

# Determinants and Performance of Sugar Export in Tanzania

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**Abstract** Tanzania ministries as well as sugar board of Tanzania are not aware of recent sugar markets trends. This study attempts to examine performance of Tanzania sugar exports and estimate sugar exports supply function for 1977-2013 periods. To estimate annual growth rates for quantities of sugar produced, consumed, imported and exported, geometric average was used by means of detailed data from country statistics through NBS, FAO and ITC computations. Multivariate regression model was used to estimate supply function. The results of the estimation revealed that, for the period of 35 years, annual growth rates of Tanzania sugar production and consumption was 3% and 7% respectively. Since, domestic factories was less than 60% productive efficient, indicating that there remains considerable scope to increase production hence exports by improving technical and allocative efficiency of existing idle resources. Thus, sugar export price has positive significant relationship while consumer price index has negative relationship with sugar exports supply. Quantity of domestic product of sugar, exchange rate and GDP are not statistically significant in explaining their impact on sugar exports supply. Moreover, Tanzania is a net exporter of molasses which is extracted or refined from sugar and is a net importer of sugar confectionery by-product. Thus, these are major sugar by-products which have significant economic implications to sugar industry stakeholders, whereby, the country is losing from sugar confectionery and gaining significantly from molasses. It is recommended that, production of sugar should increase significantly so as to satisfy both domestic and regional/foreign markets.

**Keywords:** export performance, sugar industry, supply function, regional markets, efficiency, Tanzania

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## 1. Introduction

More than 100 countries in the world are producing sugar derived from sugar cane and sugar beet. Over 79% of world sugar is produced from sugar cane, and the balance come from sugar beet which is grown mainly in the temperate zones of the northern hemisphere (Otieno *et al.*, 2003). Based on COMTRADE data, the biggest world exporters of sugar in values for 2004-2013 periods are Brazil (23.1%), France (7.0%), Thailand (5.8%) and German (5.2%). At hand, we have numerous products and by products derived from sugarcane such as sugar crystals; sugar syrup, molasses, bagasse and filter scum. Despite many uses, the current world sugar market situation has complex components and the most distorted commodity, whereby, the European Union (EU), Japan and the United States (US) are among the worst offenders in these markets (Elobeid and Beghin, 2006). Most countries including the lowest-cost producers offer some form of protection or subsidies to their producers, and/or distort price signals seen by consumers through directly distort trade in some fashion with restrictive import policies (OECD, 2003; Mitchell, 2004).

Africa's share of global sugar production is around 5% with a similar figure for global exports but a higher one

for imports, in consequence the continent is a net importer. According to Sandrey and Vink (2007), both winners and losers amongst African sugar producers were created during Everything But Arms (EBA) concession. In this regard, higher-costs producers are likely to be affected significantly and would exit the sugar sector completely. However, potential markets of their sugar are of great importance for sustaining companies (Bruntrup, 2006). Recently, Tanzania's ministries (Industry and Trade, Finance and East African Cooperation) as well as the Sugar Board of Tanzania (SBT) call upon a study to assess the trend of sugar markets and export performance (URT, 2013).

In Tanzania, the sugar industry is the largest agro-processing industry. This industry started early in 1924 when Tanganyika Planting Company Limited in Moshi started. This was followed by two other sugar companies situated in Kilombero and Mtibwa in 1961 and 1962 respectively. The industry has grown to having five sugar producers in the country. Based on existing data, sugar production in the country has increased from the initial 2,000 to more than 300,000 metric. In the past 15 years, Tanzania was among the top 12 big producer of sugar in Sub Saharan Africa (SSA). However, based on recent FAOSTAT data, production increases have been smaller in Tanzania and other African countries such as Madagascar, South Africa and Zimbabwe.

In the five years to 2015, the first quarter of Tanzania agribusiness report (2011) predicts that Tanzania will witness strong growth in domestic demand for maize, sugar and coffee due to country's expanding population and rising living standards. Due to proposed EU sugar reforms, sugar exports of EBA countries' including Tanzania was forecasted to fall because of a substantial reduction of the sugar price (Bruntrup, 2006). In this regard, these decisions eroded Tanzania's benefits from sugar exports to the European Union. Comparatively, Garside *et al.* (2004) on their findings recommended further research to get more information of the sugar industry in each of the affected countries including Tanzania.

Despite the export situations of Tanzania sugar, the country's domestic demand of sugar exceeds the combined production capacity of the country's sugar millers (URT, 2013 and FAOSTAT, 2014). Surprisingly, Tanzania was continuing to export its sugar to regional and EU markets. As for many internationally traded commodities, international sugar prices are extremely volatile and subject to long-term price decline. Since little is known to country's authorities and they are not conscious about current sugar markets trends. These motivate this paper, thus, to assess export capacity and alternative potential markets. The paper attempts to get empirical evidences towards sugar exportation viability through estimating export supply function and assessed value growth rates of sugar exports and imports. This would determine future Tanzania's sugar export decision considering available production and consumption situations. To that end, Tanzania sugar export performance and determinants of sugar export supply was examined.

