Ivus & Strong, 2007). On one hand the gravity model uses an ex-post (retrospective) approach to analyze the effect a policy on trade flows. On the other hand, the CGE model use an ex-ante (prospective) approach to quantify the effect of a trade policy on the countries' welfare and the distributions of income across countries. In other words, the CGE is used to predict/simulate on the benefits that a trade policy is expected to bear in the future.

Empirical studies corroborate on the relevance of the gravity model while looking at capturing the factors affecting trade flows. To this end, this study then adopted an augmented gravity model to achieve the third objective. The gravity-style equation model was used for the first time by Tinnbergen (1962) and Pöyhönen (1963) to analyze international trade flows. A justification for the gravity models of Tinbergen (1962) and Pöyhönen (1963) can be given based on the Walrasian theory (Ivus & Strong, 2007) where the importer represents the consumer, the exporter represents the supplier and the distance stand for the costs.

The Gravity model mimics Newton's law of universal gravitation which postulates that the force of attraction between two separate objects (say A and B) is a positive function of the objects individual masses and is inversely related to the square distance between the objects. Using the same gravity standard in trade, the objects are substituted by a pair of countries; the countries' masses are substituted by their respective GDPs while the distance is substituted by the actual distance between the trading countries (Salvatore, 2014).

Mikic and Gilbert (2007) pointed out that the gravity model is based on the idea that the volume of bilateral trade between any pair of countries is an increasing function of the combined mass of their economies and a decreasing function of distance between the two countries. To define the gravity model, consider the following scenario, where: T_{ij} stands for trade between two countries i and j (in value or volume), GDP_i and GDP_j stand for the GDP of countries i and j respectively and D_{ij} stands for the estimated distance between country i and country j. Therefore the standard gravity model specification in an implicit form can be expressed as follows:

$$T_{ij} = f(GDP_i , GDP_j , D_{ij}) \quad (3.2)$$

Explicitly, the gravity model in the context of international trade is expressed in a multiplicative form as follows:

$$T_{ijt} = \beta_0 GDP_{it}^{\beta 1} GDP_{jt}^{\beta 2} D_{ij}^{\beta 3} \quad (3.3)$$

In order to estimate the gravity equation, the gravity model literature highlights that this equation is modeled as a linear function by taking its logs. Mikic and Gilbert (2007) argued that a double logarithmic specification is usually used, relating the bilateral trade flows of each country pair (the dependent variable) to the product of their GDPs and the distance between them (the independent variables), plus an error term to capture the random component in the data. Therefore, equation (3.3) becomes as follows:

$$\log T_{ijt} = B_0 + B_1 \log GDP_{it} + B_2 \log GDP_{jt} + B_3 \log D_{ij} + \varepsilon_{ijt} \quad (3.4)$$

The gravity model can be estimated using ordinary least squares (OLS) although other methods may be helpful if the data exhibits heteroscedasticity. If the data from which the model is estimated is a panel then, a pooled OLS, fixed effects or random effects models may also be used (Rose, 2004). However, the pooled OLS model is not preferred due to its hypotheses of assuming that both countries are homogeneous. In real practice countries cannot be homogeneous. Regarding results interpretation in a gravity equation, the coefficients of continuous variables are interpreted as elasticities while the coefficients of dummy variables (if any) are interpreted as the differential effect.

3.4.1 The gravity model specification

The theoretical framework of the gravity model explained above ignored other variables which really explain trade flow between countries. Those variables have either a positive effect or a negative effect on trade. To ignore those variables results in a misspecification of the model. Therefore, in order to handle that issue, an augmented gravity model was established by adding other relevant variables which are, according to theories, perceived as factors affecting trade flows between countries. The framework used in this study adopted that of Ndayitwayeko *et al*. (2014), Putcharee (2014), Pujiati *et al.* (2014) and Konstatinos *et al.* (2010). Beyond that, this study added infrastructure as an additional independent variable. The economic rationale behind is that good infrastructures likely have a positive influence on trade. Moreover, pre-and post-analysis diagnostic tests not taken into account in these aforementioned studies were performed, to improve the exactness of findings.

To this end, an augmented gravity model used in this study included the explanatory variables such as the GDP, the distance, trade openness, infrastructure development index, per capita income and the exchange rates among others. As explained in the previous paragraphs, the subject of analysis (Burundi) is given and fixed; the subscript i denoting Burundi was then left out in the equations. Therefore, the estimated gravity equation for Burundi's food imports from other EAC countries was given by the following equation:

$$\log M_{jt}^{k} = B_0 + B_1 \log GDP_t + B_2 \log GDPC_t + B_3 \log D_j + B_4\, COLHIS + B_5 LANG + B_6 BORD + B_7 \log TOPEN_t + B_8 \log EXRAT_t + B_9 \log EXRAT_{jt} + B_{10} \log IDI_t + B_{11} logIDI_{jt} + \varepsilon_{jt} \quad (3.5)$$

Likewise, the estimated gravity equation for Burundi's food exports to other EAC countries was expressed by the following equation:

$$\log X_{jt}^{k} = B_0 + B_1 \log GDP_{jt} + B_2 \log GDPC_{jt} + B_3 \log D_j + B_4 COLHIS + B_5 LANG + B_6 BORD + B_7 \log TOPEN_t + B_8 \log EXRAT_t + B_9 \log EXRAT_{jt} + B_{10} \log IDI_t + B_{11} \log IDI_{jt} + \varepsilon_{jt} \quad (3.6)$$

From equations (3.5) and (3.6);

Subscripts j and t respectively denote each of EAC countries and time; k stands for maize, rice, sugar or wheat.

M_{jt}^{k} and X_{jt}^{k}respectively stand for Burundi's imports (exports) values from (to) country j at time t.

GDP_t and GDP_{jt} respectively stand for gross domestic product of Burundi and that of country j at time t.

$GDPC_t$ and $GDPC_{jt}$ respectively stand for gross domestic product per capita of Burundi and that of country j at time t.

$\log D_j$, $COLHIS_j$,$LANG_j$and $BORD_j$ respectively stand for the distance, sharing colonial history, sharing official language and sharing physical border between Burundi and country j.

$TOPEN_t$ stands for trade openness of Burundi at time t.

$EXRAT_t$ and $EXRAT_{jt}$ respectively stand for exchange rate of Burundi and that of country j at time t.

IDI_t and IDI_{jt} respectively stand for the infrastructure development index of Burundi and that of country j at time t.

3.4.2 Data cleaning and pre-estimation diagnostic tests

Handling the issue of zero trade values

While dealing with studies on bilateral trade, particularly at commodity level, it may happen that some data are zero values or missing. Burger *et al.* (2009) justified the existence of zero trade values by lack of trade between small and distant countries, low levels of GDP per capita, lack of cultural and historical links and the influence of policies. Empirical studies provide three techniques to handle the issue of zero trade values. Kareem (2013) pointed out that each technique has its pros and cons and the consensus on a commonly accepted solution has not been yet reached.

This study applied the techniques used by Ndayitwayeko *et al.* (2014), Hatab *et al.* (2010), Kandogan (2007) and Aguilar (2006) whereby a value of 1 was added to all imports/exports values (censoring), to overcome the aforesaid issue. In line with that technique of handling the issue of zero trade values, the dependent variables become $X_{ijt}^{*} = X_{ijt} + 1$ and $M_{ijt}^{*} = M_{ijt} + 1$ respectively for exports and imports values. In a scenario where there was unobserved trade data (that is $X_{ijt} = 0$ and $M_{ijt} = 0$), $X_{ijt}^{*} = 1$ and $\log\ (X_{ijt}^{*}) = \log 1 = 0$. The same transformation holds for imports. In the case X_{ijt} is a positive number; $\log\ (X_{ijt}^{*}) = \log\ (X_{ijt} + 1)$ which is not significantly different from $\log\ (X_{ijt})$.

Descriptive statistics

To describe the general features of data used in the study, a summary of descriptive statistics was provided. This gave the summary of the data in terms of the number of observations, the mean, the minimum value, the maximum value and the standard deviation. The value of the standard deviation informs on how data are spread out from the mean.

Test for stationarity

This study used panel data to analyze Burundi's food trade in the EAC. Panel data has the component of time series and cross sectional data. Such type of data may be non-stationary. In order to make the results more valid, there is need to check for non-stationarity. To test for stationarity, this study adopted the Im-Pesaran-Shin test (known as IPS test) (1997) which is based on Dickey–Fuller (ADF) procedure. The advantages of IPS test is that it combines both time series and cross sectional dimension. Chou and Lee (2003) indicate that it has superior power. Abdallah *et al.* (2010) indicate that IPS test begins by a separate ADF for each cross section with individual effect. ADF itself is conducted by adding the lagged values of the dependent variable ΔY_{it}. In a general form, the ADF consists of estimating the following equation:

$$\Delta Y_{it} = \beta_{it} + \beta_{it} t + \delta Y_{it-1} + \sum_{i=1}^{p} \alpha_{it} Y_{it-1} + \varepsilon_{it}. \quad (3.7)$$

Where: i=1…, N and t=1…, T

3.4.3 Hausman test to choose the model estimation technique

The most prominent estimation techniques used with panel data are the fixed effect model and the random effect model (Gujarati, 2003).

Fixed effect regression model, (FEM)

In the FEM according to Gujarati (2003), the intercept in the regression model is allowed to differ among individuals in recognition of the fact each individual or cross-sectional unit may have some special characteristics of its own. With the fixed effect model, the intercept differs between individuals but is constant over time; it is time invariant. Consider the following classical linear regression model given by:

$$Y_{it} = \beta_1 X_{it1} + \beta_2 X_{it2} + \mu_{it} \quad (3.8)$$

Where: $Y_{it}$is the value of Y for the ith unit at tth time period; X_{it1} is the value of X_1 for the ith unit for the tth time period; X_{it2} is the value of X_2 for the ith unit and tth period and μ_{it} is the error term for the ith unit for the tth time period.

The FEM is explained via the following general form equation:

$$Y_{it}= \beta_1 X_{it1}+\beta_2 X_{it2}+v_i+\varepsilon_{it}, \text{ with } \mu_{it}= v_i+\varepsilon_{it}. \quad (3.9)$$

Where: i=1…,N and t=1…,T

The error term of the classical linear regression is decomposed into the component v_i which represents the unobservable factors which vary across individuals but constant over time and the component ε_{it} represents all unobservable factors which vary simultaneously across individuals and over time. Given that $v_i$is constant across individuals, equation (9) can be expressed as follows:

$$Y_{it}= \beta_1 X_{it1}+\beta_2 X_{it2}+\alpha_1+\alpha_2+\alpha_3+\ldots+\varepsilon_{it} \quad (3.10)$$

Whereα_i, i= 1…N, N individuals.

The unobserved error component v_i is substituted by a set of constant parameters α_i. The FEM is defined as follows:

$$E(X_{it}, \alpha_i) \neq 0 \quad (3.11)$$

Where: X_{it} is the explanatory variable; α_i is the individual effect.

Random effect regression model (REM)

In the REM according to Gujarati (2003), it is assumed that the intercept of an individual unit is a random drawn from a much larger population with a constant mean value. The individual intercept is then expressed as a deviation from this constant mean value. In the random effect model, the intercept across individual units is perceived to have a common mean which is random. The REM is defined as follows:

$$E(X_{it}, \alpha_i) = 0 \quad (3.12)$$

Where: $X_{it}$is the explanatory variable;α_i is the individual effect.

Choosing between FEM and REM

The choice between REM and FEM requires a Hausman (1978) test. A significant test result is taken as evidence of a correlation between X_{it} and α_i, implying that the REM should be rejected in favor of the FEM. Using a Hausman test, the null hypothesis assumes a situation where the use of REM is appropriate (equation 3.12) while the alternative hypothesis assumes a situation where the use of FEM is appropriate (equation 3.11).

3.4.4 Post-estimation diagnostic tests

To test for the accuracy of estimates, post- estimation tests were carried out. Hence, before embarking on results discussions the tests for multicollinearity was performed. Multicollinearity refers to the situation where there is either a perfect or approximately exact linear relationship among the explanatory variables (Gujarati, 2003).

Perfect multicollinearity leads to indeterminate coefficients and undefined standard errors. This study used the VIF test to check for severe multicollinearity among the data.

3.4.5 Description and Measurement of Variables

The gross Domestic Product (GDP)

The GDP is the market value of all final goods and services made inside of a country in a year (Putcharee, 2014). The study used the GDP at constant price for a reason that it clearly captures the purchasing power of consumers in a country. It was expected that the country's GDP has a positive effect on trade. The data on the GDP were sourced from World Bank and BRB.

The GDP per capita (GDPC)

This is the average income calculated on each individual in a given geographical area or a country. It was expected that the per capita income has a positive effect on trade. This data were sourced from World Bank and BRB.

Distance (D)

This variable is defined as the spatial distance between the capital cities of two trading countries. The distance proxies the size of transport costs and reflects other trade related costs. Therefore, the sign of this variable was expected to be negative. The data on the distance were sourced from CEPII.

Sharing a colonial history, a physical border and a language (COLHIS., BORD. and LANG.)

All these variables have an influence on bilateral trade between two countries. Sharing a common border reduces transport costs while having a common foreign language facilitate interactions/communication between trade operators. Colonial history is tied up with institutions governing a particular area. In this study, all these variables were analyzed as dummy variables. It was hypothesized that they have a positive effect on trade. The data were sourced from CEPII.

Trade openness (TOPEN)

The trade openness expresses the results of trade liberalization within a country. It is an index expressing the share of trade (import and export) in the national income. In other words, it measures the level at which a country removed impediments to trade and how openly it is in regard to trading with other countries. This variable was expected to have a positive effect on trade. The data on openness were sourced from PWT.

Exchange rate (EXRAT)

This variable reflects how appreciation or depreciation of a currency affects trade between two trade partners. Theoretically, a currency appreciation boosts imports from other countries while depreciation of a currency boosts export to other countries. The sign of this variable was indeterminate. It was expected to depend on the depreciation or appreciation of each currency against the US dollar. In this study, the exchange rate was based on a US dollar. The data on exchange rate were sourced from World Bank and BRB.

Infrastructure development index (IDI)

This variable is an index measuring the level of infrastructures in a given country. An economic rationale behind is a theoretical perception that good infrastructures favor trade between countries. The IDI is an aggregated index made up of four major components namely transport, electricity, information and communication technology and water and sanitation. The data were sourced from the African Development Bank. This variable was expected to have a positive sign. Table 3.1 summarizes the variables of interest and how they were measured. i, j and t stand respectively for country i, country j and time t.

