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

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ARTICLE INFORMATION	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.

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

trade throughout the world in the 1990s. Since independence, African countries forged commercial links as the key pillars of the development. Hartzenberg (2011) indicates that in the post-colonial period, the ambition of the African leaders was to develop Africa through integration. Kayizzi-Mugerwa et al. (2014) reveal that there are currently seventeen regional economic communities (RECs) throughout Africa of which eight are officially recognized by the African Union. According to the IMF (2014), the eight RECs officially recognized by 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.

The initiation of regional blocs attracted researchers' attention on what could be the effect of regional blocs on trade flows. Some empirical studies, namely Iqbal and Islam (2014), Osabuohien et al. (2019) and Elshehawy et al. (2014) estimated the factors affecting trade flows in a regional bloc. Others evaluated the effect of regional blocs on the patterns of food trade. However, there is no general conclusion drawn so far, as long as the effect varies from a country to another and from a commodity to another. Clausing (2001) argues that empirical researchers had difficulty to reach firm conclusions about the effect of RECs on trade. In agricultural-based economies such as EAC countries, food commodities consist of the mostly exchanged goods. Through food trade, commodities are exchanged and this contributes towards an improved food supply across the involved countries. It is against this background that this study was carried out on EAC, one of the African regional blocs which consists of six countries, namely Burundi, Kenya, Uganda, South Sudan, Tanzania and Rwanda. The EAC was originally created in 1967 but collapsed in 1997 (Karugia et al., 2009). It was then revived in 2000 by three countries, namely Kenya, Uganda and Tanzania (Kasaija, 2010). The treaty that 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).

Rwanda and Burundi acceded to the EAC treaty on 18 June, 2007 and became full members of the community on 1 July, 2007 (Gaalya et al., 2017). South Sudan acceded to the treaty on 15 April, 2016 and became an effective member on 15 August, 2016 (UNCTAD, 2018). The common feature of EAC countries is that of food insecurity. EAC countries are often struck by food insecurity and trade constitutes one of the key ways to reduce the level of food insecurity across EAC countries. Exchange of food commodities between EAC countries enhances food availability and hence contributes to food security among EAC citizens. Provided the role of trade in reducing food insecurity in EAC countries, it is more relevant to carry out studies focused on food trade across EAC countries, to contribute to its improvement.

The aim of this study was twofold: firstly this study determined the intensity of Burundi's sugar imports from EAC. Secondly, this study estimated the factors which influence Burundi's sugar imports. Burundi is a smaller open economy among other EAC partner states. Nevertheless, the theoretical and empirical literature is unclear on how the trade of relatively small economies such as Burundi performs in a regional economic community. Thus, there is a need to conduct an empirical study before drawing a conclusion. Since Burundi integrated into the East African Community, trade in food commodities has not been given adequate attention in the empirical analysis. So far, there are few trade-related studies done in Burundi. To the best of our knowledge, only Ndayitwayeko et al. (2014) analyzed agri-food import dependency of Burundi for the period 2000-2010, using the gravity model. The findings from their study revealed that Burundi's GDP, its trade partners' populations, exchange rate, distance, common colonial history and membership in a REC are the main factors influencing food imports. However, the results from their study are more general and the study was not rigorously focused on food commodities. It 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 EAC countries. In addition, the study did not analyze the intensity of trade between Burundi and each of EAC countries. However, the intensity of trade stands as one of the key informative indicators in the area of bilateral trade. Furthermore, the study drew conclusions on a short time period (two years); nevertheless, there are some variables which require more than two years in order to observe their influence on imports and/or exports. In order to address these limitations of the study done by Ndayitwayeko et al. (2014), this study used disaggregated data (single commodity), covered a long time period and included another variable which is an infrastructure development index.

To this end, this study was then expected to relatively provide further evidence on Burundi's sugar imports from EAC. Hence, this study was meant to bridge the gap left by studies done. Findings from this study provided quantified information to policy makers which might be useful while addressing

issues related to sugar demand and/or supply in Burundi. This study was limited in time, from 2003 to 2018. The reason behind that choice was due to the availability of data. In addition, 2003 corresponds to the resume of regular economic activities in Burundi after more than a decade of civil war and 2018 corresponds to the first decade since Burundi integrated into EAC. Moreover, this study concerned one food commodity, namely sugar. Sugar is a very important food commodity in a typical Burundian diet and is produced across all EAC countries. Lastly, this study did not take into account South Sudan, for a reason that it joined the EAC recently, (in 2016). There are no trade statistics between Burundi and South Sudan as far as trade of sugar is concerned.

