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The Battle of Sugar Imports and Domestic Sugar Production in Nigeria: Roles of Political, Policies, and Economic Environments

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Abstract

The study examined roles of political and economic environments on sugar import demand from 1965 to 2014 in Nigeria. Time series data were obtained from FAO, Central Bank of Nigeria and National Bureau of Statistics as well as World Bank. Augmented Dickey-Fuller-GLS unit root test showed that all series were integrated of order one. The long-run and short-run elasticity of sugar import demand were determined using techniques of co-integration and error correction models. The trend in sugar import revealed an average positive exponential growth rate of about 3.49% from 1965 to 2014. The empirical results revealed that, the long run import demand function of sugar responded negatively to the agro based capacity utilization rate, nominal exchange rate, real GDP and domestic price of sugar; whereas, it reacted positively to period of civilian rule, domestic production and per capita income. The symmetric adjustment coefficient of sugar import demand to a long run equilibrium stood at 33.26% per annum. In the short run, sugar import had a significant negative and inelastic relationship with the external reserves; while it has significant positive inelastic association with the world price of sugar. To improve domestic sugar production; it is recommended that, the Nigeria government should designed programmes and incentives to boost agro industrial capacity utilization in the country. Market determines nominal exchange rate should prevail in the economy, such that import demand will based on equilibrium market exchange rate and not subsidize or regulated rate. The country should regulate its foreign reserve policy by setting a threshold, above which excess deposit should be plough back to the domestic economy inform of investments rather than support excessive importation. Civilian regime in Nigeria should strive to reduce corruption and ensured policy tight from conceptualization to implementation.

Keywords: Sugar import, Macroeconomics, Agriculture, Sugar policies, Nigeria, Economy.

Contents

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1. Introduction

Sugar sub sector is one of the key providers of industrial employment in Nigeria (Akpan, 2013). The industry also plays an important role in food self-sufficiency policy of the federal government (National Sugar Development Council Document (NSDC), 2008). The sub sector provides critical raw materials for food and beverage, bakery and confectionery, soft drinks and pharmaceutical industries among others. The demand for direct household and industrial consumptions has continued to remain firm in Nigeria. The current domestic consumption of sugar in Nigeria is about 1.45 million tons per annum (Central Bank of Nigeria (CBN), 2014). Domestic sugar production however, has varied between 7,000 to 55,000 tons per annum from 1969 to 2010 (Wada *et al*., 2001; Savannah Sugar Company Limited (SSC), 2006). Nigeria's sugar requirements are mainly met through imports of raw sugar that is refined locally. About 98 percent of all imports come in the form of raw sugar and is refined locally while the remainder of imports is refined sugar. Currently, domestic production of sugar is slightly less than 5% of the country's annual requirement (CBN, 2010) and NSDC (2010). From 2001 to 2003 domestic sugar production in the country declines considerably reaching all time low value of less than 1% of sugar consumed in the country (CBN, 2010; Food and Agricultural Organization FAO, 2014).

Despite depending on import, the country is the largest consumer of sugar in West Africa and has a large area of cultivable land suitable for growing industrial sugarcane (Busari and Misari, 1996; ADB, 2000; ADF, 2000). Also, over the years the federal government has carried out policies that were aimed at boosting sugar production in the country. Some of the policies include; 50% tariff on the importation of white sugar, 5% levy on imported raw sugar, five year tax holiday to sugar refineries and privatization of major sugar firms in the country, as well as sugar expansion programme in collaboration with the African Development Bank and African Development Fund in 1989 and 1991 respectively. These packages were meant to stimulate local sugar production and increase the commodity's productivity as well capacity utilization in the sub sector. In spite of these provisions, Nigeria still imports above 90% of its sugar consume locally (Nigerian Financial Business News, 2010). This implies that huge amount of foreign exchange is needed for sugar importation and this has a tendency to impact negatively on the country's external reserves, development of other sectors of the economy and the welfare of sugarcane farmers in the country. For instance, about ₦26billion or about $173.33million (at N150 for 1 dollar) was spent on sugar importation in 2008 (NFBN, 2010). According to the National Sugar Development Council (NSDC), Nigeria has a land potential of over 500,000 hectares of suitable cane fields that can produce over 5 million metric tons of sugarcane that when processed, can yield about 3 million metric tons of sugar. However, the sector has been neglected and depends almost totally on refining imported raw brown sugar from Brazil worth over $500 million per annum (Annual Sugar Report for Nigeria, 2013).