Table 2: Model variables, measurement and expected signs

Variables	Description	Nature of the variable	Measurement	Expected sign
Mjt	Imports of Burundi from country j at time t	Continuous dependent variable	Imports values	N/A
Xjt,	Exports of Burundi to country j at time t	Continuous dependent variable	Exports values	N/A
GDPi/jt,	Gross Domestic Product of Burundi and country j at time t	Continuous independent variable	Numerical value of a country's wealth	(+)
GDPCi/jt	Gross domestic product per capita of Burundi at time t	Continuous independent variable	Numerical value of a country's wealth per individual	(+)
Dj	Distance between Burundi and country j	Continuous independent variable	Numerical value of the distance between the capital cities of trading partners	(-)
COLHIS	Sharing a common Colonial history	Dummy independent variable	1= yes, if they share the colonial history 0 = no, if not	(+)
LANG	Sharing a common Language	Dummy independent variable	1= yes, if they share the language 0= no, if not	(+)
BORD	Sharing a common Border	Dummy independent variable	1= yes , if they share the border 0= no, if not	(+)

TOPEN	Trade openness index	Continuous independent variable	Numerical value of the share of trade in the GDP	(+)
EXRATjt	Exchange rate of Burundi or country j at time t	Continuous independent variable	Numerical value of the variability in appreciation or devaluation of currency against a US dollar	(+ / -)
IDIjt	Infrastructure development index of Burundi or country j at time t	Continuous independent variable	Numerical value of IDI	(+)

3.5 Description of commodities involved in the study

The commodities which were involved in the study and their respective codes are presented in the Table 3.3.

Table 3: List of food commodities involved in the study

Commodities	Codes and description
Maize	044: Maize corn
Wheat	O41: Wheat
Rice	042: Rice
Sugar	061: Sugar

Source: UNCOMTRADE (2019)

CHAPTER FOUR
RESULTS AND DISCUSSION

This chapter presents the results from the analysis to address the objectives of the study. It is organized in three sections according to the three objectives. Briefly, the first objective was about to characterize the patterns of trade between Burundi and other EAC partner states for maize, rice, sugar and wheat. The second objective determined the intensity of trade between Burundi and other EAC partner states for maize, rice, sugar and wheat. The third objective determined the factors that influence trade flows between Burundi and other EAC partner states for maize, rice, sugar and wheat. Before embarking on the third objective, a summary of relevant descriptive statistics was presented including different tests performed in order to improve the accuracy of the estimates.

4.1 Food trade patterns between Burundi and other EAC partner states

This section addresses the first objective of this study. The discussions focused on the results of the trade patterns between Burundi and other EAC partner states with regard to maize, rice, sugar and wheat. Results are presented from Figure 4.1 to Figure 4.4.

4.1.1 Maize imports

The results on the patterns of Burundi's maize imports from the EAC countries are presented in Figure 4.1 below.

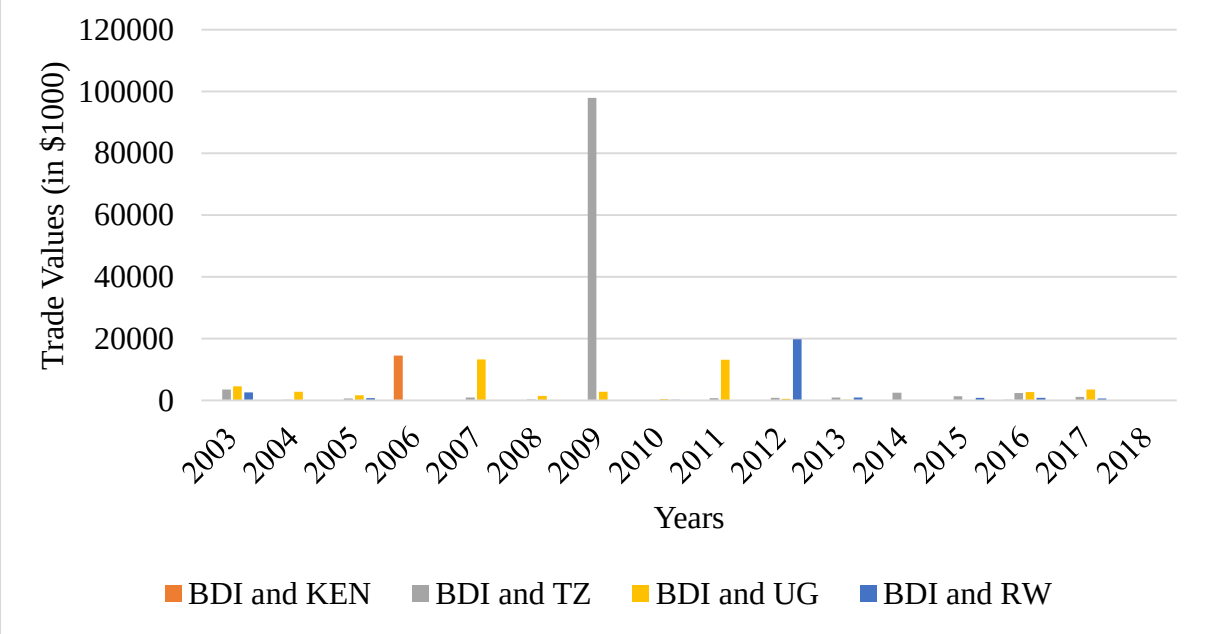

Figure 4.1: Burundi's maize imports from EAC countries
Legend: BDI: Burundi; KEN: Kenya; TZ: Tanzania; RW: Rwanda; UG: Uganda.

Figure 4.1 depicts the evolution of the patterns of Burundi's maize imports from other EAC partner states. From the Figure, it is clear that there were no immediate impacts on maize imports into Burundi after joining the EAC in 2007 until 2013 when the quantity imported fell drastically and stabilized. However, there was a significant change between 2008 and 2010 regarding maize imports from Tanzania. This period corresponds to the time when the government of Burundi decided to remove all internal tax duties on some food commodities imported, maize included.

Nevertheless, the results shows that the decision of removing tax duties had an effect only for maize imported from Tanzania. This can be explained by the existence of many entry points on the shared border and the availability of maize production surplus in Tanzania. It is important to note that there has been a general decrease of maize imports from all EAC countries since 2013. The reasons for this trend could be the political instability in Burundi that erupted and interfered with regular economic activities. Indeed, it is evident that peace and security stand as the key pillars of trade across countries. When countries are politically stable trade can operate regularly and hence contribute to the improvement of citizens' welfare.

4.1.2 Rice imports

The results on the patterns of Burundi's rice imports from EAC countries are presented in Figure 4.2 below.

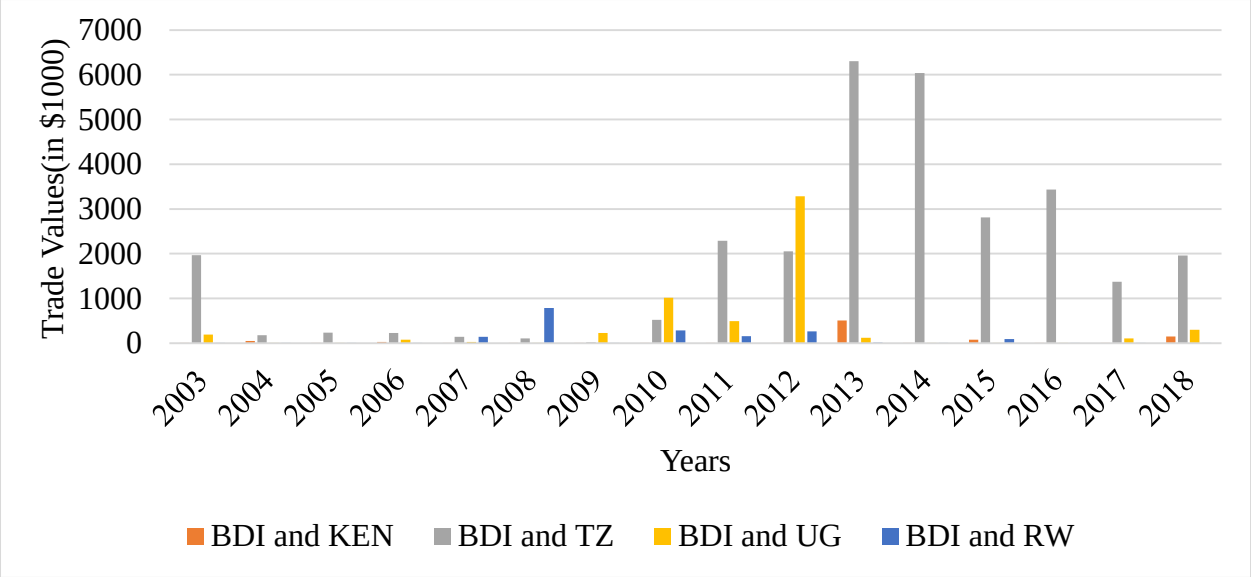

Figure 4.2: Burundi's rice imports from EAC countries

Legend: BDI: Burundi; KEN: Kenya; TZ: Tanzania; RW: Rwanda; UG: Uganda.

Figure 4.2 describes the evolution of the patterns of Burundi's rice imports from EAC countries. The results show an increase in the patterns of imports between year 2009 and 2013, particularly with Uganda and Tanzania. Overall, the patterns of rice imports increased during this period and this is attributed to the integration of Burundi into the EAC coupled with the increase in rice consumption among Burundi citizens. Indeed, Burundi experienced a phenomenal increase in urban centres since 2005 (the period when the country manifestly recovered peace and security on its entire territory). According to Nzeyimana (2016) the increase in urban centres triggered an increase in rice demand on Burundi local markets. The trend generally decreased from year 2015 and this is due to political instability that prevailed in the country. Overall, a conclusion can be drawn that there has been an effect of joining the EAC in the patterns of rice imports.

4.1.3 Sugar imports

The results on the patterns of Burundi' sugar imports from EAC countries are presented in Figure 4.3 below.

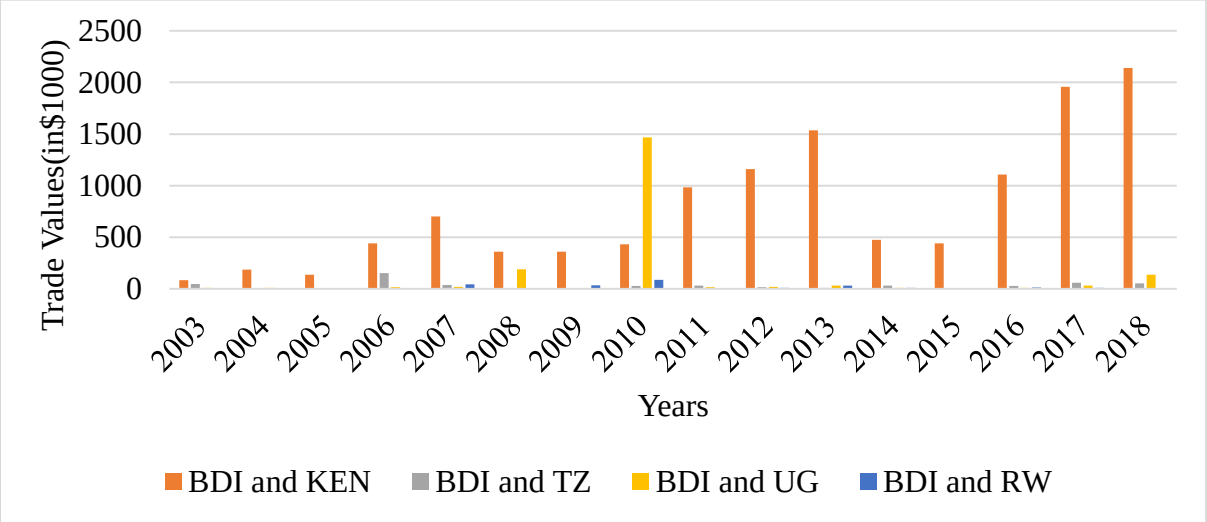

Figure 4.3: Burundi's sugar imports from EAC countries

Legend: BDI: Burundi; KEN: Kenya; TZ: Tanzania; RW: Rwanda; UG: Uganda.

Figure 4.3 shows that the patterns of Burundi's sugar imports is dominated by Kenya with the highest quantities than that of other EAC countries. There is an evident exponential increase which seems to have been enhanced by the integration of the country into the EAC regional bloc. In addition, the patterns of Burundi's sugar imports from Uganda indicate an increase around year 2009 and 2010, a period which corresponds to the wake of Burundi's integration into the EAC.

4.1.4 Wheat imports

The results on the patterns of Burundi's wheat imports from EAC countries are presented in Figure 4.4 below.

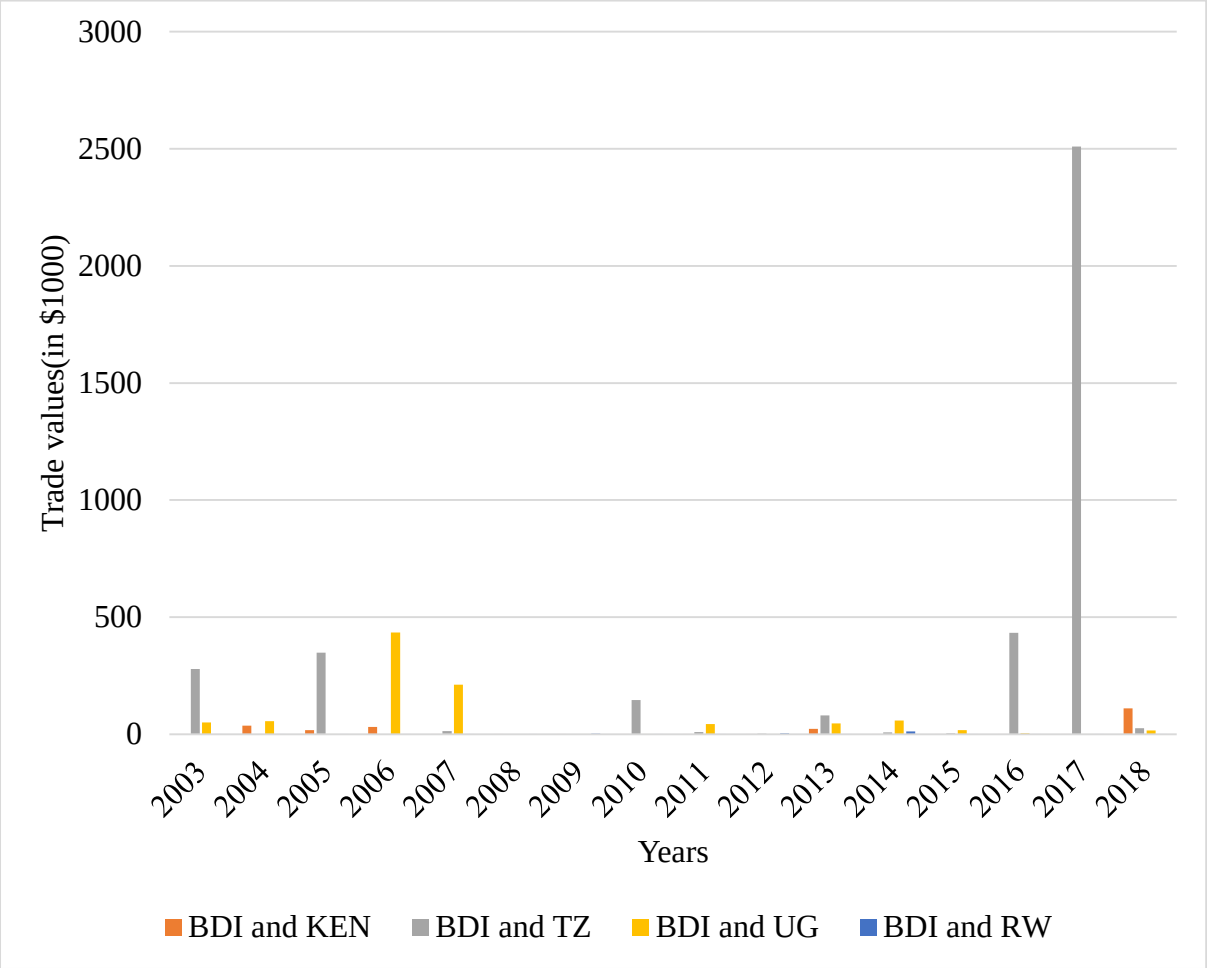

Figure 4.4: Burundi's wheat imports from EAC countries

Legend: BDI: Burundi; KEN: Kenya; TZ: Tanzania; RW: Rwanda; UG: Uganda.