2 Theoretical framework

This study was underpinned by the theory of regional integration. The theory was developed by 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 the trade creation as a situation whereby some domestic production in a member of 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 a regional economic integration as a process by which a group of countries forms 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 (1994) in the 1960s. Balassa (1994) defines an economic integration as a process and as state of affairs. Seen as a process, it consists of measures designed to reduce or abolish discrimination between countries. Viewed as a state of affairs, it can be represented by the absence of various forms of discrimination between national economies in order to tie the commercial links between them. Robson (1998) highlights that an economic integration targets the promotion of efficiency in resource use at the region level.

Its fullest attainment includes the elimination of all the 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 the economic integration process, Tinbergen (1962) distinguishes between negative integration, which denotes those aspects of regional integration that simply involve the removal of discrimination and restrictions on movement and 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. The economic integration can take several forms that represent varying degrees of 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 tax harmonization measures; 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 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 the income redistribution within individual countries.

3 Materials and methods

3.1 Data sources

The data were sourced from UNCOMTRADE (United Nations Commodity Trade), UNTRAINS (United Nations Trade Analysis and Information System), WITS (World Integrated Trade Solution), World Bank, Trade map and Burundi revenue authority (OBR).

3.2 Estimation techniques

This study used the intensity of trade technique and the gravity model to meet the objectives. The trade intensity technique used in this study was developed by Kojima in 1964 (Ambrose and Sundar, 2014). 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. 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. Provided that there are many empirical studies done using the intensity of trade, this study adopted Ambrose and Sundar (2014) for a reason that they used a recently improved formula to compute the intensity of trade. Therefore the expression of the intensity of Burundi's sugar imports from EAC countries was given by the following equation:

$$MTI_{ijt}^k = \frac{\left[\frac{M_{ijt}^k}{M_{itt}^k}\right]}{\left[\frac{X_{jt}}{X_{EACt}-X_{it}}\right]} \times 100 \qquad (1)$$

where, i and j refer to Burundi and one of EAC countries, respectively; k refers to sugar; t refers to time; MTI_{ijt}^k denotes the intensity of i's sugar imports (in values) from j at time t; M_{ijt}^k denotes i's sugar imports (in values) from j at time t; M_{itt}^k denotes total i's sugar imports (in values) at time t; X_{jt} denotes total j's exports (in values) to EAC at time t; X_{EACt} denotes total EAC export (in values) at time t; X_{it} denotes total i's exports (in values) at time t.

In the above equation, X_it is 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 (Drysdale and Garnaut, 1982). The value of trade intensity ranges between 0 to $+\infty$ (Mikic and Gilbert, 2007). Theoretically, an index of more (less) than 1 (or 100 if expressed in percentage) indicates a bilateral trade flow that is larger (smaller) than expected, given the partner country's importance in world trade.

Concerning estimation of the factors which influence sugar imports, this study used the gravity model. The gravity model in the context of social sciences was first used by James Stewart in the 1940s (Ndayitwayeko et al., 2014) and then proposed in trade theory by Tinbergen (1962) as well as Pöyhönen (1963). The standard gravity model postulates that the volume of trade between two countries is a function of the GDPs and the distance separating two trading partners. The standard gravity model can be implicitly expressed using the following equation:

$$T_{ij} = f(GDP_i, GDP_j, D_{ij}) \qquad (2)$$

T_{ij} stands for trade between the two countries i and j (in values 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.