## 2. Literature Review

### 2.1 Theoretical Standpoint

Despite the criticisms of the international trade theories particularly theory of comparative advantage and the technology and product life cycle theory. These theories are considered relevant in underpinning the theoretical foundation of the present paper. In other words, the paper takes them as guiding theories, without completely disregarding the external factors by integrating important points into the research model. As described previously, the paper has complied with some theories assumptions in favour of increasing sugar supply in Tanzania.

Comparatively, the role of technology could not be ignored by the paper including heavy investments in agriculture research, extension and processing and value addition to the extent that sugar industry in Tanzania would to be more competitive in sugar exports compared to other countries. These theories also address the importance of efficiency allocation of scarce resources, technology innovation and specialisation to some sugar by-products. Therefore, useful ideas adopted from theories so as Tanzania sugar producers could strive on costs minimisation then increase their profits hence increase welfare of stakeholders such as government, consumers and traders.

### 2.2. Empirical Review

Many studies estimate export supply of various commodities and others analyse sugar policies of particular

areas. However, export supply function approaches also differ based on objectives of the study. For instance, Tokarick (2010) has presented a method for estimating import demand and export supplies on a country basis without using econometrics. The method relies on some standard results borrowed from production theory and a well-know model of international trade. There is a vast literature (i.e. Stern *et al.* (1976) and Khan and Goldstein (1985) for surveys) that contain empirical estimates of trade elasticities, but the magnitude of the estimates varies widely, and in some instances, the signs of the estimates are contrary to theory. Accordingly, this paper also assesses if sign of the sugar export supply function comply with the theory.

Utikulu *et al.* (2004) argued that a traditional model of export supply with explanatory variables such as export prices (relative contribution of improved export profitability), variable home and foreign costs, and productive capacity can be further extended by taking the effects of trade reform which consists of measures to reduce anti-export bias. Their argument is based on the study which examined export supply and trade reform and the empirical analysis focused on Turkish case. Thus, Turkey's long-run export supply function was estimated. The co-integration and error correction type of modeling were employed. By applying these sophisticated time series techniques, they had robust empirical evidence that prices, relative prices, and real exchange rates had no significant effect on the Turkish export supply in the long run (steady state). Results of their basic model suggest that the Turkish export supply has been significantly driven by variable cost especially real wages. Based on the revealed strength of the methodology, this study adopted similar approach. To concur with Turkish case, however, this paper also analyses the Tanzania sugar productive capacity since it has been proved to be one of the main contributor on the country sugar export supply.

Moreover, the study which has been done by UNCTAD (2005) examined the determinants of export performance using regression technique and observed that trade barriers continue to be significant. Moreover, the issue of building supply capacity was revealed to be important in building the competence in exploiting export opportunity. This paper has adopted the related approach and use ITC computations based on COMTRADE data to come out with Tanzania sugar by-products whereby a country could specialise and gain from comparative advantages.

Haleem *et al.* (2005) made significant contribution by reviewing export supply function for citrus fruits in Pakistan for 1975-2004 periods. Similar to Tanzania sugar industry, horticulture revealed to be an important sub-sector of agriculture and play a vital role particularly in rejuvenation of rural economy. Their study used co-integration technique to analyse Pakistan's export supply of citrus. This paper has used the same approach since co-integration is a recently developed time series technique. Recent developments in time series econometrics indicate that most time series are non-stationary. If the series is non-stationary then the use of usual statistical tools to analyse data is not appropriate (Granger and Newbold, 1974). Findings of their study have brought out clearly that the share of fruit export has been declining over the years. There were very less earnings from export of fruits in the early years which gradually increased at the end.

Like Haleem *et al.* (2005) estimated results; this paper also shows the importance of price and non-price factors in explaining export supply function for Tanzania sugar. Generally, the study through this paper builds on the work of Haleem *et al.* (2005) and has adopted similar empirical strategy.

Svedberg (1991) has assessed export performance of Sub-Saharan Africa (SSA). His study had only two objectives. The first was to assess the export performance of the SSA countries jointly and by country. He has focused on the period since 1970. The second objective was to provide some broad explanations for the export performance observed. The main effort was directed towards estimating the relative role of changes in (i) the barter terms of trade, (ii) the export volume, and (iii) the export composition. Thus, this paper not only examined export volume for the 1977-2013 periods but also assessed determinants of Tanzania sugar export supply. Moreover, sugar export composition was considered and by using empirical evidence obtained the study has managed to come out with useful sugar by-products which can benefit the country. Using more or less the same approach, this paper also estimates annual growth rates for sugar exports and imports quantities and values, domestic production, and consumption.

Mndeme (2008) has examined the impact of the EU sugar market reforms on the Tanzania Sugar export performance. In his study, OLS technique of econometric analysis has been used for regression analysis by application of E Views. Results revealed that, Tanzania would experience significant reduction in sugar export revenue as a result of EU sugar reforms, and this would have negative effect to the Tanzanian economy especially for people involved in sugar industry. On the basis of the variables selected, exchange rate, income of trading partners and domestic production costs determines sugar export performance. Accordingly, this would build the

competitive export capacity to explore other market opportunities than EU reformed market and ultimately facilitate the industry to compensate the revenue shortfalls from export market as a result of EU sugar market reforms. Comparatively, this study was strengthened its multivariate regression model by using major five response variables. To increase robustness of the model and the study, it was not only included exchange rate but also incorporated domestic production, sugar export price, consumer price index and gross domestic product. To this end, this paper also targets regional markets which were ignored by Mndeme's study for Tanzania's sugar exports.