Figure 4.4 describes the evolution of the patterns of Burundi's wheat imports from other EAC countries. There has not been any visible increase in the level of wheat imports as a consequence of integration of Burundi into the EAC. Except for Burundi's sporadic wheat imports from Uganda in 2005-2007 and from Tanzania in 2015-2017, the other periods of time showed little quantity of wheat imported from EAC countries. Therefore, the results show clearly that there has not been a visible effect of EAC integration on the patterns of Burundi's wheat imports from EAC countries.

4.2 Intensity of trade between Burundi and other EAC partner States

This section addresses the second objective of this study. The interpretations and discussions of the results focused on determining from which country Burundi intensively imported in each commodity and how this evolved over time. Histograms were used to depict the results. Figure 4.5 to Figure 4.8 present the intensity of Burundi's imports with regard to maize, rice, sugar and wheat.

4.2.1 Maize imports

The results on the intensity of Burundi's maize imports from the EAC countries are presented in Figure 4.5 below.

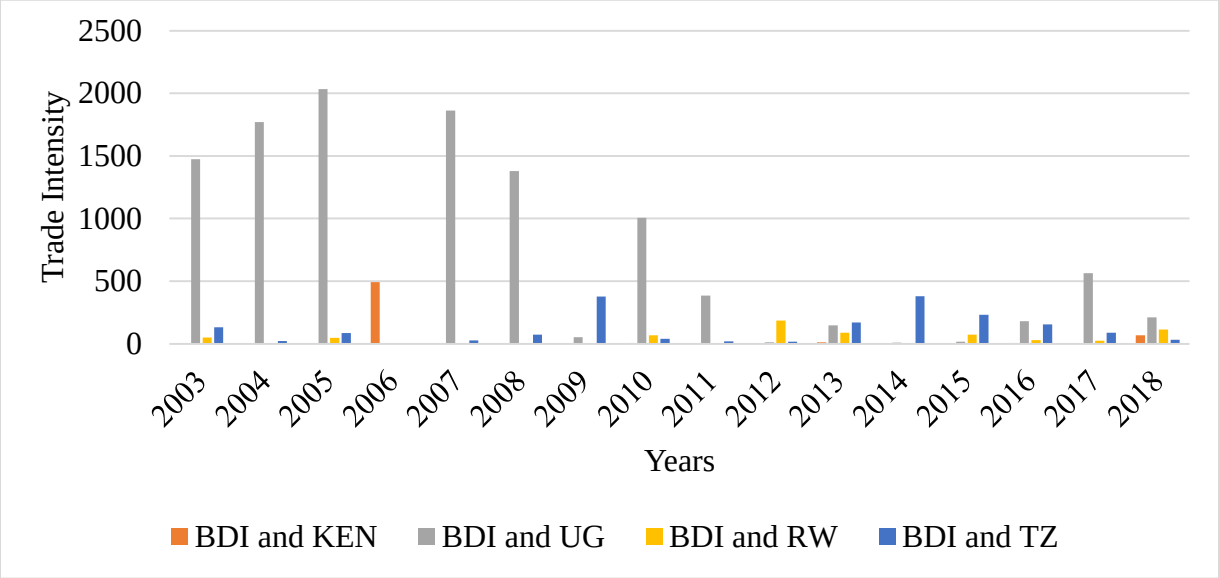

Figure 4.5: Intensity of Burundi's maize imports from EAC countries

Legend: BDI: Burundi; KEN: Kenya; TZ: Tanzania; RW: Rwanda; UG: Uganda.

Figure 4.5 reveals that Burundi intensively imported maize from Uganda followed by Tanzania and Kenya. However, the intensity was more pronounced prior to integration into the EAC. Immediately after that, the trend has declined over time due to the increase of domestic production. According to MINAGRIE (2017) maize production significantly increased as a result of government subsidies in fertilizers granted to farmers.

4.2.2 Rice imports

The results on the intensity of Burundi's rice imports from EAC countries are presented in Figure 4.6 below.

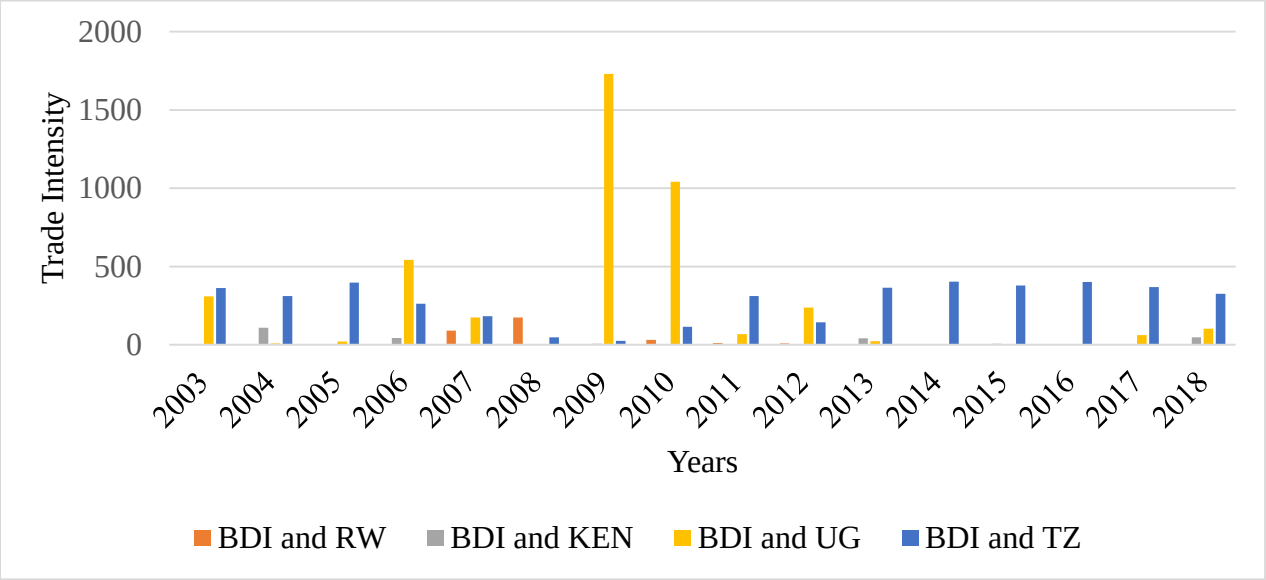

Figure 4.6: Intensity of Burundi's rice imports from EAC countries

Legend: BDI: Burundi; KEN: Kenya; TZ: Tanzania; RW: Rwanda; UG: Uganda**.**

The intensity of rice imports is shown in Figure 4.6. Even prior to the integration, Burundi intensively imported rice from basically two countries: Tanzania and Uganda. But around the period 2009-2010, the country intensively imported rice from Uganda. However, post-integration, the intensity of rice imports was solely from Tanzania and has remained relatively constant over time probably due to the comparative advantage of sharing border with many entry points. Although Burundi shares border with Rwanda, the intensity was hampered by unfavorable diplomatic relationships between the two countries and probably low level of maize production in Rwanda. However, rice imports from other EAC countries such as Kenya were not too intensive due to lack of comparative advantage.

4.2.3 Sugar imports

The results on the intensity of Burundi' sugar imports from EAC countries are presented in Figure 4.7 below.

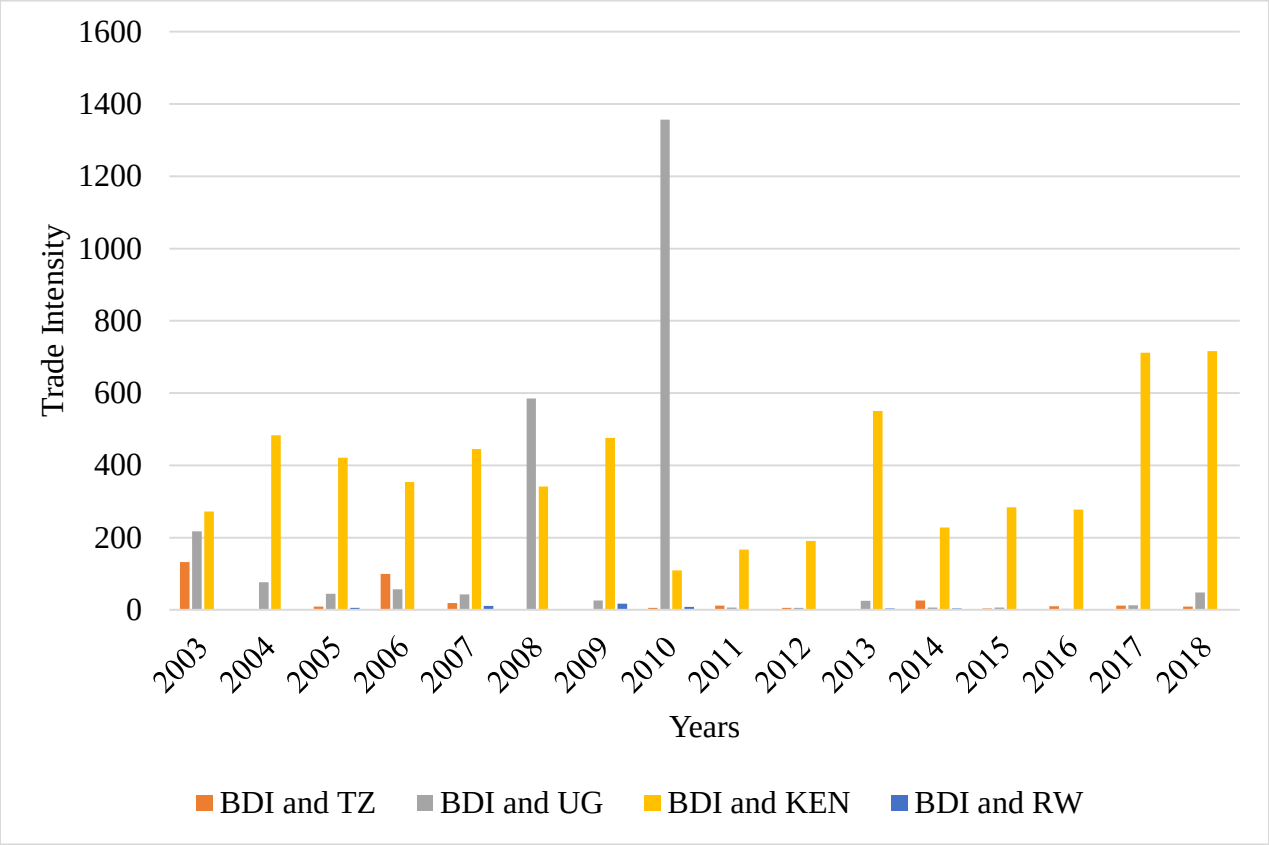

Figure 4.7: Intensity of Burundi's sugar imports from EAC countries

Legend: BDI: Burundi; KEN: Kenya; TZ: Tanzania; RW: Rwanda; UG: Uganda.

Before and after the integration, the intensity of Burundi's sugar imports from Kenya has dominated and it is on an upward trend (Figure 4.7). Although the country imported sugar from Uganda, the intensity was very low except in occasional circumstances like in 2008 and 2010. For the case of Tanzania and Rwanda, the results revealed that Burundi's intensity of imports in sugar was too small following a downward trend.

4.2.4 Wheat imports

The results on the intensity of Burundi's wheat imports from EAC countries are presented in Figure 4.8 below.

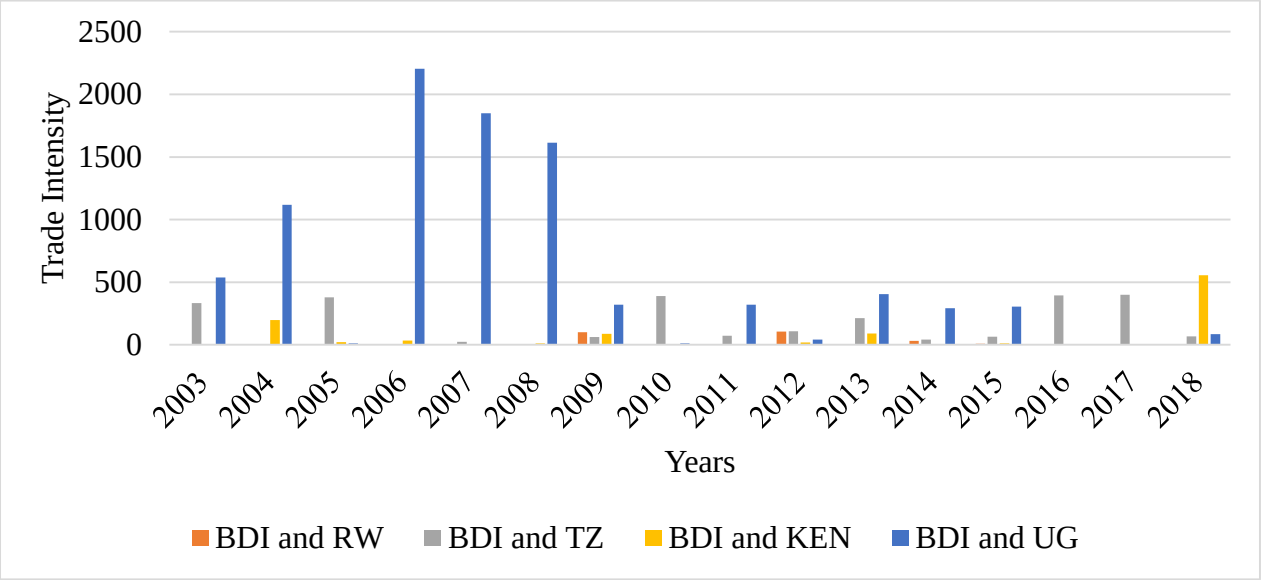

Figure 4.8: Intensity of Burundi's wheat imports from EAC countries

Legend: BDI: Burundi; KEN: Kenya; TZ: Tanzania; RW: Rwanda; UG: Uganda.

The results in Figure 4.8 reveal that prior to the integration, the intensity of wheat imports was relatively high with Uganda. This however, declined after the integration into the EAC which has seen the intensity with Tanzania and occasionally with Kenya grow. This is one effect of membership. Although it did not appear in any official document, it is likely that there were bilateral agreements on wheat imports between Burundi and Uganda before the later integrated into the EAC.

4.3 Factors affecting Burundi's food trade flows with other EAC countries

This section addresses the third objective of the study. The discussions focused on the factors that influence food trade flows between Burundi and other EAC countries.

4.3.1 Summary statistics

The summary of descriptive statistics of variables used is presented in Table 4.1 and Table 4.2 for imports and exports respectively.