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

$$T_{ijt} = \beta_0 GDP_{it}^{\beta_1} GDP_{jt}^{\beta_2} D_{ij}^{\beta_3} \qquad (3)$$

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. The standard gravity model explained above ignore other interesting variables explaining trade. In the context of this study, the gravity model was expanded by adding other variables which are theoretically known as trade determinants. Thus, the equation of the gravity model used to estimate the factors which influence Burundi's sugar imports was given by the following expression:

$$\begin{aligned}logM_{ijt} =\ &\beta_0 + B_1 logGDP_{it} + \beta_2 logD_{ij}+ \\ &\beta_3 logTOPEN_{it} + \beta_4 logEXRAT_{it}+ \\ &\beta_5 logEXRAT_{jt} + \beta_6 logIDI_{it}+ \\ &\beta_7 logIDE_{jt} + \varepsilon_{it}\end{aligned} \qquad (4)$$

where, subscripts i, j and t denote Burundi, each of EAC countries and time, respectively; M_{ijt} stands for sugar imports at time t; GDP_{it} stands for the gross domestic product of i at time t; $TOPEN_{it}$ stands for the trade openness of i at time t; $EXRAT_{it}$ and $EXRAT_{jt}$ stand for the exchange rates of i and j, respectively, at time t; IDI_{it} and IDI_{jt} stand for an infrastructure development index of country i and j, respectively, at time t; β_0 = constant, $\beta_1 \ldots \beta_7$ are respective coefficients associated with the variables; ε_{it} stands for the error term.

4   Results and Discussion

The results are presented into three sections. The first section concerns the summary statistics of the variables of interest. The second section is about the results on the intensity of Burundi's sugar imports and its evolutions over time. The third section deal with the estimation of the factors affecting Burundi's sugar imports.

4.1   The summary statistics

The summary statistics of the variables of interests is presented in the Table 1. The results in Table 1 show that the data revolve around the mean with low standard deviations. The data of sugar imports present minimum value of zero, showing that there are periods of time where Burundi did not import sugar from the East African Community. The number of observations is 64 with a maximum mean value of 3.274 and a minimum mean value of 1.155.

4.2   Intensity sugar imports

The results on the intensity of Burundi's sugar imports from EAC are presented in Fig. 1. It shows that before and after integration, the intensity of Burundi's sugar imports from Kenya has dominated and it is on an upward trend. Although the country imported sugar from Uganda, the intensity was very low except

Table 1. The summary statistics of the considered variables

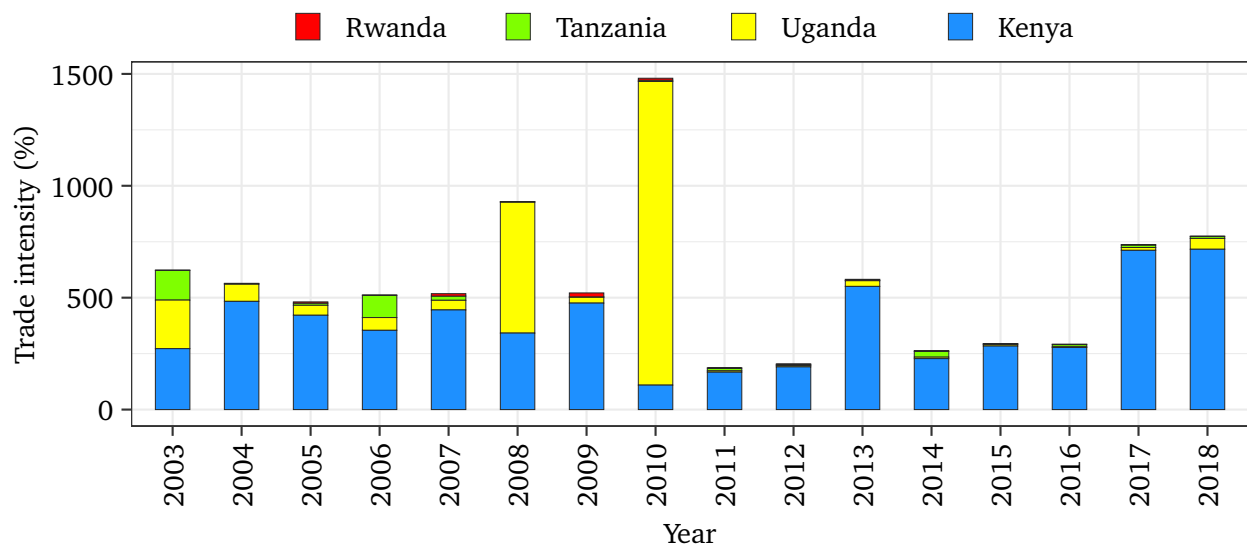| Variables	Obs. number	Mean	Std. Dev.	Min	Max
$logImpSugar$	64	1.521	0.934	0	3.330
$logGDPi$	64	3.274	0.192	2.894	3.501
$logEXRATi$	64	3.119	0.083	2.999	3.247
$logEXRATj$	64	2.817	0.569	1.828	3.567
$logDij$	64	2.706	0.272	2.255	2.938
$logTOPENi$	64	1.602	0.052	1.508	1.692
$logIDIi$	64	1.173	0.030	1.142	1.250
$logIDIj$	64	1.155	0.162	0.716	1.408