It should be noted that, some scholars did not include some variables in their models which could be a source of biasness to their estimates if omitted variables are important. For example, Karimi (2003) did not include exchange rate variable. Thus, there is no consistency in the literature, theoretical or empirical on the effects of exchange rate variability on export trade. Several models have been proposed suggesting that exchange rate variability might adversely affect trade (Barkoulas *et al.*, 2002). The literature offers several reasons why exchange rate variability might benefit export trade. The important view is that exports contracts are usually denominated in foreign currency. Thus exchange rate variability induces uncertainty in the pricing decisions of domestic firms engaged in export business (Abbott *et al.*, 2001). However, this paper incorporates all important variables (equation 1) to reduce biasness of the model and presents actual estimated results.

### 2.3. Conceptual Framework

Below is the diagrammatic representation of the conceptual framework for the Tanzania sugar export performance examination and determinants assessment of sugar export market (Figure 1).

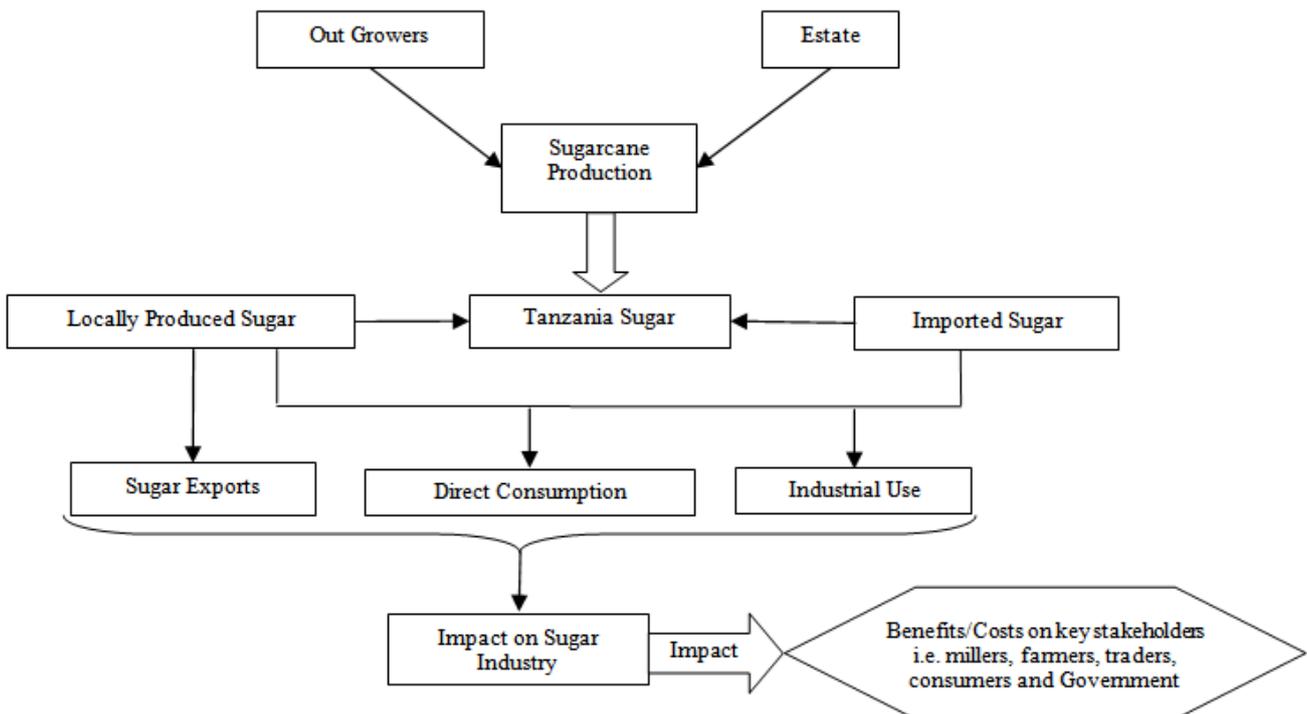


Figure 1. Conceptual Framework

### 3. Methodology

#### 3.1. Data Collection, Sources and Methods

The paper uses numerous sources of data and most of them are time series which were obtained purposely: Tanzania sugar industry reports and interviews with some industry actors particularly SBT officials. The main sources of secondary data and sugar related statistics are Sugar Board of Tanzania (SBT), National Bureau of Statistics (NBS), Food and Agriculture Organisation (FAO) of United Nations, Tanzania Revenue Authority (TRA), country economic surveys, and International Trade Centre (ITC) computations based on COMTRADE data. Personal communications and checklist were used targeting respective offices, respondents and specific type of data.