Table 4: Summary statistics for imports between Burundi and EAC countries

Variables	Obs.	Mean	Std. Dev.	Min	Max
log ImpMaize	64	2.171	1.327	0	4.991
log ImpRice	64	1.562	1.275	0	3.799
log ImpSugar	64	1.521	0.934	0	3.330
log ImpWheat	64	0.805	0.911	0	3.399
log GDPi	64	3.274	0.192	2.894	3.501
log EXRATi	64	3.119	0.083	2.999	3.247
log EXRATj	64	2.817	0.569	1.828	3.567
log Dij	64	2.706	0.272	2.255	2.938
log TOPENi	64	1.602	0.052	1.508	1.692
log IDIi	64	1.173	0.030	1.142	1.250
log IDIj	64	1.155	0.162	0.716	1.408

The results in Table 4.1 suggest that the data revolve around the mean with low standard deviations. However, the data of some variables particularly for maize and rice present a relatively large standard deviations. Lastly, the data on maize, rice, sugar and wheat present low minimum value of zero. The number of observations is 64 with a maximum mean of 3.274 and a minimum mean of 0.805.

Table 5: Summary statistics for exports between Burundi and EAC countries

Variables	Obs.	Mean	Std. Dev.	Min	Max
log ExpMaize	64	0.089	0.435	0	2.530
log ExpRice	64	0.131	0.465	0	2.348
log ExpSugar	64	0.551	1.122	0	3.781
log ExpWheat	64	0.870	0.395	0	2.249
log GDPj	64	4.263	0.406	3.283	4.944
log EXRATi	64	3.119	0.083	2.999	3.247
log EXRATj	64	2.817	0.569	1.828	3.567
log Dij	64	2.706	0.272	2.255	2.938
log TOPENi	64	1.602	0.052	1.508	1.692
log IDIi	64	1.173	0.030	1.142	1.250
log IDIj	64	1.155	0.162	0.716	1.408

The results in Table 4.2 indicate that the data go round the mean with low standard deviations. However, the data on sugar exhibits a relatively high standard deviation. The total number of observations is 64 with a minimum value for maize, rice, sugar and wheat equal to zero. The maximum value of the mean is 4.263 and the minimum value of the mean is 0.089.

4.3.2 Pre- estimation tests results for food trade flows between Burundi and EAC countries

The panel unit roots test

Since this study used panel data, a panel unit roots test was conducted using the Im-Pesaran-Shin (IPS) test to check if the variables were stationary. The advantage of the IPS test is that it combines information from the time series dimension with that from the cross section dimension such that fewer time observations are required for the test to have power. Hence, this test was preferred over other tests in the context of this study.

With the IPS panel unit root test, hypotheses are stated as follows: Ho: All panels contain a unit root; H1: Some panels are stationary. Table 4.3 presents the results obtained.

Table 6: Panel unit roots test results

Variables	Im-Pesaran -Shin test				
	Levels	p-values	First order difference	p-values	comments
logimpMaize	-1.688**	0.045	-	-	stationary
logimpRice	-1.063**	0.014	-	-	stationary
logimpSugar	-3.124*	0.009	-	-	stationary
logimpWheat	-1.563***	0.059	-	-	stationary
logexpMaize	-5.293*	0.000	-	-	stationary
logexpRice	-4.520*	0.000	-	-	stationary
logexpSugar	-4.114*	0.001	-	-	stationary
logexpWheat	-4.348*	0.000	-	-	stationary
logGDPi	-4.641*	0.000	-	-	stationary
Log GDPj	-2.642**	0.033	-	-	stationary
logExRati	0.1315	1.000	-0.5319*	0.098	stationary
logExratj	0.4657	1.000	-0.857*	0.093	stationary
logDij	omitted	-	-		-
logTOPENi	-1.283**	0.038	-		stationary
logIDIi	-2.159**	0.015	-		stationary
logIDIj	-1.8779	0,221	-0.372*	0.099	stationary

Note: *, ** and ***: rejection of the null hypothesis of a unit root test at 1%, 5% and 10% significant level.

The results in Table 4.3 show that the null hypothesis of a unit root test was rejected for all variables except for the exchange rates and the infrastructure development index for the trading partner. This implies that they were integrated of order zero I (0). The results reported in Table 4.3 support the null hypothesis of IPS test for only these three variables. Greene (2000) indicates that if a variable is not stationary, taking the first difference for that variable makes it stationary. Hence the first difference was taken and the variables became stationary. Therefore, one can conclude that at most 10% significant level, all the variables used were stationary.

Random and fixed effect model results

Analyzing panel data requires the use of either OLS pooled model, random effect model or fixed effect model. The OLS pooled model assumes homogeneity of the units in a panel dataset. This rarely happens in real practices. Therefore the OLS pooled model was found irrelevant since the five EAC countries are not homogeneous. Consequently, the random effect model and the fixed effect model were found to be more relevant. Therefore, the choice between random effect model and fixed effect model, was made using Hausman test. Use of Hausman test is based on the null hypothesis that the random effect model is appropriate and the corresponding alternative hypothesis is that the fixed effect model is appropriate. The results in Table 4.4 showed that the random effect model was the most appropriate model over the fixed effect model. Hence, this study used the random effect model to estimate the gravity model.

Table 7: Summary of Hausman test results

Commodity	Imports		Exports	
	Value of chi2	Prob>chi2	Value of Chi2	Prob>chi2
Maize	3.790	0.704**	1.05	0.983**
Rice	4.340	0.631**	1.94	0.925**
Sugar	0.100	1.000**	8.40	0.210**
Wheat	0.170	0.999**	3.89	0.691**

Note: ** denotes fail to reject the null hypothesis in the Hausman test at 5% significance level.

The results reported in Table 4.4 indicates that the random effect model was relevant to estimate the factors affecting food trade. In all cases, the Hausman test failed to reject the null hypothesis. The estimation results from the random effect model are presented in the following sections.

4.3.3 Econometric results of factors affecting Burundi's imports from EAC countries

This section deals with the estimation of the factors which influence Burundi's imports. Thus, the results of factors which affect Burundi' imports for maize, rice, sugar and wheat are presented from Table 4.5 to Table 4.8. The results were produced by STATA.13.

Maize imports

Table 4.5 presents econometric findings of factors affecting Burundi's maize imports from EAC countries.

Table 8: Econometric results of factors affecting Burundi's maize imports from EAC countries

Variables	Coefficients	Standard error	p-values
log GDP	-0.711*	2.366	0.076
log EXRAT	3.05*	5.017	0.054
log EXRATj	1.183***	0.302	0.000
log Dj	-0.099*	0.672	0.088
log TOPEN	-2.114***	2.874	0.004
log IDI	2. 452*	5.641	0.066
log IDIj	-1.613***	1.558	0.003
Constant	-5.704*	14.087	0.068
Value of R-squared			
Within	**0.018**		
Between	**0.979**		
Overall	**0.346**		
Wald test	**29.75 (Prob >chi2= 0.000)**		
corr (u_i , X)	**0**		

Note: ***, ** and * mean significant at 1%, 5% and 10% level respectively.

The results presented in Table 4.5 show that the coefficient associated to Burundi's GDP has a negative sign and is statistically significant at 10%. This indicates that a 1% increase in the GDP leads to a decrease of maize imports by 0.711%. Seemingly, the country takes advantage of growth in the GDP to import other commodities rather than maize. This is because there is an apparent link between growth in the GDP and an increase in maize production. Nyamweru (2017) revealed that agriculture contributes at more than 30% in the GDP of Burundi.

The exchange rate of Burundi and that of its trading partner have positive signs and are statistically significant respectively at 10% and 1%. When the Burundian franc (BIF) appreciates against the USD by 1%, maize imports augment by 3.05%. The appreciation of BIF makes imports relatively cheaper and this provokes an expansion of maize imports. Again, a 1% appreciation of the currency of the trading partner causes an increase of maize imports by 1.183%. The local demand in the trading partner falls down due to inflation occasioned by an increase in the exchange rate. Thus, Burundi uses that opportunity to expand its maize imports. In line with that, Monfared and Akin (2017) revealed the existence of a positive relationship between exchange rate and inflation.

The distance has a negative sign and is statistically significant at 10%. Specifically, a 1% increase in the distance gives rise to a fall of maize imports by 0.099%. These results concur with the theory of cost. Eifert *et al*. (2008) indicated that the higher there is cost of trading, the less trade takes place and vice-versa. The estimated coefficient for Burundian trade openness has a negative sign and is statistically significant at 1% in affecting maize imports. A 1% increase in trade openness of Burundi generates a diminution of maize imports by 2.114%. The country benefits from its trade openness to import other commodities rather than maize which it can produce domestically. Indeed, the government supports farmers by offering fertilizer subsidies and this increased maize production according to MINAGRIE (2018).

The coefficient of Burundian infrastructure development index has a positive sign and is statistically significant at 10%. A 1% increase in the infrastructure development index triggers an expansion of maize imports by 2.452%. In line with these results, Limao and Vanables (2001) indicate that infrastructure is an important determinant of transport cost, especially for landlocked countries. Lastly, the infrastructure development index of the trading partner has a negative sign and is statistically significant at 1%. A 1% increase in the infrastructure development index of the trading partner occasions a fall of Burundi's maize imports by 1.613%.

The improvement of infrastructures in the trading partners opens up other new export outlets rather than Burundi and this reduces the quantity of maize imported. Overall, the results discussed in this section are consistent with some of the findings of other empirical studies including Kabanda (2014) and Patcharee (2012).

Rice imports

Table 4.6 presents econometric findings of factors affecting Burundi's rice imports from EAC countries.

Table 9: Econometric results of factors affecting Burundi's rice imports from EAC countries

Variables	Coefficients	Standard error	p-values
log GDPi	2.405**	2.053	0.024
log EXRATi	2.422	4.353	0.578
log EXRATj	0.588**	0.262	0.025
log Dij	-0.012*	0.583	0.098
log TOPENi	5.058**	2.494	0.043
log IDIi	7.587	4.895	(0.121)
log IDIj	-4.899***	1.352	0.000
Constant	-26*	12.223	0.028
Value of R-squared			
Within	**0.133**		
Between	**0.980**		
Overall	**0.467**		
Wald test	**49.18 (Prob >chi2= 0.000)**		
corr (u_i , X)	**0**		

Note: ***, ** and * mean significant at 1%, 5% and 10% level respectively.

Results in Table 4.6 suggests that Burundi's GDP has a positive sign and is statistically significant at 5%. A 1% increase in the GDP generates an augmentation of its rice imports by 2.405%. The country grasps the opportunity of its growth in the GDP by importing rice. This confirms the existing literature arguing that the economic size of countries and trade volume are positively linked.

Li *et al.* (2010) pointed out the existence of a long-term or short-term causality between the GDP and the volume of exports and imports. The coefficient associated to the exchange rate of the trading partner has a positive sign and is statistically significant at 5% to influence the value of rice imports. A 1% appreciation of the currency of the trading partners results in an increase of Burundi's rice imports by 0.58%. Although an increase in exchange rate of the trading partner may shoot up prices, the country finds it advantageous to import rice from the region rather than from the rest of the world. However, these results contrast those of Musila and Newark (2003) who revealed that any devaluation of a currency in a given country improve its exportations and vice-versa. This is because they did not take into account of other advantages granted by a REC (as far as trade is concerned) which motivate the country to continue importing from a REC rather than from the rest of the world.

The distance has a negative sign and is statistically significant at 10%. Holding other things constant, a 1% increase in the distance causes a fall of Burundi's rice imports by 0.012%. This is plausible because the more countries are separated, the higher are costs of doing business and hence the smaller trade takes place. The Burundian trade openness index has a positive sign and is statistically significant at 5%. A 1% increase in the trade openness of Burundi generates an increase of rice imports by 5.058%. Burundi benefited from integration into the EAC to import rice from the region. It is evident that any policy meant to ameliorate the level of trade openness in Burundi enlarges the value of rice imports from EAC region.

The coefficient associated to the infrastructure development index of the trading partner has a negative sign and is statistically significant at 1%. A 1% increase in the infrastructure development index leads to a decrease of Burundi's rice imports by 4.899%. On the face of it, good infrastructures in the trading partner reinforce intra-country trade and this lowers Burundi's rice imports. These results contrast those of Bougheas *et al*. (1999) who revealed a positive relationship between a level of good infrastructure in a country and the volume of imports by its trading partner. This is because the context of this study differs from that of theirs. The EAC countries face infrastructure challenges at a point that any improvement of infrastructures at country level opens up new other intra-country market outlets.

Sugar imports

Table 4.7 presents econometric results of factors affecting Burundi's sugar imports from EAC countries.

Table 10: Econometric results of factors affecting Burundi's sugar imports from EAC countries

Variables	Coefficients	Standard error	p-values
log GDPi	0.520*	1.162	0.065
log EXRATi	-1.572	2.464	0.524
log EXRATj	-0.671***	0.148	0.000
log Dij	-2.081***	0.330	0.000
log TOPENi	0.92	1.412	0.948
log IDIi	1.629*	2.771	0.055
log IDIj	2.376***	0.765	0.002
Constant	-3.82*	6.920	0.058
Value of R-squared			
Within	**0.208**		
Between	**0.998**		
Overall	**0.681**		
Wald test	**119.95 (Prob >chi2= 0.000)**		
corr (u_i , X)	**0**		

Note: ***, ** and *mean significant at 1%, 5% and 10% level respectively.

The results in Table 4.7 indicates that the estimated coefficient of the GDP has a positive sign and is statistically significant at 10% in determining sugar imports. This suggests that a 1% increase in Burundi's GDP gives rise to an expansion of sugar imports by 0.52%. The economic rationale behind the positive sign of the coefficient associated to GDP can be explained based on the link between growth in the GDP and an increase in the purchasing power of citizens.

According to some of economic literature, the GDP growth provokes an increase in the purchasing power of citizens (all other things held constant) followed by an increase in domestic aggregated demand. Consequently, there is an immediate expansion of imports. The exchange rate of the trading partner has a negative sign and is statistically significant at 1%. When the currency of the trading partner appreciates by 1%, sugar imports fall by 0.671%. This can be explained by the macroeconomic theory of exchange rate. The theory states that, all other things held constant, the devaluation of a currency triggers an expansion of exports while the appreciation of a currency provokes a rise of imports. In accordance with this theory, Genc and Artar (2014) revealed the existence of a long-run relationship between effective exchange rates and exports/imports of emerging countries.

The distance has a negative sign and is statistically significant at 1%. This implies that a 1% increase in the distance results in a reduction of Burundi sugar imports by 2.081% due to trade costs. This is compatible with the gravity model theory highlighting that the distance negatively affects bilateral trade. Moreover, this results are compatible with those of Kabanda (2014) and Ardiyanti (2015).

The infrastructure development index of Burundi has a positive sign and is statistically significant at 10%. The results suggest that a 1% increase in infrastructure development index of Burundi tends to increase sugar imports by 1.629%. Lastly, the coefficient associated to the infrastructure development index of the trading partner has a positive sign and is statistically significant at 1%. A 1% increase in the infrastructure development index of the trading partner induces sugar imports to increase by 2.376%. Everything points to the fact that adequate infrastructures ease the linkage between Burundi and other sugar markets within EAC. In line with the role of infrastructures in trade, Lamli and Ismail (2014) indicate that infrastructure development is very key to speed up the economic integration within the region particularly in the area of international trade and investment.