Figure 1. The intensity of Burundi's sugar imports from East African Community (EAC)

Table 2. Econometric results of factors affecting Burundi's sugar imports from East African Community (EAC)

Variables	Coefficients	Standard error	p-values
$logGDPi$	0.520	1.162	0.065*
$logExRATi$	−1.572	2.464	0.524
$logExRATj$	−0.671	0.148	0***
$logDij$	−2.081	0.33	0***
$logTOPENi$	0.92	1.412	0.948
$logIDIi$	1.629	2.771	0.055*
$logIDIj$	2.376	0.765	0.002***
Constant	−3.82	6.92	0.058*

R^2 values: within = 0.208, between = 0.998, overall = 0.681, Wald test = Prob>chi^2= 0.000, corr (u_i, X = 0);
***, ** and * designate significant at 0.1%, 1%, and 5% level of significant, respectively.

in occasional circumstances like in 2008 and 2010. In the case of Tanzania and Rwanda, the results revealed that Burundi's intensity of imports in sugar was too small with a downward trend.

4.3 Factors affecting sugar imports

The most prominent estimation techniques used with panel data are the fixed effect model (FEM) and the random effect model (REM) (Gujarati, 2009). In the FEM according to (Gujarati, 2009), the intercept in the regression model is allowed to differ among individuals in recognition of the fact that each individual or cross-sectional unit may have some special characteristics of its own. In the fixed effect model, the intercept differs between individuals by being constant over time; it is time invariant. In the REM according to Gujarati (2009), it is assumed that the intercept of an individual unit is randomly 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. With the random effect model, the intercept across individual units is perceived to have a common mean which is random.

In order to make a choice between the random effect model and the fixed effect model, a Hausman test was conducted. Using a Hausman test, the null hypothesis assumes that the random effect model is appropriate while the alternative hypothesis assumes that the fixed effect model is appropriate. The results of the Hausman test showed a chi-square of 0.100 (p>1.000). Hence, the Hausman test failed to reject the null hypothesis at most 10% significance level (p-value greater than 0.1). Therefore, the random effect model was used to estimate the determinants of Burundi's sugar imports. The results of the estimated gravity equation using the random effect model are presented in Table 2. These results were produced by STATA.13. The results in Table 2 indicate that the estimated coefficient of 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 with GDP can be explained based on the link between growth in 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, these 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 the infrastructure development index of Burundi tends to increase sugar imports by 1.629%. Lastly, the coefficient associated with an 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, Ramli and Ismail (2014) indicate that infrastructure development is important as a tool to speed up the economic integration within the region particularly in the area of international trade and investment.

5 Conclusions and Policy Implications

This study firstly determined the intensity of Burundi's sugar imports from EAC. The results reveal that Burundi intensively imports sugar from Kenya followed by Uganda. Secondly, the determinants of Burundi's sugar imports were estimated. The results suggest that the GDPs, the distance and the exchange rates are the major factors determining Burundi's sugar imports from EAC. This results concur with those of Kabanda (2014) and Ardiyanti (2015). Moreover, they confirm the existing literature arguing that the economic size of countries and the volume of trade are positively linked. Li et al. (2010) pointed out the existence of a long-term or short-term causality between GDP and total exports and imports. Therefore, policy makers should formulate policies and take related actions meant to efficiently improve the intensity of Burundi's sugar imports. Moreover, policy makers and other food trade stakeholders in Burundi should give more attention and put rigorous controls on GDPs, distance, and exchange rates in order to ease a smooth movement of sugar imports.

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Conflict of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

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