#### 3.2. Sugar Exports Supply Function Estimation and Specification

The secondary data regarding domestic production, sugar export quantity, sugar export and domestic prices, GDP and exchange rate were used in this paper particularly for sugar export supply function estimation. To have best statistical implications, annual time series data from 1977 to 2013 were analysed using STATA through the following model adopted from Haleem *et al.*, (2005) and small modification made from model of Cerra and Saxena (2002).

$$\ln QE_{st} = \alpha_0 + \beta_1 \ln EP_{st} + \beta_2 \ln DP_{st} + \beta_3 \ln CPI_t + \beta_4 \ln ER_t + \beta_5 \ln GDP_t + \mu_{st} \quad (1)$$

Where

$\ln QE_{st}$  = Quantity of sugar exported in metric tons.

$\ln EP_{st}$  = Sugar export price measured by the export unit value index (2000=100).

$\ln DP_{st}$  = Domestic production quantity of sugar.

$\ln CPI_t$  = Consumer price index representing domestic price index (2000=100).

$\ln GDP_t$  = Tanzania's gross domestic product measured at constant factor cost of 2000.

$\ln ER_t$  = Exchange rate in terms of Tanzania shillings/US dollar (TAS/USD).

$\mu_{st}$  = Stochastic error term.

Standard supply theory suggests that the partial derivatives of supply of sugar exports with respect to sugar export and domestic prices of export goods are positive and negative, respectively. The domestic production of sugar ( $DP_{st}$ ) is expected to have a positive sign as higher production results in higher exportable surplus, *ceteris paribus*. On an a priori basis, a direct relationship was expected between quantity exported of a sugar ( $QE_{st}$ ) and Gross Domestic Product ( $GDP_t$ ), a reflection of robustness of the economy. The exchange rate plays a crucial role in explaining the variations in net exports of a commodity especially in a country where exchange rates are volatile. Higher exchange rates that occur during devaluation of domestic currency lead to increased exports. Thus a positive sign was anticipated between the exchange rate and exports.

The supply of sugar exports in an economy driven by market incentives depends positively on the price at which

these goods can be sold in foreign markets ( $\beta_1 > 0$ ). As the price at which the export good can be sold in the domestic market, proxied by the consumer price index, increases the incentive should be to switch supply from the foreign to the domestic market ( $\beta_2 < 0$ ). If exports are prices in the consumer's currency, then the price received by the exporter in domestic currency will fall as the exchange rate appreciates, which reduce the incentive to supply ( $\beta_4 < 0$ ). Export supply should also rise with the capacity of the Tanzania economy ( $\beta_5 > 0$ ) to produce goods and services, proxied by the industrial production index ( $\beta_3 > 0$ ).

The recently developed time series technique such as co-integration analysis used to estimate supply function parameters for sugar export from Tanzania. Developments in time series econometrics indicate that most time series are non-stationary. If the series is non-stationary then the use of the usual statistical tools to analyse data is not appropriate. Most economic time series are trended over time and regressions between trended series may produce significant results with high  $R^2$ 's, but may be spurious or meaningless (Granger and Newbold, 1974).

The concept of co-integration states that an individual series can wander extensively, but when paired with another series or a set of series, the pairs tend to move together over time and the difference between them are constant (i.e. stationary). A stationary series has a tendency to return to its mean value constantly and to fluctuate around it in a more or less constant range.

Consider the following first order autoregressive model:

$$Y_t = \phi Y_{t-1} + u_t, \quad t = 1, 2, \dots, T \quad (2)$$

If  $\phi < 1$ , the series  $Y_t$  is stationary and if  $\phi = 1$ , the series is non-stationary and its known as random walk.  $Y_t$  in equation (2) can be made stationary after differencing once (although in general this is not necessarily the first difference). The number of times a series needs to be differenced in order to achieve stationary depends upon the number of unit roots it contains. If a series becomes stationary after differencing  $d$  times, then it contains  $d$  unit roots and is said to be integrated of order  $d$ , denoted to  $I(d)$ . In equation (2) where  $\phi = 1$ ,  $Y_t$  has a unit root and thus  $Y_t \sim I(1)$ .

#### 3.3. Testing Unit Roots

Dickey-Fuller (DF) test (Dickey and Fuller, 1981) is most commonly used for testing unit root. The DF-test requires estimating the following by OLS:

$$\Delta Y_t = \sigma + \beta_t + (\phi - 1)Y_{t-1} + \mu_t \quad (3)$$

Equation (3) indicates that the series  $Y_t$  has both stochastic and deterministic trends and can be used as a DF-equation for testing the unit root hypothesis such as  $H_0: (\phi - 1) = 0$ . The test statistic used to test the unit root hypothesis is the  $Tt$ -statistic. If the calculated  $Tt$ -value ( $t$ -value of the coefficient  $\phi - 1$ ) is greater than critical  $Tt$ -value, then  $Y_t$  is non-stationary.

From equation (3) we can also test the joint hypothesis of unit root and no trend such as,  $H_0: (\phi - 1) = \beta = 0$  against the alternative hypothesis of the trend stationary such as,  $H_1: (\phi - 1) = \beta \neq 0$  by using the  $\phi$ -statistic with critical values from Dickey and Fuller (1981). If calculated  $(\phi - 1)$  value is less than the critical value, the

null is rejected;  $Y_t$  is stationary with a significant trend and is a trend stationary series.