Wheat imports

Table 4.8 presents econometric findings of factors affecting Burundi's wheat imports from EAC countries.

Table 11: Econometric results of factors affecting Burundi's wheat imports from EAC countries

Variables	Coefficients	Standard error	p-values
log GDPi	-1.122*	1.714	0.051
log EXRATi	2.865	3.635	0.340
log EXRATj	0.589***	0.219	0.007
log Dij	-1.107**	0.487	0.023
log TOPENi	-0.377	2.082	0.856
log IDIi	-2.535*	4.087	0.053
log IDIj	-0.480*	1.128	0.067
Constant	-4.977	10.206	0.626
Value of R-squared			
Within	**0.069**		
Between	**0.997**		
Overall	**0.272**		
Wald test	**20.96 (Prob >chi2= 0.003)**		
corr (u_i , X)	**0**		

Note: ***, ** and * mean significant at 1%, 5% and 10% level respectively.

The results in Table 4.8 show that the GDP has a negative sign and is statistically significant at 10%. A 1% increase in the GDP of Burundi occasions a decline of wheat imports by 1.122%. Apparently, the increase in Burundi's GDP reflects an augmentation of the output of goods produced domestically which compete with wheat imports. This lessens the level of Burundi's wheat imports.

The coefficient associated to the exchange rate of the trading partner has a positive sign and is statistically significant at 1%. A 1% appreciation of the currency of the trading partner gives rise to an augmentation of wheat imports by 0.58%. This reveals that the appreciation of the currency of the trading partner does not impede Burundi's wheat imports from the EAC region. Burundi's wheat imports are inelastic to prices applied in other EAC countries and this inform that wheat stands among basic food items in the country.

The coefficient of the distance has a negative sign and is statistically significant at 5%. A 1% increase in the distance induces a decrease of Burundi's wheat import by 1.107% due to the costs. This results are compatible with those of Huang (2007) who indicated that the transport costs and the unfamiliarity can explain the negative correlation between geographic distances and the volume of bilateral trade.

The infrastructure development index of Burundi has a negative sign and is statistically significant at 10%. A 1% increase in the Burundian infrastructure development index generates a decrease of Burundi's wheat imports by 2.53%. Lastly, the infrastructure development index of the trading partner has a negative sign and is statistically significant at 10%. A 1% increase in the infrastructure development index of the trading partner induces a decrease of Burundi's wheat imports by 0.48%. Ostensibly, the improvement of infrastructures facilitates access to other wheat markets within the country and/or outside the region and this takes down Burundi's wheat imports from EAC region.

4.3.4 Econometric results of factors affecting Burundi's exports

Trade flows involves both imports and exports. This section addresses the factors which influence Burundi's exports to the other EAC partner states. The results are presented from Table 4.9 to Table 4.12. The results were produced by STATA.13.

Maize exports

Table 4.9 presents the econometric findings of factors affecting Burundi's maize exports to other EAC countries.

Table 12: Econometric findings of the factors affecting Burundi's maize exports to EAC countries

Variables	Coefficients	Standard error	p-values
log GDPj	0.667**	0.689	0.033
log EXRATi	-1.987**	1.951	0.030
log EXRATj	0.033*	0.120	0.077
log Dij	-1.269**	0.861	0.014
log TOPENi	1.480	1.034	0.153
log IDIi	2.830**	2.050	0.016
log IDIj	0.048	0.537	0.928
Constant	1.029	6.817	0.880
Value of R-squared			
Within	**0.146**		
Between	**0.992**		
Overall	**0.217**		
Wald test	**15.54 (Prob >chi2= 0.029)**		
corr (u_i , X)	**0**		

Note: ***, ** and * mean significant at 1%, 5% and 10% level respectively.

The results in Table 4.9 reveals that the GDP of the trading partner has a positive sign and is statistically significant at 5%. A 1% increase in the GDP of the trading partner leads to an increase of Burundi's maize export by 0.667%. An economic rationale behind these results could be that since maize is a staple food across East Africa, an increase in the GDP of the trading partner provokes an increase of its domestic demand. Karemera *et al*. (1999) indicate that an importing country's income shows its purchasing power. As far as one can see, growth in the GDP rises the willingness to consume Burundi's maize exports.

Therefore, this triggers an expansion of Burundi's maize exports. These results confirm the findings of Ndayitwayeko *et al.* (2014) and Angeline (2014) who revealed that growth in the GDP of the importer is positively linked to the expansion of the exports of its trading partner. The coefficient associated to the exchange rate of Burundi has a negative sign and is statistically significant at 5%. When the BIF appreciates by 1% against the USD, there is a decrease of maize export by 1.987%.

The exchange rate of the trading partner has a positive sign and is significant at 10%. This shows that a 1% appreciation of the currency of the trading partner generates an increase of Burundi's maize exports by 0.033%. Appreciation of the Burundian currency makes its exports relatively more expensive and increase in the exchange rate of the trading partner makes Burundi's exports relatively cheaper, as far as maize is concerned. These results are compatible with findings of Zia and Mahmood (2013) who revealed that an exchange rate depreciation clearly improves the export-price competitiveness.

The distance has a negative sign and is statistically significant at 5% in explaining maize exports. A 1% increase in the distance generates a contraction of maize exports by 1.269%. Hence, it is comprehensible that the distance hampers exports. Lastly the infrastructure development index of Burundi has a positive sign and is statistically significant at 5%. A 1% increase in the infrastructure development index of Burundi induces an increase of Burundi's maize export by 2.830%. The infrastructures smoothly ease the export of maize to the EAC region. The more there are good and adequate infrastructures, the higher there is a volume of Burundi's maize exports.

Rice exports

Table 4.10 presents econometric findings of factors affecting Burundi's rice exports to other EAC countries.

Table 13: Econometric results of factors affecting Burundi's rice exports to EAC countries

Variables	Coefficients	Standard error	p-values
log GDPj	0.259*	0.716	0.071
log EXRATi	-1.431**	2.029	0.048
log EXRATj	-0.061*	0.125	0.062
log Dij	-1.106**	0.895	0.021
log TOPENi	-0.522	1.076	0.627
log IDIi	3.322	2.132	0.119
log IDIj	-0.167	0.558	0.765
Constant	3.790	7.090	0.593
Value of R-squared			
Within	**0.085**		
Between	**0.978**		
Overall	**0.260**		
Wald test	**19.7 (Prob >chi2= 0.006)**		
corr (u_i , X)	**0**		

Note: ***, ** and* mean significant at 1%, 5% and 10% respectively.

The results in Table 4.10 show that the coefficient associated to the GDP of the trading partner has a positive sign and is statistically significant at 10%. A 1% increase in the GDP of the trading partner occasions an augmentation of rice exports by 0.25%. The richer are citizens in the trading partner, the easier they afford Burundi's rice exports and hence rice exports jump up. These results are consonance with the findings of Fadeyi (2013) who highlighted a positive effect of growth in the GDP of one country and the exports of another country.

The exchange rate of Burundi has a negative sign and is statistically significant at 5%. A 1% appreciation of Burundian currency causes a decline of Burundi's rice export by 1.431%. This sustains how price competitiveness between countries is important to influence the volume of bilateral trade in general and exports in a particular way. The exchange rate of the trading partner has a negative sign and is statistically significant at 10%. A 1% appreciation of the currency of the trading partner prompts a decrease of rice exports by 0.061%.

The trading partner exploits the appreciation of its currency by finding out other relatively competitive rice suppliers rather than Burundi and this diminishes Burundi's rice exports. The distance has a negative sign and is statistically significant at 5%. A 1% increase in the distance generates a decline of Burundi's rice exports by 1.106. It is obvious that the distance acts negatively on the exports like other trade barriers.

Sugar exports

Table 4.11 presents econometric findings of factors affecting Burundi's sugar exports to other EAC countries.

Table 14: Econometric results of factors affecting Burundi's sugar exports to EAC countries

Variables	Coefficients	Standard error	p-values
log GDPj	-0.707*	1.419	0.061
log EXRATi	-1.079*	4.019	0.078
log EXRATj	-0.241	0.248	0.333
log Dij	-1.999**	1.774	0.026
log TOPENi	-2.123**	2.131	0.031
log IDIi	-0.949	4.224	0.822
log IDIj	-0.706 *	1.106	0.052
Constant	18.356	14.044	0.191
Value of R-squared			
Within	**0.140**		
Between	**0.975**		
Overall	**0.500**		
Wald test	**56.20 (Prob >chi2= 0.000)**		
corr (u_i , X)	**0**		

Note: ***, ** and * mean significant at 1%, 5% and 10% level respectively.

The results in Table 4.11 indicate that the GDP of the trading partner has a negative sign and is statistically significant at 10%. A 1% increase in the GDP of the trading partner gives rise to a diminution of sugar export by 0.707%. Provided that growth in the GDP improves the welfare of citizens, it seem like the country uses that opportunity to import other commodities whose demand is highly expressed following the improvement of citizens' wellbeing.

The exchange rate of Burundi has a negative sign and is statistically significant at 10%. When the Burundian currency appreciates by 1%, there is a decrease of sugar exports by 1.07%. This are compatible with the economic theories arguing that the appreciation of a currency discourages exports. Hence, the re-evaluation of a currency obstruct exports. The distance has a negative sign and is statistically significant at 5%. A 1% increase in the distance results in a fall of Burundi's sugar export by 1.999% due to transport costs and other route barriers which discourage trade. These results confirms those of Disdier and Head (2008) whose empirical analysis revealed a negative relationship between the distance and the volume of trade.

The coefficient of the Burundian trade openness has a negative sign and is statistically significant at 5%. A 1% increase in the trade openness occasions a decrease of sugar exports by 2.123%. The country does not augment sugar exports following an improvement of the level of its trade openness. Apparently, there are particular policies applied to sugar exports but this does not appear in official documents to be confirmed. The infrastructure development index of the trading partner has a negative sign and is statistically significant at 10%. A 1% increase generates a decrease of sugar exports by 0.706%. Adequate infrastructures in the trading partners opens other new sources of sugar rather than Burundi and this diminishes Burundi's sugar exports.

Wheat exports

Table 4.12 presents econometric findings of factors affecting Burundi's wheat exports to other EAC countries.

Table 15: Econometric results of factors affecting Burundi's wheat exports to EAC countries

Variables	Coefficients	Standard error	p-values
log GDPj	0.425*	0.668	0.052
log EXRATi	0.213*	1.892	0.091
log EXRATj	-0.109	0.117	0.349
log Dij	-0.98**	0.835	0.023
log TOPENi	0.246	1.003	0.806
log IDIi	-1.439**	1.988	0.046
log IDIj	-0.405**	0.520	0.043
Constant	2.357**	6.611	0.072
Value of R-squared			
Within	**0.052**		
Between	**0.915**		
Overall	**0.110**		
Wald test	**6.97 (Prob >chi2= 0.043)**		
corr (u_i , X)	**0**		

Note: ***, ** and * mean significant at 1%, 5% and 10% respectively.

The results in Table 4.12 points out that the GDP of the trading partner has a positive sign and is statistically significant at 10%. A 1% increase in the GDP of the trading partner leads to an increase of Burundi's wheat exports by 0.42%. This indicates that an increase in the GDP of the trading partner occasions a rise of wheat consumption at country level. This could be true provided that wheat is among the staple food within the EAC region.

The exchange rate of Burundi has a positive sign and is statistically significant at 10% in determining wheat exports. This means that when the Burundian franc appreciates by 1%, there is an expansion of Burundi's wheat exports by 0.213%. The appreciation of the Burundian currency makes domestic goods more expensive triggering unwillingness to purchase. Hence, the domestic demand in wheat falls down due to increase in the exchange rate occasioning an increase in wheat exports. These results are consonance with those of Angeline (2014), Aichel and Felbermayr (2013) and Panda *et al*. (2016) whose empirical analysis revealed a negative relationship between an increase in the exchange rates and domestic demand.

The distance has a negative sign and is statistically significant at 5%. This results show that a 1% increase in the distance lead to a decrease of wheat exports by 0.98%. Referring to cost, Ndayitwayeko *et al.* (2014) indicated that the distance not only makes trade expensive and reduces the volume of trade, but it even affects the composition of trade. It is evident that the distance acts as a trade barriers. These results on the distance confirm the results of the study done by Nguyen and Vo (2017), Caporale *et al*. (2009) and Fieler (2011) whose studies revealed a negative relationship existing between the volume of exports and the distance separating the capital cities of two trading countries. Wolf (2000) revealed a positive relationship between the distance and other formal and informal trade barriers. Hence, the longer there is distance, the higher there is probability for trade to face many barriers, both formal and informal.

Lastly, the coefficients associated to both Burundian infrastructure development index and that of the trading partners have negative signs and are statistically significant at 5% in affecting Burundi's wheat exports. This indicates that a 1% increase in the infrastructure development index of Burundi leads to a decrease of wheat exports by 1.43%. Moreover, results indicate that a 1% increase in the infrastructure development index of the trading partner result in a decrease of wheat exports by respectively 0.40%. This shows that improvement of the infrastructures within the trading partners impedes wheat exports. Ostensibly, improvement of the infrastructures foster intra-trade rather than inter-trade, as far as wheat exports are concerned.

4.3.5 Post-estimation test for factors affecting food trade flows between Burundi and other EAC countries

In this study, the post-estimation test conducted was that of multicollinearity. The test was run using a VIF test to check the presence of a perfect multicollinearity problem among the data.

Test for multicollinearity

The VIF test was run to check if there was severe multicollinearity among the data. This could render questionable the estimates found. Multicolllinearity problem occurs whenever an independent variable is correlated with one or more other independent variables in a multiple regression. On one hand, the independent variables may be highly correlated and this is referred to perfect multicollinearity. On the other hand, the independent variables maybe weakly correlated and this is referred to weak multicollinearity. There are different causes of multicollinearity. Generally, multicollinearity occurs when independents variables are correlated to one another. Gujarati (2003) indicates that if multicollinearity is perfect, the regression coefficient are indeterminate and the standard errors infinite.

Franke (2010) indicates that multicollinearity increases the variances of the regression coefficient and this can results in coefficients with theoretically implausible magnitudes or signs, coefficients which vary substantially with small changes and coefficients which are individually non-significant even though they explain significant amounts of variance overall. Another consequence of multicollinearity lies in the confidence intervals. In the presence of high multicollinearity, the confidence intervals of the coefficients tend to become very wide and the statistics tend to be very small. It becomes difficult to reject the null hypothesis of any study when the multicollinearity problem is present in the data.

Hence, it is crucial to check for it and address it in case it is present in the data. In some of empirical studies, the VIF threshold considered is 5 while others consider a threshold of 10 to confirm the presence of the issue of severe multicollinearity. In the context of this study, the threshold considered was 10, meaning that a value greater than 10 was showing severe multicollinearity while a value less or equal to 10 indicated absence of perfect multicollinearity. After running the VIF test, the results showed that the data had an issue severe multicollinearity. Gujarati (2003) indicates that in case of severe multicollinearity among the data, the best and simple way to handle it is to drop out the variables which are suspected to be the source of severe multicollinearity.