Government has not relented in her effort to increase the productivity of the sugar sub sector in Nigeria. In 2013, government revised the sugar tariff structure to revitalize activities in the sugar industry, boost domestic raw sugar production and create jobs. New tariffs for raw and refined sugar were announced, as well as for sugar related production equipment and machinery. The government implemented a zero per cent import duty on machinery and spare parts destined for local sugar manufacturing industries; five year tax holiday for investors in the sugar value chain; 10 percent import duty and 50 percent levy on imported raw sugar and 20 percent duty and 60 percent levy for imported refined sugar (CBN, 2013). These measures were intended to re-direct investments back to the sub sector and promotes backward integration in the sugar value chain. Given this brief scenario in the Nigeria's sugar industry, the need to promote domestic production and control importation of sugar will depends largely on the understanding of roles of political and economic environments on food importation in the country. Since importation is basically an economic activity that is modeled by categories of policy, there are needs to understand the relationship between both political and economic environments and food importation in the country. On this premise, the study specifically established the relationship between sugar import and the political and economic environments in Nigeria.

2. Literature Review

Literature on sugar import demand is scanty with respect to Nigeria. However, the study reviewed import demand functions of various economies. Frank and Maylene (2005) employed Stock-Watson dynamic OLS (DOLS) model to derive the long-run price, income and urbanization elasticity of import demand. The data covers the period 1970-2000. Results indicated that real GDP, relative price and urbanization are the key determinants of import demand for pulses in India. Also, Safoulanitou and Mathias (2007) identified factors that explained food imports in Congo. The analysis showed that the exchange rate of the local currency, armed conflicts, re-export trade, income and the domestic production index all represent the main factors that account for food imports in Congo in the short and or long term. In Nigeria, Ogundele (2007) examined the effects of various trade policy instruments such as tariff, import restrictions, outright ban on rice import and other determinants on the import demand for rice in Nigeria between 1960 and 2007. The long run equilibrium model revealed that, exchange rate, per capita income and local output of rice have positive significant relationship with rice import demand.

The short run dynamic model (ECM) result further confirmed the significance of per capita income and local output as major positive determinants of rice import in Nigeria. In another empirical work (Lançon and Hélène, 2007) posited that, policy measures are among the major determinant of expansion of rice imports in developing countries. In a similar manner, Fatukasi and Bernard (2010) assessed the determinants of import from 1970 to 2008 in Nigeria. The long run model reveals exchange rate and external reserves have negative relationship with import in Nigeria. The GDP and trade openness impacted positively on import in the long run. In the short run, external reserves, GDP and trade openness were important decision variables. Nassr (2013) estimated import demand function in Palestine. The finding showed positive relationship between the demand for imports and GDP and negative relationship with the index of consumer prices.

2.1. Research Gaps Identified in the Reviewed Literature

Researches on sugar import demand are absent in the literature. The country is currently depending on sugar import for her domestic and industrial consumption. Hence there is an overwhelming need to link sugar import to macroeconomic variables for efficient policy formulation on sugar imports in the country. Also, it is evidenced that political environment has not been considered in the sugar import demand function in developing countries. This is a serious missing linked especially in Nigeria, where politic plays a significant role in the economic activities. Also, some of the studies stick to the traditional theoretical framework of import demand by incorporating few macroeconomic variables in the function. This study bridges that gap by expanding macroeconomic variables in the function.