If the error term is not white-noise, there is autocorrelation in the residual. To overcome this problem first, we can generalise the testing equation or second, we can adjust the DF-statistics (Thomas, 1997). It is common to follow the former that is the augmented Dickey-Fuller (ADF) test. For this lagged values of the dependent variable are included on the right hand side of the DF-equation of (3) which becomes:

$$\Delta Y_t = \sigma + \beta_t + (\varnothing - 1)Y_t - 1 + \sum_{i=1}^k \theta_i \Delta Y_t - 1 + \mu_t \quad (4)$$

Langrange Multiplier (LM) test (Holder and Perman, 1994) was used to be familiar with the number of lagged values of the dependent variable. If there is more than one unit root, then first it is tested for a unit root in the levels of the series  $Y_t$ . If the hypothesis of the presence of a unit root is not rejected, we test the first difference (such as  $\Delta Y_t$ ) for the presence of a second unit root and so on. This testing procedure from lower to higher orders of integration continues until the null of a unit root is rejected.

### 3.4 Co-integration with Multiple Equations: The Johansen Method

Johansen's Full Information Maximum Likelihood (FIML) approach (Johansen, 1988) was used to test for co-integration and it allowed the estimation of all possible co-integration relationship and develops a set of statistical tests about how many co-integration vectors exist.

FIML approach for multivariate co-integration is based on the following vector autoregressive (VAR) model:

$$Z_t = A_t Z_t - 1 + \dots + A_k Z_t - k + \mu_t \quad (5)$$

Where  $Z_t$  is an  $(n \times 1)$  vector of  $I(1)$  variables,  $A_t$  is an  $(n \times n)$  matrix of parameters,  $\mu_t$  is  $(n \times 1)$  vector of white errors. Since  $Z_t$  is assumed to be non-stationary, it is convenient to rewrite (5) in its first-difference or error correction form as:

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \dots + \Gamma_{k-1} \Delta Z_{t-k+1} + \Pi Z_{t-k} + \mu_t \quad (6)$$

Where  $\Gamma_i = - (I - A_1 - A_2 - \dots - A_i)$ ,  $(i=1, 2, \dots, k-1)$ , and  $\Pi = - (I - A_1 - A_2 - \dots - A_k)$ .

Equation (6) differs from the standard first-difference form of the VAR model only through the inclusion of term  $\Pi Z_{t-k}$ . This term provides information about the long-run equilibrium relationship between the variables in  $Z_t$ . If the rank of the  $\Pi$  matrix,  $r$ , is  $0 < r < n$ , there are ' $r$ ' linear combinations of the variables in  $Z_t$  that are stationary. In this case, the  $\Pi$  matrix can be decomposed into two matrices  $\alpha$  and  $\beta$  such that  $\Pi = \alpha\beta$ , where  $\alpha$  is he error correction term and  $\beta$  contains ' $r$ ' distinct co-integration vectors such as, the co-integration relationship between the non-stationary variables. If there are variables which are  $I(0)$  and are insignificant in the long-run co-integration space but affect the short-run model, equation (6) can be written as:

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \Psi D_t + \mu_t \quad (7)$$

Where  $D_t$  represent the  $I(0)$  variables, which are often included to take account of short-run shocks to the system such as policy interventions. Two likelihood ratio (LR)

tests are constructed for detecting the presence of a single co-integration vector. The first is the trace test statistics:

$$\lambda_{\text{trace}} = -2 \ln Q = -T \sum_{i=r+1}^p \ln(1 - \lambda_i) \quad (8)$$

It tests the null hypothesis of at most  $r$  co-integration vectors against the alternative that it is greater than  $r$ . The second is the maximal-eigen value test:

$$\lambda_{\text{max}} = -2 \ln(Q : \frac{r}{r+1}) = -T \ln(1 - \lambda_{r+1}) \quad (9)$$

This tests the null hypothesis of  $r$  co-integrating vectors against the alternative that it is  $r + 1$ . The critical values for these tests have been derived by Monte Carlo simulations and tabulated by Johansen (1988).

### 3.5. Growth Rates Computations

Geometric average growth rate was used as an estimated major indicator. The estimated annual growth rate for quantities of sugar exports, imports, production and consumption as specified as follows:

Mathematical definition of Growth Rate (GR)

$$GR = \left( \left( \frac{X^1}{X^0} \right)^{\frac{1}{n}} - 1 \right) \times 100 \quad (10)$$

Where  $X^0$  represents specific quantity in the start period,  $X^1$  represents the quantity in the end period and  $n$  represents the number of periods (not including the start).

## 4. Results and Discussion

### 4.1. The Trend of Tanzania Sugar Production, Consumption, Import and Export

Tanzania sugar industry is offering direct employment to more than 16,300 households. Unfortunately, for the 2008-2013 periods direct employment to sector has been decreasing at the rate of 4%. Production of sugar in the country has not met its target hence factories are operating under capacity. On average sugar industry was 16.9% inefficient in terms of technical and allocative efficiency in 2010. The level of inefficiency reported to increase overtime, for instance, about 56% operating capacity reported in 2013. This means that factories need to allocate and utilise full resources available particularly land so as to expand area used to grow sugar canes. For example, recent data show that, more than 44,000 hectares used to grow sugar canes in Tanzania. Sugar cane out-growers occupy only 40% of the total area.