Therefore, after checking among the data, four variables (GDP per capita, sharing history, sharing border and sharing language) were dropped out from the model due to their higher level of multicollinearity. These variables exhibited higher values of VIF allowing to conclude that they were the source of perfect multicollinearity. Once dropped, the remaining variables no longer presented the issue of perfect multicollinearity. The variables dropped due to their severe multicollinearity did not appear in the estimation results. Table 4.13 presents the results of the VIF test on imports and exports after sorting out the issue of multicollinearity.

Table 16: VIF test results on imports and exports

Imports	VIF	Exports	VIF
GDPi	10.11	GDPj	10.49
EXRATi	8.45	EXRATi	10.53
EXRATj	3.10	EXRATj	9.93
Dij	1.63	Dij	2.86
TOPENi	1.48	TOPENj	1.79
IDIi	1.45	IDIi	1.52
IDIj	1.10	IDIj	1.11
Mean VIF	3.90	Mean VIF	5.30

The results in Table 4.13 show that the variables considered did not exhibit a severe multicollinearity. The value of VIF on the GDPs was respectively 10.11 and 10.38 for imports and exports. Hence, these variables were exempt from the multicollinearity problem. The value of the VIF for exchanges rates on both imports and exports show values which are less than the threshold considered in this study. As far as the distance is considered, the results of the VIF test indicate a value which is less than the threshold considered. Likewise for other variables namely the trade openness, the infrastructure development index, for import and exports, the values of the VIF results are less than the threshold considered in this study. Looking at the mean VIF, results in Table 4.13 reveal that the variables on imports had a mean VIF of 3.90 with a higher value of 10.11. The variables on exports had a mean VIF of 5.30 with a higher value of 10.49. Hence, it is clear that the data used did not exhibit the problem of perfect multicollinearity. As said in the previous lines, sorting out the problem of multicollinearity results in improved estimates after running the regression.

CHAPTER FIVE
CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the results of this study. The chapter is organized as follows: the first section deals with a brief summary of the study; the second section is about the key conclusions drawn from this study; the third section deals with the recommendations and the fourth section is about the suggestions for future studies.

5.1 Summary of the study

This study was about food trade between Burundi and other EAC countries. It involved five EAC countries namely Burundi, Kenya, Uganda, Tanzania and Rwanda. More specifically, it characterized the evolution of food trade patterns between Burundi and other EAC partner states, determined the intensity of food trade between Burundi and other EAC countries and estimated the factors which affect Burundi's food trade with other EAC countries. This study was limited in time over the period 2003-2018. One of the reasons to choose this period was related to data availability. In addition this study was narrowed to four food commodities namely maize, rice, sugar and wheat. This food commodities are majorly consumed in Burundi and are easily tradable. This study used a descriptive approach to meet the first and second objective and thereafter, a gravity model approach was used to determine the factors which affect Burundi's trade with other EAC partner states, as far as maize, rice, sugar and wheat are concerned.

5.2 Conclusions

The first objective concerned the characterization of the patterns of food trade between Burundi and EAC countries. In respect of this, the results indicate that there has not been a significant effect on Burundi's integration into EAC. Examining the patterns of food trade and their evolution over time, only little changes have been observed. A small change was perceived in food imports particularly for maize, rice and sugar. On the side of exports, the integration of Burundi into EAC had an imperceptible change on the patterns of Burundi's food exports. Burundi remained a net food importer and the level of exports remained too low. All in all, the integration of Burundi into the EAC brought little improvements in the patterns of Burundi's food imports but did not make visible improvements in regard to the patterns of Burundi's food exports. The patterns of food imports slightly increased as a results of integration of Burundi into the EAC. The patterns of food exports did not visibly improved.

The values of Burundi's exports to other EAC countries remained too low as far as trade in maize, rice, sugar and wheat is concerned. The second objective determined the intensity of food trade between Burundi and other EAC countries. The results allow concluding that Burundi intensively imported maize, rice and wheat from Uganda followed by Tanzania. In regard to sugar, it was noted that Burundi intensively imported sugar from Kenya followed by Uganda. Among other EAC countries, the results show that Rwanda was the only country where the intensity of trade remained relatively too small. The level of the intensity of Burundi's imports in maize, rice, sugar and wheat from Rwanda remained too low.

The third objective was about to estimate the factors which influence Burundi-EAC food trade. The results revealed that the GDPs, the exchange rate of the trading partners, the trade openness of trading partners and the infrastructure development indices influence food trade in different proportions. Some of this variables had positive or negative effect on either imports or exports depending on the commodity and the country Burundi imported from. However, regardless of the direction of trade (either imports or exports), it is particularly important to highlight that the GDPs, the exchange rates and the distance stood as the main factors which were statistically significant to influence Burundi's food trade with EAC partner states, as far as maize, rice, sugar and wheat are concerned.

5.3 Recommendations

1. The first objective of this study explored the evolution of the patterns of food trade for maize, rice, sugar and wheat. In accordance with the findings, the government of Burundi should design and implement policies meant to upgrade the patterns of food trade. Clearly, there should be particular trade advantages granted to imports (exports) from (to) other EAC countries to give incentives to food trade operators. This could boost Burundi's patterns of food trade with other East African Community EAC partner states. There should be particular rules and regulations meant to expand the patterns of maize, rice, sugar and wheat trade with other EAC partner states.

2. The second objective was about the determination of the intensity of food trade. The results came up with a useful information on which country Burundi trades intensively with and for which commodity among the four food commodities involved in this study. Therefore, the government of Burundi should consult other stakeholders in trade across the region in order to create a space that efficiently maximize the intensity of food trade through attractive trade policies.

For instance, they should establish in which commodities Burundi has a comparative advantage (disadvantage) and intensifies exports (imports) with each of the EAC countries accordingly. This could allow the country to avoid producing what it can import at relatively low cost or could be an incentive to invest in the commodity for which Burundi imports at high cost.

3. The third objective estimated the factors which influence trade flows between Burundi and other EAC partner states. In accordance with the results, there should be a particular attention to the GDPs, the exchange rates and the distance to facilitate or impede each of them accordingly in order to boost food trade flows. Policy maker across the EAC should put a rigorous control on these variables to favour a smooth exchange of maize, rice, sugar and wheat between EAC partner states.

5.4 Suggestions for future studies

In the context of this study, it was not easy to draw a conclusion on other food commodities provided that the study was narrowed to only four food commodities. In order to contribute to the best understanding of the effect of the EAC on food trade flows, future research should carry out a study on other food commodities and if possible on all food commodities. In line with that, there is need of a study which may categorize food commodities such as cereals, tubers, dairy products and fish products among others. This kind of study should focus on each group to be able to draw a conclusion on the effect of the EAC regional integration on trade of each group of commodities.

In addition, it was difficult to predict on how food trade flows will operate provided that this study used an ex-post approach. Future research should use an ex-ante approach to predict on food trade performance of Burundi within the EAC. Moreover there is need to carry out a study on the effect of food trade on food security. Provided that trade contribute to food availability across countries, a study on the effect of intra-EAC trade on food security should be more relevant as far as intra-EAC trade is concerned. Lastly, provided that trade improves the economic growth of countries, there is need to conduct a study assessing the effect of food trade on the economic growth of EAC partner states. In line with that, it was difficult to draw a conclusion on what has been the effect of food trade on the welfare of citizens across the EAC region. Therefore, future research should focus on the link between intra-EAC food trade and the welfare of citizens within the East African Community.

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APPENDICES

Appendix A: Data on imports

COUNTRY CODE	YEAR	log IMPMAIZE	log IMPRICE	log IMPSUGAR	log IMPWHEAT	log GDPi	log EXRATi	log EXRATj	log Dij	log TOPENi	log IDIi	log IDIj
1	2003	0	0	1.923	0	2.895	3.0234	1.881	2.938	1.58	1.157	0.952
1	2004	1.3973	1.6916	2.2707	1.566	2.962	3.0313	1.899	2.938	1.657	1.142	0.974
1	2005	1.0895	0	2.1389	1.253	3.048	3.0252	1.878	2.938	1.574	1.144	0.996
1	2006	4.162	1.481	2.6462	1.513	3.105	2.9994	1.858	2.938	1.628	1.145	1.06
1	2007	0.3215	0.0792	2.8463	0	3.132	3.0341	1.828	2.938	1.589	1.147	1.083
1	2008	0.0831	0	2.5572	0.076	3.207	3.0738	1.84	2.938	1.666	1.169	1.113
1	2009	0.029	0.4817	2.558	0.021	3.251	3.09	1.888	2.938	1.556	1.203	1.21
1	2010	0.9503	0	2.635	0	3.308	3.0902	1.899	2.938	1.588	1.238	1.266
1	2011	0.0652	0.1915	2.9932	0.049	3.349	3.1005	1.948	2.938	1.651	1.25	1.265
1	2012	0.0588	0.6884	3.0651	0	3.368	3.1589	1.927	2.938	1.693	1.179	1.268
1	2013	1.6178	2.7063	3.1864	1.385	3.389	3.1939	1.935	2.938	1.665	1.163	1.266
1	2014	0.0842	0.4296	2.6778	0	3.432	3.1927	1.944	2.938	1.621	1.162	1.339
1	2015	1.461	1.9032	2.6457	0	3.492	3.196	1.992	2.938	1.556	1.164	1.38
1	2016	2.2161	0.0249	3.0444	0.02	3.471	3.2099	2.007	2.938	1.508	1.165	1.387
1	2017	1.1564	0	3.2922	0.305	3.501	3.2371	2.015	2.938	1.536	1.167	1.397
1	2018	1.1218	2.1708	3.3307	2.046	3.488	3.248	2.005	2.938	1.568	1.179	1.408
2	2003	3.5463	3.2937	1.6647	2.447	2.895	3.0234	3.016	2.891	1.58	1.157	0.717
2	2004	2.2334	2.2545	0	0	2.962	3.0313	3.037	2.891	1.657	1.142	0.732
2	2005	2.8189	2.3761	0.541	2.543	3.048	3.0252	3.052	2.891	1.574	1.144	0.806
2	2006	1.7688	2.3523	2.189	0	3.105	2.9994	3.097	2.891	1.628	1.145	0.843
2	2007	2.9801	2.1629	1.5774	1.159	3.132	3.0341	3.094	2.891	1.589	1.147	0.872
2	2008	2.5025	2.0379	0.4374	0	3.207	3.0738	3.079	2.891	1.666	1.169	0.925

2	2009	4.9911	1.2468	0.2266	0	3.251	3.09	3.122	2.891	1.556	1.203	0.972
2	2010	1.8702	2.7164	1.4669	2.168	3.308	3.0902	3.159	2.891	1.588	1.238	1.009
2	2011	2.8589	3.3603	1.4979	1.021	3.349	3.1005	3.2	2.891	1.651	1.25	1.014
2	2012	2.9351	3.312	1.2172	0.44	3.368	3.1589	3.201	2.891	1.693	1.179	1.024
2	2013	2.9507	3.7995	0.97	1.909	3.389	3.1939	3.209	2.891	1.665	1.163	1.009
2	2014	3.4046	3.781	1.5236	0.921	3.432	3.1927	3.221	2.891	1.621	1.162	1.046
2	2015	3.1351	3.4491	0.6066	0.61	3.492	3.196	3.308	2.891	1.556	1.164	1.076
2	2016	3.3726	3.5361	1.4591	2.637	3.471	3.2099	3.34	2.891	1.508	1.165	1.078
2	2017	3.0735	3.1377	1.7742	3.4	3.501	3.2371	3.35	2.891	1.536	1.167	1.087
2	2018	1.099	3.2925	1.7325	1.426	3.488	3.248	3.354	2.891	1.568	1.179	1.098
3	2003	3.6547	2.2833	0.9839	1.712	2.895	3.0234	3.293	2.74	1.58	1.157	1.054
3	2004	3.451	0	0.9523	1.75	2.962	3.0313	3.258	2.74	1.657	1.142	1.064
3	2005	3.2242	0.1189	0.4378	0	3.048	3.0252	3.251	2.74	1.574	1.144	1.082
3	2006	0.1106	1.8869	1.1973	2.638	3.105	2.9994	3.263	2.74	1.628	1.145	1.097
3	2007	4.1238	1.4437	1.2602	2.328	3.132	3.0341	3.236	2.74	1.589	1.147	1.128
3	2008	3.1524	0	2.2776	1.734	3.207	3.0738	3.235	2.74	1.666	1.169	1.182
3	2009	3.4441	2.3618	0.8189	0.031	3.251	3.09	3.308	2.74	1.556	1.203	1.205
3	2010	2.5856	3.0078	3.1667	0	3.308	3.0902	3.338	2.74	1.588	1.238	1.252
3	2011	4.1193	2.6899	1.2194	1.647	3.349	3.1005	3.402	2.74	1.651	1.25	1.236
3	2012	2.7525	3.5163	1.2698	0	3.368	3.1589	3.398	2.74	1.693	1.179	1.24
3	2013	2.3694	2.0819	1.5009	1.667	3.389	3.1939	3.413	2.74	1.665	1.163	1.252
3	2014	1.7619	0.0241	0.987	1.775	3.432	3.1927	3.414	2.74	1.621	1.162	1.27
3	2015	2.0036	0.0086	0.9314	1.278	3.492	3.196	3.51	2.74	1.556	1.164	1.297
3	2016	3.4363	0.0959	0.9474	0.721	3.471	3.2099	3.534	2.74	1.508	1.165	1.301
3	2017	3.5413	2.0342	1.4844	0.237	3.501	3.2371	3.558	2.74	1.536	1.167	1.305
3	2018	1.5591	2.4796	2.1419	1.213	3.488	3.248	3.568	2.74	1.568	1.179	1.314
4	2003	3.4211	0.1608	0	0.161	2.895	3.0234	2.719	2.255	1.58	1.157	1.145

4	2004	0	0.3703	0.2672	0	2.962	3.0313	2.748	2.255	1.657	1.142	1.176
4	2005	2.8621	0	0.6168	0.21	3.048	3.0252	2.737	2.255	1.574	1.144	1.18
4	2006	0.1477	0.9014	0.6421	0	3.105	2.9994	2.737	2.255	1.628	1.145	1.188
4	2007	0	2.1628	1.634	0.163	3.132	3.0341	2.738	2.255	1.589	1.147	1.201
4	2008	1.4238	2.8973	0	0.037	3.207	3.0738	2.738	2.255	1.666	1.169	1.225
4	2009	0	0.5083	1.551	0.508	3.251	3.09	2.755	2.255	1.556	1.203	1.257
4	2010	2.3922	2.4524	1.9432	0.369	3.308	3.0902	2.766	2.255	1.588	1.238	1.271
4	2011	2.1541	2.2019	0.4509	0	3.349	3.1005	2.778	2.255	1.651	1.25	1.272
4	2012	4.2967	2.4245	1.0374	0.719	3.368	3.1589	2.788	2.255	1.693	1.179	1.269
4	2013	2.971	1.0652	1.5048	0	3.389	3.1939	2.813	2.255	1.665	1.163	1.271
4	2014	2.0282	0.2693	0.9609	1.125	3.432	3.1927	2.836	2.255	1.621	1.162	1.29
4	2015	2.9394	1.9506	0.2499	0	3.492	3.196	2.856	2.255	1.556	1.164	1.31
4	2016	2.9465	0	1.0789	0.217	3.471	3.2099	2.895	2.255	1.508	1.165	1.311
4	2017	2.8177	0.6571	0.9952	0.03	3.501	3.2371	2.923	2.255	1.536	1.167	1.317
4	2018	1.9016	0	0.1581	0.368	3.488	3.248	2.934	2.255	1.568	1.179	1.317