Local consumption of sugar includes domestic and industrial use. Domestic production of sugar can satisfy local consumption by 62% and the rest covered through imports mostly outside the East Africa region (Figure 2). Given production and consumption level in 1980s era which was slightly fluctuating, however, for the period of 35 years annual growth rates of Tanzania sugar production and consumption was 3% and 7% respectively. Consumption of sugar within the country was projected to increase more than what can be produced domestically. Moreover, for the past 10 years, EU markets have been receiving a slight significant higher quantity of Tanzania

sugar exports compared to regional markets. For instance, more than 55% of sugar export from Tanzania has been exported to EU markets and the rest to the other regional markets. For many years now demand of sugar in domestic market has been higher than total supply of sugar produced

by local factories. Thus, the country has been facing enormous deficit and the rate of deficit projected to increase if the amount of sugar production at the domestic level would not increase significantly.

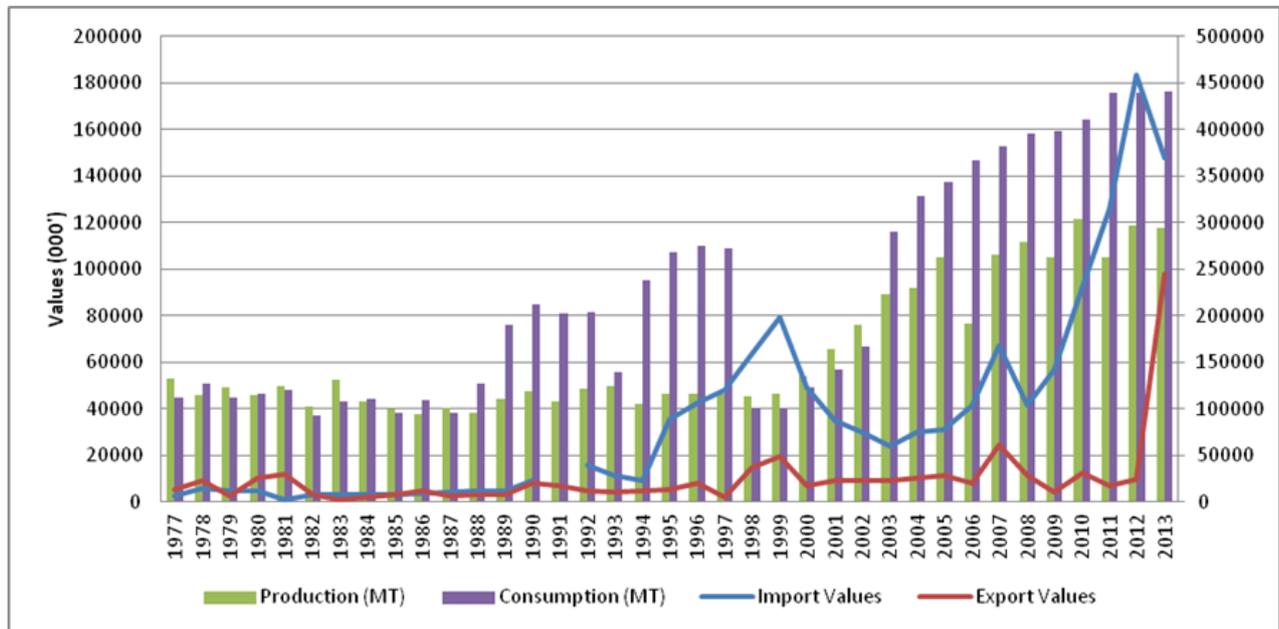


Figure 2. Tanzania Sugar Production, Consumption, Import and Export Trends

Sugar by-products which brought special attention as far as Tanzania is concerned are molasses and sugar confectionery. To this end, the country is a net exporter of molasses which was extracted or refined from sugar and is a net importer of sugar confectionery (including white chocolate), not containing cocoa. Then, these are major sugar by-products which have significant economic implications to sugar industry stakeholders (Figure 1), whereby, the country was losing and gaining significantly from sugar confectionery and molasses respectively. The level of production of these by-products should increase so as to reduce importation and increasing exportation

accordingly. It would be plausible to test out on markets specialisation for the Tanzania to export sugar into few countries which could buy different sugar by-products at higher prices compared to others. For example, the EU and regional markets, UK and Spain and Mozambique revealed to be promising market niche which can offer reasonable price of molasses. Whereby, sugar confectionery has been imported from higher cost markets with fairly exception with Thailand. Thus, potential markets should be considered for both exports and imports so as to improve country’s trade balance hence increase welfare of traders and consumers extensively.

Table 1a. ANOVA Results and Model Parameters

$\ln QE_{st} =$	$1.085 \ln EP_{st+}$	$0.595 \ln DP_{st+}$	$-0.6 \ln CPI_{t+}$	$-0.491 \ln GDP_{t+}$	$0.62 \ln ER_t$	$+ 2.479$
	(0.0304)	(0.6038)	(0.4196)	(0.9081)	(0.4974)	(14.72)
<b>Source</b>	<b>SS</b>	<b>Df</b>	<b>MS</b>			
<b>Model</b>	96.698	24	4.02908			
<b>Residual</b>	0.0118	1	0.01185			
<b>Total</b>	96.7097	25	3.8683			

Note: Number of observations (years) = 26; F (24, 1) = 299.69; Probability>F = 0.0428; R-square = 0.9894; Adjusted R-square = 0.961; Root MSE = 0.10887; Durbin-Watson Stat = 2.895; Akaike info criterion = 3.315.

#### 4.2. Determinants of Tanzania Sugar Export Supply

The results in Table 1a revealed that, approximately 98.9% of the variation in quantity of Tanzania sugar export in metric tons was explained by the sugar export price measured by the export unit value index, quantity of domestic product of sugar, consumer price index which was representing domestic price index, gross domestic product, and exchange rate. Getting higher percent of R<sup>2</sup> was not a surprise in long-run estimation of export supply

functions (Utkulu *et al.*, 2004). In their Turkish export supply model estimation they had obtained 97% R<sup>2</sup> value. The probability of the F statistic is significant which implies that the model is well specified.

The quantity of sugar exported for the previous quarter significantly impacts on the current quarter’s sugar exports supply. The quantity of sugar exported for the previous three quarters also has a significant effect on the current quarter’s sugar export supply. This finding is consistent with that of Agasha (2007) and Musinguzi *et al.* (2000) who reported that lagged export growth rate have a

statistically significant impact on current year's growth rate.

Sugar export price has a significant and positive effect on sugar exports supply (Table 1b). The effect is statistically significant at 1% level. The lagged value of export price at 2<sup>nd</sup> lag significantly affects current period's export supply of sugar. This finding is consistent with that of Agasha (2007) whereby, his study reported significant level of 5% and positive effect of foreign price level on export growth rate. Not only that but also similar findings revealed by the study of Ndulu and Lipumba (1990) while studying opportunities and constraints to trade and their influence on growth and development of African economies. They also revealed that foreign prices of primary commodities significantly affect the export performance of country's involved in their production. Moreover, Edward and Golub (2004) investigated the determinants of export supply in South Africa and found out that foreign prices have a highly significant impact on manufacturing export performance in South Africa.

Quantity of domestic product of sugar has insignificant impact on sugar exports supply except at the 1<sup>st</sup> lag. However, findings revealed a negative relationship with sugar exports supply unexpectedly for the all lags undertaken. This means that, there is an indirect relationship between quantity of sugar produced domestically and exportation performance of this product. Conversely, insignificant impact of this variable on the sugar exports supply function for the last two lags might have an indirect meaning that, decision of exporting sugar into foreign markets don't depend on country's capacity. This was not a surprise because domestic demand of sugar in local markets is higher than the supply. According to Agasha (2007) and Mwinuka (2010), domestic production of sugar should be strengthened not only at the factory level but also at the farm level. In this regard, resources such as labour and land should be utilized full so as to increase local sugar production so as to have significant impact on sugar exports.

Consumer Price Index (CPI) which is representing domestic price index has a positive and insignificant impact on sugar exports supply. It has statistical significant at the 10% level at the 3<sup>rd</sup> lag. This means the higher CPI in Tanzania would increase consumption power of customers hence purchase most of the sugar at the local level, and vice versa is true for motivating sugar exports supply. However, this has not much revealed from the 1<sup>st</sup> and 2<sup>nd</sup> lags. Sharma (2001) while investigating the determinants of exports in India discovered that a fall of domestic prices of a particular product makes exports cheaper in the international markets resulting in their increased demand; this is due to the influence of exchange rate depreciation.

The Gross Domestic Product has a positive and 1% significant impact on sugar exports supply of a given period. However, 2<sup>nd</sup> lag revealed unexpected results of negative influence into export supply. Comparatively, insignificant impact of GDP also revealed from the study of Agasha (2007) while studying determinants of export growth rate in Uganda. However, this was a different finding from that of Ngeno (1990) who while studying the determinant of exports in Kenya found that an increase in domestic output increase export growth. Kumar (1998) conducted a study on determinant of export performance

in developing countries and found out that GDP has a positive relationship with export volumes since increased production leads to surplus output in an open economy being exhausted in international markets. This finding also contradicts the findings of Fungazza (2004), while studying export performance and its determinants in developing countries; he found out that lagged GDP has a positive significant relationship with export growth rate.

**Table 1b. Results of the Short-run Relationship Model (Dependent Variable:  $\ln QE_{st}$ ; included observations: 26 after adjusting endpoints)**

Variable	Coefficient	Std. Error	t-statistics	Probability
$\ln QE_{st}$				
L1	-0.675	0.315	-2.14	0.278
L2	-0.074	0.357	-3.01	0.204
L3	-0.524	0.353	-1.48	0.377
$\ln EP_{st}$	0.947	0.060	15.73	0.040
L1	0.507	0.313	1.62	0.352
L2	0.671	0.300	2.23	0.268
L3	0.392	0.373	1.05	0.485
$\ln ER_t$	-1.462	0.467	-3.13	0.197
L1	-1.171	0.897	-1.31	0.416
L2	0.720	0.570	1.26	0.426
L3	1.071	0.293	3.65	0.170
$D \ln DP_{st}$	-0.043	0.274	-0.16	0.901
L1	-1.066	0.433	-2.46	0.246
L2	-0.158	0.457	-0.35	0.788
L3	-0.049	0.682	-0.07	0.954
$DCPI_t$	4.732	3.162	1.50	0.375
L1	-0.820	2.309	-0.36	0.783
L2	-0.247	2.465	-0.10	0.936
L3	-4.395	2.447	-1.80	0.323
$D \ln GDP_t$	12.647	5.423	2.33	0.258
L1	205.244	60.598	3.39	0.183
L2	-109.873	35.478	-3.10	0.199
L3	8.070	6.317	1.28	0.423
Res_L1	-189.314	68.539	-2.76	0.221
C	9.315	1.917	4.86	0.129