Note: 1: Kenya; 2: Uganda; 3: Tanzania; 4: Rwanda

Appendix B: Data on exports

COUNTRY CODE	YEARS	log EXPMAIZE	log EXPRICE	log EXPSUGAR	log EXPWHEAT	log GDPj	log EXRATi	log EXRATj	log Dij	log TOPENi	log IDIi	log IDIj
1	2003	0	0	0	0	4.173	3.023	1.881	2.938	1.58	1.157	0.952
1	2004	0	0	0	0	4.207	3.031	1.899	2.938	1.657	1.142	0.974
1	2005	0	0	0	0	4.273	3.025	1.878	2.938	1.574	1.144	0.996
1	2006	0	0	0	1.45	4.412	2.999	1.858	2.938	1.628	1.145	1.06
1	2007	0	0	0	0	4.505	3.034	1.828	2.938	1.589	1.147	1.083
1	2008	0	0	0	0	4.555	3.074	1.84	2.938	1.666	1.169	1.113
1	2009	0	0	0	0	4.568	3.09	1.888	2.938	1.556	1.203	1.21
1	2010	0	0	0	0	4.602	3.09	1.899	2.938	1.588	1.238	1.266
1	2011	0	0	0	0	4.623	3.101	1.948	2.938	1.651	1.25	1.265
1	2012	0	0	0	0	4.703	3.159	1.927	2.938	1.693	1.179	1.268
1	2013	0	0	0	0	4.741	3.194	1.935	2.938	1.665	1.163	1.266
1	2014	0	0	0	0	4.789	3.193	1.944	2.938	1.621	1.162	1.339
1	2015	0	0	0	0	4.806	3.196	1.992	2.938	1.556	1.164	1.38
1	2016	0	0	0	0	4.84	3.21	2.007	2.938	1.508	1.165	1.387
1	2017	0	0	0	0	4.896	3.237	2.015	2.938	1.536	1.167	1.397
1	2018	0	0	0	0	4.944	3.248	2.005	2.938	1.568	1.179	1.408
2	2003	0	0	1.3115	0	4.183	3.023	3.016	2.891	1.58	1.157	0.717
2	2004	0	0	2.191	0	4.222	3.031	3.037	2.891	1.657	1.142	0.732
2	2005	0	0	0	0	4.265	3.025	3.052	2.891	1.574	1.144	0.806
2	2006	0	0	0	0	4.271	2.999	3.097	2.891	1.628	1.145	0.843
2	2007	0	0	0	0	4.339	3.034	3.094	2.891	1.589	1.147	0.872
2	2008	0	0	0	0	4.446	3.074	3.079	2.891	1.666	1.169	0.925
2	2009	0	0	0	0	4.464	3.09	3.122	2.891	1.556	1.203	0.972
2	2010	0	0	0	0	4.505	3.09	3.159	2.891	1.588	1.238	1.009

2	2011	0	0	0	0	4.54	3.101	3.2	2.891	1.651	1.25	1.014
2	2012	0	0	0	0	4.598	3.159	3.201	2.891	1.693	1.179	1.024
2	2013	0	0	0	0	4.66	3.194	3.209	2.891	1.665	1.163	1.009
2	2014	0.015	0.652	0.0149	0	4.699	3.193	3.221	2.891	1.621	1.162	1.046
2	2015	0	0	0	0	4.676	3.196	3.308	2.891	1.556	1.164	1.076
2	2016	0	0	0	0	4.697	3.21	3.34	2.891	1.508	1.165	1.078
2	2017	0	0	0	0	4.727	3.237	3.35	2.891	1.536	1.167	1.087
2	2018	0	0	0	0	4.759	3.248	3.354	2.891	1.568	1.179	1.098
3	2003	0	0	0	0	3.802	3.023	3.293	2.74	1.58	1.157	1.054
3	2004	0	0	0	0	3.9	3.031	3.258	2.74	1.657	1.142	1.064
3	2005	0	0	0	0	3.955	3.025	3.251	2.74	1.574	1.144	1.082
3	2006	0	0	0	0	3.997	2.999	3.263	2.74	1.628	1.145	1.097
3	2007	0	0	0.2375	0	4.09	3.034	3.236	2.74	1.589	1.147	1.128
3	2008	0	0	0	0	4.153	3.074	3.235	2.74	1.666	1.169	1.182
3	2009	0	0	0	0	4.259	3.09	3.308	2.74	1.556	1.203	1.205
3	2010	0	0	0	0	4.305	3.09	3.338	2.74	1.588	1.238	1.252
3	2011	0.874	0	0	0	4.305	3.101	3.402	2.74	1.651	1.25	1.236
3	2012	0	0	0	0	4.364	3.159	3.398	2.74	1.693	1.179	1.24
3	2013	0	0	0	0	4.391	3.194	3.413	2.74	1.665	1.163	1.252
3	2014	0	0	0	0	4.436	3.193	3.414	2.74	1.621	1.162	1.27
3	2015	0	0	0	0	4.433	3.196	3.51	2.74	1.556	1.164	1.297
3	2016	0	0	0	0	4.383	3.21	3.534	2.74	1.508	1.165	1.301
3	2017	0	0	2.5806	0	4.415	3.237	3.558	2.74	1.536	1.167	1.305
3	2018	0	0	0	0	4.439	3.248	3.568	2.74	1.568	1.179	1.314
4	2003	0	0	3.0371	0	3.284	3.023	2.719	2.255	1.58	1.157	1.145
4	2004	0	1.664	3.4189	0	3.337	3.031	2.748	2.255	1.657	1.142	1.176
4	2005	0	0	3.0895	0	3.429	3.025	2.737	2.255	1.574	1.144	1.18

4	2006	0	0.863	2.6513	0	3.494	2.999	2.737	2.255	1.628	1.145	1.188
4	2007	0	0	3.7816	0	3.581	3.034	2.738	2.255	1.589	1.147	1.201
4	2008	2.53	0	3.161	0	3.687	3.074	2.738	2.255	1.666	1.169	1.225
4	2009	0	2.201	3.2547	0	3.73	3.09	2.755	2.255	1.556	1.203	1.257
4	2010	0	2.348	2.7015	0	3.762	3.09	2.766	2.255	1.588	1.238	1.271
4	2011	2.295	0.68	0.5782	0	3.817	3.101	2.778	2.255	1.651	1.25	1.272
4	2012	0	0	0	0	3.865	3.159	2.788	2.255	1.693	1.179	1.269
4	2013	0	0	0.6409	0	3.882	3.194	2.813	2.255	1.665	1.163	1.271
4	2014	0	0	0.4289	2.249	3.904	3.193	2.836	2.255	1.621	1.162	1.29
4	2015	0	0	0	0.052	3.918	3.196	2.856	2.255	1.556	1.164	1.31
4	2016	0	0	0	0.032	3.928	3.21	2.895	2.255	1.508	1.165	1.311
4	2017	0	0	2.2396	0	3.961	3.237	2.923	2.255	1.536	1.167	1.317
4	2018	0	0	0	1.786	3.978	3.248	2.934	2.255	1.568	1.179	1.317

Note: 1: Kenya; 2: Uganda; 3: Tanzania; 4: Rwanda

Appendix C: Intensity of trade indicators

			Commodity and intensity of trade indicator in %							
Year	Importer	Trade partner	Commodity	Indicator	Commodity	Indicator	Commodity	Indicator	Commodity	Indicator
2003	Burundi	Kenya	Maize	0.042	Rice	0.211	Sugar	272.201	Wheat	1.364
2004	Burundi	Kenya	Maize	4.063	Rice	109.779	Sugar	483.576	Wheat	198.301
2005	Burundi	Kenya	Maize	1.655	Rice	1.891	Sugar	421.492	Wheat	21.803
2006	Burundi	Kenya	Maize	491.311	Rice	44.264	Sugar	354.110	Wheat	34.216
2007	Burundi	Kenya	Maize	0.039	Rice	1.921	Sugar	445.251	Wheat	2.211
2008	Burundi	Kenya	Maize	0.062	Rice	0.584	Sugar	341.744	Wheat	10.850
2009	Burundi	Kenya	Maize	0.000	Rice	6.431	Sugar	475.780	Wheat	88.049
2010	Burundi	Kenya	Maize	5.694	Rice	0.280	Sugar	109.272	Wheat	3.370
2011	Burundi	Kenya	Maize	0.002	Rice	0.092	Sugar	167.058	Wheat	3.449
2012	Burundi	Kenya	Maize	0.001	Rice	0.172	Sugar	190.643	Wheat	19.827
2013	Burundi	Kenya	Maize	11.107	Rice	42.225	Sugar	550.375	Wheat	91.428
2014	Burundi	Kenya	Maize	0.019	Rice	0.112	Sugar	227.568	Wheat	3.065
2015	Burundi	Kenya	Maize	3.456	Rice	7.852	Sugar	283.766	Wheat	11.670
2016	Burundi	Kenya	Maize	7.722	Rice	0.089	Sugar	277.540	Wheat	0.686
2017	Burundi	Kenya	Maize	1.870	Rice	0.503	Sugar	711.682	Wheat	0.600
2018	Burundi	Kenya	Maize	69.376	Rice	48.038	Sugar	716.342	Wheat	554.575
2003	Burundi	Uganda	Maize	1474.330	Rice	309.960	Sugar	217.037	Wheat	537.103

2004	Burundi	Uganda	Maize	1770.390	Rice	8.256	Sugar	76.702	Wheat	1119.093
2005	Burundi	Uganda	Maize	2035.233	Rice	20.613	Sugar	44.459	Wheat	10.090
2006	Burundi	Uganda	Maize	0.047	Rice	543.534	Sugar	57.028	Wheat	2204.117
2007	Burundi	Uganda	Maize	1862.770	Rice	174.946	Sugar	42.995	Wheat	1849.729
2008	Burundi	Uganda	Maize	1379.623	Rice	1.908	Sugar	584.948	Wheat	1615.170
2009	Burundi	Uganda	Maize	52.116	Rice	1731.590	Sugar	26.183	Wheat	319.884
2010	Burundi	Uganda	Maize	1006.846	Rice	1042.429	Sugar	1356.884	Wheat	12.283
2011	Burundi	Uganda	Maize	385112	Rice	68.354	Sugar	6.185	Wheat	319.535
2012	Burundi	Uganda	Maize	10.843	Rice	238.929	Sugar	5.954	Wheat	40.815
2013	Burundi	Uganda	Maize	147.592	Rice	23.129	Sugar	25.388	Wheat	403.906
2014	Burundi	Uganda	Maize	8.529	Rice	0.070	Sugar	6.704	Wheat	293.702
2015	Burundi	Uganda	Maize	17.097	Rice	0.138	Sugar	6.703	Wheat	306.273
2016	Burundi	Uganda	Maize	180.416	Rice	0.147	Sugar	2.758	Wheat	4.824
2017	Burundi	Uganda	Maize	565.115	Rice	63.159	Sugar	12.423	Wheat	0.593
2018	Burundi	Uganda	Maize	210.509	Rice	103.100	Sugar	48.560	Wheat	85.969
2003	Burundi	Tanzania	Maize	131.173	Rice	362.412	Sugar	132.640	Wheat	333.634
2004	Burundi	Tanzania	Maize	22.570	Rice	312.109	Sugar	2.039	Wheat	4.212
2005	Burundi	Tanzania	Maize	85.851	Rice	398.497	Sugar	9.534	Wheat	378.471
2006	Burundi	Tanzania	Maize	1.566	Rice	262.756	Sugar	99.325	Wheat	0.842
2007	Burundi	Tanzania	Maize	26.772	Rice	182.325	Sugar	18.913	Wheat	25.137
2008	Burundi	Tanzania	Maize	72.149	Rice	48.298	Sugar	1.988	Wheat	6.972

2009	Burundi	Tanzania	Maize	378.422	Rice	25.821	Sugar	1.626	Wheat	61.304
2010	Burundi	Tanzania	Maize	41.269	Rice	114.462	Sugar	5.832	Wheat	389.539
2011	Burundi	Tanzania	Maize	20.544	Rice	311.200	Sugar	12.161	Wheat	73.526
2012	Burundi	Tanzania	Maize	15.935	Rice	143.918	Sugar	5.378	Wheat	108.556
2013	Burundi	Tanzania	Maize	170.509	Rice	364.505	Sugar	2.331	Wheat	213.155
2014	Burundi	Tanzania	Maize	379.100	Rice	403.172	Sugar	25.583	Wheat	40.853
2015	Burundi	Tanzania	Maize	232.724	Rice	380.005	Sugar	3.580	Wheat	64.437
2016	Burundi	Tanzania	Maize	154.318	Rice	401.376	Sugar	10.003	Wheat	394.301
2017	Burundi	Tanzania	Maize	88.811	Rice	369.878	Sugar	11.558	Wheat	399.230
2018	Burundi	Tanzania	Maize	33.625	Rice	326.053	Sugar	9.276	Wheat	68.333
2003	Burundi	Rwanda	Maize	49.363	Rice	0.134	Sugar	1.441	Wheat	0.865
2004	Burundi	Rwanda	Maize	0.066	Rice	2.039	Sugar	1.877	Wheat	2.096
2005	Burundi	Rwanda	Maize	47.191	Rice	0.837	Sugar	5.648	Wheat	0.873
2006	Burundi	Rwanda	Maize	0.005	Rice	4.700	Sugar	1.418	Wheat	0.423
2007	Burundi	Rwanda	Maize	0.013	Rice	91.279	Sugar	10.715	Wheat	1.261
2008	Burundi	Rwanda	Maize	2.889	Rice	175.377	Sugar	0.361	Wheat	3.779
2009	Burundi	Rwanda	Maize	0.001	Rice	2.557	Sugar	17.556	Wheat	101.090
2010	Burundi	Rwanda	Maize	68.936	Rice	31.054	Sugar	8.687	Wheat	3.076
2011	Burundi	Rwanda	Maize	1.995	Rice	10.703	Sugar	0.540	Wheat	3.469
2012	Burundi	Rwanda	Maize	186.417	Rice	9.479	Sugar	1.806	Wheat	104.657
2013	Burundi	Rwanda	Maize	88.617	Rice	0.333	Sugar	3.962	Wheat	1.302

2014	Burundi	Rwanda	Maize	7.745	Rice	0.060	Sugar	3.434	Wheat	32.091
2015	Burundi	Rwanda	Maize	72.979	Rice	5.939	Sugar	0.775	Wheat	7.915
2016	Burundi	Rwanda	Maize	28.550	Rice	0.057	Sugar	2.058	Wheat	0.740
2017	Burundi	Rwanda	Maize	24.585	Rice	0.610	Sugar	0959	Wheat	0.085
2018	Burundi	Rwanda	Maize	114.093	Rice	0.082	Sugar	0.123	Wheat	2.980

Appendix D: Growth rate of trade values between Burundi and Kenya, Uganda, Tanzania and Rwanda