Note that:  $\ln QE_{st}$  = Quantity of Sugar exported in metric tons,  $\ln EP_{st}$  = Sugar export price measured by the export unit value index,  $\ln DP_{st}$  = Quantity of domestic production of sugar,  $\ln CPI_t$  = Consumer price index representing domestic price index,  $\ln GDP_t$  = Tanzania's gross domestic product,  $\ln ER_t$  = Exchange rate in terms of TAS/dollar.

The effect of exchange rate on sugar export supply is statistically significant at 1% level. Conversely, the 1<sup>st</sup> and 2<sup>nd</sup> lag revealed to be insignificantly impact sugar export supply (Table 1b). This is not a surprise since the findings are similar to that of Musinguzi and Obwona (2000) and Agasha (2007) who found real exchange rate to have an insignificant effect on export growth rate but then contradicts a number of other findings. Studies in Ghana and India by Fosu (1992) and Sharma (2001) respectively have shown that real exchange rate has a significant negative relationship with export growth. Sharma concluded that a fall in domestic prices due to exchange rate depreciation makes exports cheaper in the international markets resulting into their increased demand. Cline (2004) also had a similar study using pooled data for

over 100 developing countries for the period 1981-2001. He ran an Ordinary Least Square regression and his results shown that real exchange rate has a significant effect that is its depreciation increases export growth.

## 5. Conclusions

The paper sets out to examine performance of sugar exports, estimate growth rates of quantity of sugar production, consumption, exports and imports, and identify the determinants of Tanzania sugar exports supply for the 1977-2013 periods. These have been a matter of contention not only in Tanzania but also in other African countries as a whole for a long time. Empirical results and analysis presented reveal that, sugar export price which measured by the export unit value index and consumer price index representing domestic price index have a significant impact on sugar exports supply. Accordingly, sugar export price has positive relationship while consumer price index has negative relationship with sugar exports supply. Quantity of domestic product of sugar, exchange rate and GDP are not statistically significant in explaining their impact on sugar exports supply.

The findings however have shown that, there is a room for improvement of local sugar production to have a significant impact on sugar export supply. Since, mean level of domestic factories targets hence their efficiency in production was 83.1% in 2010 and 56% in 2013 indicating that there remains considerable scope to increase production hence exports by improving technical and allocative efficiency of existing factories and/or sugar cane out-growers. Subsequently, for satisfying domestic demand of sugar sufficiently, production amount should increase more than double. However, increase of Tanzania sugar production would not only capture domestic demand but also existing potential of international markets particularly regional markets.

The analysis brings out clearly that the performance of Tanzania sugar exports is not promising compared to what we have been losing due to imports. Deficit trade balance out of sugar has been persisting for more than 25 years now; hence the country experienced less earning from sugar exports which has been fluctuating over time. The fluctuating performance of sugar exports is likely to be attributed by low and fluctuating domestic sugar production, inconsistent export policies, currency depreciation, export duties, competitiveness of exports and situation in the international markets. Estimated results showed the great importance of price and less non-price factors in explaining export supply function for Tanzania's sugar.

On the basis of different sugar products which the country is losing in growing market, molasses resulting from the extraction or refining of sugar is the only product which is doing better compared to others. Through molasses, the country was a winner in growing sectors hence it has a potential growth for world market and trade. Also, molasses has been exported to Kenya, Uganda, Netherland and Oman, whereby, Kenya and Netherlands were major consumers of this product. Thus, the country should export more of this sugar by-product rather than other due to comparative advantage Tanzania has on it.

Therefore, sugar products which brought special attention are molasses and sugar confectionery. To this

end, Tanzania was a net exporter of molasses which was extracted or refined from sugar and was a net importer of sugar confectionery (including white chocolate), not containing cocoa. Then, these are major sugar by-products which have significant economic implications to processors, traders and consumers; whereby, the country was losing and gaining significantly from sugar confectionery and molasses respectively. Their level of production should increase so as to reduce importation and increasing exportation accordingly.

### 5.1. Policy Implications

On the basis of the findings, the general policy implication is that foreign markets access for both EU and regional markets and domestic supply capacity has to be considered equally important along the development process of the country's sugar industry. Simultaneous efforts to improve both sugar supply capacity and foreign market access through enhancement of the performance of sugar millers/industry and the structural deepening of the industry. Comparatively, local produced sugar has higher domestic and foreign demand hence existence of potential markets cannot be denied. However, export of sugar by-products is concentrated mainly on molasses which is extracted or refined from sugar. In this regard, the rest of other sugar by-products particularly sugar confectionery would better be consumed domestically rather than exported since the country is losing significantly.

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