Year	Maize				Rice				Sugar				Wheat			
	Ken	Tz	Ug	Rw	Ken	Tz	Ug	Rw	Ken	Tz	Ug	Rw	Ken	Tz	Ug	Rw
2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	2296.60	-95.16	-37.45	-99,96	4716,20	-90,90	-99,47	200,44	124,16	-97,78	-7,829	-15,00	34,826	-96.64	9.32	123.21
2005	-52.90	286.70	-40.68	72594,40	-97,92	32,51	-68,50	-25,70	-26,31	147,50	-78,13	269,17	-52.81	347331.22	-98.18	-38
2006	128541.03	-91.22	-99.98	-99,94	2827,20	-5,36	24047,93	596,90	223,21	6102,54	747,81	7,903	86.73	-96.71	4329 7,80	61,29

2007	-99.99	1552.96	4585275,517	146,91	-99,31	-35,49	-64,80	1973,26	58,661	-76,03	16,64	1141,99	-96.83	12,428	-51,23	-54,40
2008	-80.75	-66.77	-89,32	2453,60	400,00	-25,19	-96,26	445,69	-48,67	-95,27	995,56	-97,62	-0,81	-91,06	80.23	-80,26
2009	-67.29	30796.77	95,84	-96,08	103,20	-84,59	22805,60	-99,71	0,190	-60,58	-97,03	3356,00	-0,7368	-16,67	-34.56	2370,0
2010	11375.36	-99.92	-86,18	24469,50	-50,78	3019,67	344,05	12602,29	19,44	4031,24	26140,12	150,98	1900	14535,70	1233,33	-39,72
2011	-97.95	886.40	3326,33	-42,37	-44,60	341,11	-51,95	-43,98	128,40	7,67	-98,93	-97,89	-88,00	-93,51	4237,00	-25,37

2012	-10.54	19.19	-95,71	13886,01	600,36	-10,53	571,69	67,38	18,039	-49,17	13,09	442,70	733,33	-81,49	-97,69	323,10
2013	27814.48	3.68	-58,71	-95,28	12981,57	207,32	-96,35	-95,98	32,24	-46,20	74,26	212,90	2225,80	4462,78	4445,00	-76,36
2014	-99.47	184.53	-75,63	-88,685	-99,66	-4,16	-99,95	-91,91	-69,03	288,68	-71,63	-73,72	-95,70	-90,86	28,86	1134,00
2015	12939.72	-46.24	75,78	721,75	4578,74	-53,44	-64,91	10174,27	-7,152	-90,60	-13,40	-90,44	0,00	-58,11	-69,30	-91,90
2016	485.78	72.82	2633,96	1,64	-99,92	22,20	1135,00	-98,86	150,78	813,31	4,25	1312,72	-95,40	13998,31	-76,32	-35,10

2017	-91.84	-49.79	27,37	-25,68	14619,00	-60,06	43294,33	254,00	76,99	110,40	275,40	-19,11	2117,39	479.83	-82.99	-89,06
2018	-8.22	-99.02	-98,98	-88,00	1594,91	42,86	180,58	-71,75	9,27	-9,30	366,52	-95,06	10694,31	-89.97	2018.78	1781,69

Appendix E: Production figures for Maize, Rice, Sugar and Wheat for the period 2003-2018

YEAR	MAIZE	RICE	SUGAR	WHEAT
2003	120575	61256	120586	8092
2004	123199	64532	123199	7493
2005	125666	67947	125666	7756
2006	116825	68311	116825	8007
2007	115507	70911	115807	7987
2008	117681	70846	117681	8094
2009	120379	78432	121767	8583
2010	126412	83019	131730	9034
2011	128383	91415	203883	9787
2012	140536	64620	220326	4196
2013	162417	41454	239515	6423
2014	127829	67377	206644	5628
2015	160713	38674	213130	6421
2016	243740	146633	218115	7980
2017	228355	55952	215118	8060
2018	290498	55671	178459	22751

Appendix F: Key data analysis outputs

```
Random-effects GLS regression                   Number of obs     =         64
Group variable: code                            Number of groups  =          4

R-sq:                                           Obs per group:
     within  = 0.0182                                         min =         15
     between = 0.9796                                         avg =       16.0
     overall = 0.3469                                         max =         17

                                                Wald chi2(7)      =      29.75
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0001
```

logimpmaize	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
loggdpi	-.7113895	2.366582	-0.30	0.764	-5.349804	3.927025
logexrati	3.050279	5.01779	0.61	0.543	-6.784409	12.88497
logexratj	1.18366	.3028337	3.91	0.000	.5901173	1.777203
logdij	-.0991656	.6726797	-0.15	0.883	-1.417594	1.219262
logtopeni	-2.114924	2.874634	-0.74	0.462	-7.749103	3.519255
logidii	2.452688	5.641643	0.43	0.664	-8.604728	13.5101
logidij	-1.613925	1.558193	-1.04	0.300	-4.667927	1.440077
_cons	-5.704629	14.08792	-0.40	0.686	-33.31645	21.90719
sigma_u	0					
sigma_e	1.114995					
rho	0	(fraction of variance due to u_i)				

```
Random-effects GLS regression                   Number of obs     =         64
Group variable: code                            Number of groups  =          4

R-sq:                                           Obs per group:
     within  = 0.1337                                         min =         15
     between = 0.9800                                         avg =       16.0
     overall = 0.4676                                         max =         17

                                                Wald chi2(7)      =      49.18
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000
```

logimprice	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
loggdpi	2.405347	2.053436	1.17	0.241	-1.619313	6.430008
logexrati	2.422078	4.353837	0.56	0.578	-6.111286	10.95544
logexratj	.5884822	.2627628	2.24	0.025	.0734766	1.103488
logdij	-.0120259	.5836708	-0.02	0.984	-1.156	1.131948
logtopeni	5.058025	2.494263	2.03	0.043	.1693594	9.94669
logidii	7.587926	4.895141	1.55	0.121	-2.006374	17.18223
logidij	-4.899564	1.352013	-3.62	0.000	-7.549461	-2.249667
_cons	-26.84092	12.22381	-2.20	0.028	-50.79914	-2.88269
sigma_u	0					
sigma_e	.97228438					
rho	0	(fraction of variance due to u_i)				

```
Random-effects GLS regression                   Number of obs     =         64
Group variable: code                            Number of groups  =          4

R-sq:                                           Obs per group:
     within  = 0.2083                                         min =         15
     between = 0.9984                                         avg =       16.0
     overall = 0.6817                                         max =         17

                                                Wald chi2(7)      =     119.95
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000
```

logimpsugar	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
loggdpi	.5203786	1.162514	0.45	0.654	-1.758107	2.798864
logexrati	-1.572184	2.464842	-0.64	0.524	-6.403187	3.258818
logexratj	-.671198	.1487582	-4.51	0.000	-.9627586	-.3796373
logdij	2.081211	.3304342	6.30	0.000	1.433572	2.72885
logtopeni	.0927973	1.41208	0.07	0.948	-2.674828	2.860423
logidii	1.629579	2.771291	0.59	0.557	-3.802053	7.06121
logidij	2.37651	.7654166	3.10	0.002	.8763211	3.876699
_cons	-3.826946	6.920278	-0.55	0.580	-17.39044	9.73655
sigma_u	0					
sigma_e	.56256977					
rho	0	(fraction of variance due to u_i)				

.

```
Random-effects GLS regression                   Number of obs     =         64
Group variable: code                            Number of groups  =          4

R-sq:                                           Obs per group:
     within  = 0.0693                                         min =         15
     between = 0.9973                                         avg =       16.0
     overall = 0.2724                                         max =         17

                                                Wald chi2(7)      =      20.96
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0038
```

logimpwheat	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
loggdpi	-1.122951	1.714473	-0.65	0.512	-4.483257	2.237355
logexrati	2.865918	3.635145	0.79	0.430	-4.258835	9.990672
logexratj	.5895133	.2193883	2.69	0.007	.1595202	1.019506
logdij	1.107146	.4873238	2.27	0.023	.1520094	2.062283
logtopeni	-.3771809	2.082533	-0.18	0.856	-4.45887	3.704508
logidii	-2.535575	4.087096	-0.62	0.535	-10.54614	5.474986
logidij	-.4806951	1.128835	-0.43	0.670	-2.693171	1.731781
_cons	-4.977467	10.20601	-0.49	0.626	-24.98089	15.02595
sigma_u	0					
sigma_e	.84561699					
rho	0	(fraction of variance due to u_i)				

```
Random-effects GLS regression                   Number of obs     =         64
Group variable: code                            Number of groups  =          4

R-sq:                                           Obs per group:
     within  = 0.1467                                         min =         16
     between = 0.9927                                         avg =       16.0
     overall = 0.2172                                         max =         16

                                                Wald chi2(7)      =      15.54
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0297
```

logexpmaize	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
loggdpj	.6678384	.6891292	0.97	0.332	-.6828301	2.018507
logexrati	-1.987279	1.95131	-1.02	0.308	-5.811776	1.837218
logexratj	.0339587	.1208717	0.28	0.779	-.2029454	.2708629
logdij	-1.269196	.861564	-1.47	0.141	-2.95783	.4194387
logtopeni	1.480516	1.03482	1.43	0.153	-.5476951	3.508726
logidii	2.830435	2.050717	1.38	0.168	-1.188897	6.849766
logidij	.0483496	.5370298	0.09	0.928	-1.004209	1.100909
_cons	1.029827	6.81781	0.15	0.880	-12.33283	14.39249
sigma_u	0					
sigma_e	.41174922					
rho	0	(fraction of variance due to u_i)				

```
Random-effects GLS regression                   Number of obs     =         64
Group variable: code                            Number of groups  =          4

R-sq:                                           Obs per group:
     within  = 0.0857                                         min =         16
     between = 0.9789                                         avg =       16.0
     overall = 0.2609                                         max =         16

                                                Wald chi2(7)      =      19.77
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0061
```

logexprice	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
loggdpj	.2592804	.7166512	0.36	0.718	-1.14533	1.663891
logexrati	-1.431998	2.02924	-0.71	0.480	-5.409235	2.545239
logexratj	-.0611444	.125699	-0.49	0.627	-.3075099	.185221
logdij	-1.106805	.8959727	-1.24	0.217	-2.862879	.6492694
logtopeni	-.5223395	1.076148	-0.49	0.627	-2.631552	1.586873
logidii	3.322427	2.132617	1.56	0.119	-.8574262	7.50228
logidij	-.1670357	.5584774	-0.30	0.765	-1.261631	.9275598
_cons	3.790752	7.090095	0.53	0.593	-10.10558	17.68708
sigma_u	0					
sigma_e	.42479517					
rho	0	(fraction of variance due to u_i)				

.

```
Random-effects GLS regression                   Number of obs     =         64
Group variable: code                            Number of groups  =          4

R-sq:                                           Obs per group:
     within  = 0.1405                                         min =         16
     between = 0.9754                                         avg =       16.0
     overall = 0.5009                                         max =         16

                                                Wald chi2(7)      =      56.20
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000
```

logexpsugar	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
loggdpj	-.7075209	1.4196	-0.50	0.618	-3.489886	2.074844
logexrati	-1.079613	4.01968	-0.27	0.788	-8.958041	6.798815
logexratj	-.241076	.2489945	-0.97	0.333	-.7290963	.2469443
logdij	-1.999333	1.774814	-1.13	0.260	-5.477905	1.479238
logtopeni	-2.123193	2.131721	-1.00	0.319	-6.301289	2.054902
logidii	-.9490408	4.224459	-0.22	0.822	-9.228827	7.330746
logidij	-.7065233	1.106276	-0.64	0.523	-2.874785	1.461739
_cons	18.35686	14.04463	1.31	0.191	-9.1701	45.88382
sigma_u	0					
sigma_e	.79787426					
rho	0	(fraction of variance due to u_i)				

```
Random-effects GLS regression                   Number of obs     =         64
Group variable: code                            Number of groups  =          4

R-sq:                                           Obs per group:
     within  = 0.0527                                         min =         16
     between = 0.9155                                         avg =       16.0
     overall = 0.1107                                         max =         16

                                                Wald chi2(7)      =       6.97
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.4322
```

logexpwheat	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
loggdpj	.4252091	.6682671	0.64	0.525	-.8845703	1.734989
logexrati	.2134363	1.892237	0.11	0.910	-3.495281	3.922153
logexratj	-.1098467	.1172125	-0.94	0.349	-.339579	.1198855
logdij	-.989319	.8354818	-1.18	0.236	-2.626833	.6481953
logtopeni	.2465433	1.003493	0.25	0.806	-1.720267	2.213354
logidii	-1.439494	1.988635	-0.72	0.469	-5.337148	2.45816
logidij	-.4053628	.5207722	-0.78	0.436	-1.426058	.615332
_cons	2.357589	6.611413	0.36	0.721	-10.60054	15.31572
sigma_u	0					
sigma_e	.38943256					
rho	0	(fraction of variance due to u_i)				

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Appendix G: Publication from the Study

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Agricultural Economics
ORIGINAL ARTICLE

Estimation of factors affecting Burundi's sugar imports from East African community

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ABSTRACT

Around the world, the creation of regional economic communities attracted more attention in empirical analyses. Different techniques were used in order to assess the performances of trades taking place in the regional economic communities. This study applied such analysis to Burundi, concerning sugar imports from the East African Community (EAC). More specifically, this study determined the intensity of Burundi's sugar imports and estimated the factors which influence Burundi's sugar imports. Both the histograms and the gravity model were used to analyze the data collected from 2003 to 2018. In essence, the results indicated that Burundi intensively imported sugar from Kenya followed by Uganda. Moreover, the results revealed that the gross domestic products (GDPs), the distance and the exchange rates were the major factors influencing Burundi's sugar imports. For instance, it was found that a 1% increase in the Burundian GDP leads to an expansion of sugar imports by 0.52%. Therefore, policy makers in Burundi should create a space that efficiently maximizes the intensity of sugar imports through attractive trade policies. Moreover, they should particularly put a rigorous control on GDPs, exchange rates and distance in order to enhance a smooth movement of sugar imports from the East African Community.

Keywords: Sugar, gravity model, intensity of imports, regional economic community, trade flows

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1 Introduction

Trade is perceived as a tool which can ease the availability of goods and services among citizens. (Salvatore, 2014) indicates that we live in a globalized world where tastes converge and both goods and services we usually use are mostly provided by foreigners. Thus, trade's existence is inevitable in modern open economies. Empirical studies, namely Abbott et al. (2009) and Shihab et al. (2014) revealed a positive correlation existing between trade and the level of countries' development: all other things held constant, trade leads to economic growth and this triggers an enhanced level of development across trading partners. Examining the nexus between trade and economic growth, Robertson (1938) famously described exports as an engine of growth and Minford et al. (1995) hailed foreign trade as an elixir of economic growth. Marshall (1959) points out that the causes which determine the economic progress of nations belong to the study of international trade. Countries around the world established mechanisms and other tools meant to speed up exchange of goods and services between them. In most of the cases, these mechanisms pass through policies allowing countries to grant each other trade incentives. In line with this, regional integration is considered as a strategy which can optimize expected benefits from trade. Ardiyanti (2015) indicates that regional trade agreements have covered more than half of international