3. Theoretical Framework

Following the work of Mayes (1981) a simple import demand function is explicitly shown as:

$$M_t = \vartheta Y^{\alpha} \left(\frac{P_m}{P_d}\right)^{\beta} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (\mathbf{1})$$

Where M = Import, Y = Domestic income, Pm = international price of commodity i, Pd = domestic price of commodity i. Attaching log to equation 1 will yield:

$$log(M_t) = log\left(\vartheta Y^{\alpha} \left(\frac{P_m}{P_d}\right)^{\beta}\right) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2)$$

Linearizing equation 2 and expressing it explicitly will yield:

$$log(M_t) = log\vartheta + \alpha \log(Y) + \beta \log\left(\frac{P_m}{P_d}\right) + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

Where α and β are import elasticity of demand with respect to domestic income and own price of commodity. However, equation 3 has been expanded to include several explanatory variables such as exchange rate, per capita income; external reserve and liberalization dummy etc. (Ogundele, 2007; Igberi *et al.*, 2012). The study further expands equation 3 by including dummies.

4. Materials and Methods

Study Area**:** The study was conducted in Nigeria; the country is situated on the Gulf of Guinea in the sub Saharan Africa. Nigeria lies between 4^0 and 14^0 North of the Equator and between longitude 3^0 and 15^0East of the Greenwich. The country has a total land area of about 923,769km^2 (or about 98.3 million hectares) with 853km of coastline along the northern edge of the Gulf of Guinea and a population of over 140 million people (National Population Commission Website, 2006). Nigeria is bounded by the Republics of Benin in the west, Chad and Cameroon in the east and Niger to the north.

Data source: Secondary data were used for the study. These data were sourced from several publications of Central Bank of Nigeria (CBN), National Bureau of Statistics, records of Savanna and Bacita sugar companies, Food and Agricultural Organization (FAO) as well as the World Bank. Data covered the period from 1965 to 2014.

5. Analytical Technique

5.1. The Trend Analysis of Sugar Import in Nigeria (1965 – 2014)

The study investigated the nature of movement and growth rate in sugar import in Nigeria. An exponential trend equation was specified as shown explicitly:

$$log_e SUI_t = b_0 + b_1 T + U_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4)$$

Where 'T' is the time expressed in year; SUI_t is the annual quantity of total sugar import (tons) in Nigeria. The exponential growth rate is given as: (r) $=\left(e^{b1} - 1\right) * 100 \dots\dots\dots\dots\dots\dots (5)$

The exponential growth rate was adopted because several literature opine to the continuous increase in sugar imports in Nigeria (CBN, 2014). The study used quadratic exponential equation to ascertain whether the growth rate in sugar import assumes an accelerated or decelerated rate over increased period of time in Nigeria. Explicitly, the model is shown as:

$$log_e P_t = b_o + b_1 t_1 + b_2 t_2^2 + u_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

The inference implies that, if $b_2 > 0$; then sugar import has accelerated positive or negative growth rate over increase time: when $b_2 < 0$; the growth rate in sugar import is not significant.

5.2. Long Run Sugar Import Demand Function in Nigeria

To determine the long run sugar import demand function in Nigeria, a time dependent regression model was specified at the level of variables. The model is specified explicitly as thus:

$$SUI_t = \beta_0 + \beta_1 RGP_t + \beta_2 EXC_t + \beta_3 ACU_t + \beta_4 EXR_t + \beta_5 POL_t + \beta_6 DPS_t + \beta_7 RWS_t + \beta_8 DPR_t + \beta_9 PCG_t + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (7)$$

Where;

SUI_t = Quantity of total sugar import in time't' (tons)
RGP_t = Annual real GDP of Nigeria at current purchaser price (₦)
EXC_t = Nominal exchange rate of Naira for Dollar
ACU_t = Annual agro- industrial capacity Utilization as a proxy of Domestic Utilization (%)
EXR_t = Annual volume of external reserve/GDP as enhancement of importation (₦)
POLt = Political stability Dummy (1 during democratic era and 0 during military period)
DPSt = Domestic price of sugar (₦/ton)
RWSt = Real world price of sugar (₦)
DPRt = Domestic production or output of sugar (ton)

PCGt = Per capita GDP as a proxy of household demand in Nigeria (₦/Person)
U_t = Stochastic error term and $U_t \sim$ IID (0, δ^2_U). β's are long run import elasticity.
To validate the existence of the long run stable relationship in the sugar import function in Nigeria, the study applied the Engle and Granger two-step technique and Johansen co-integration tests. Following the Granger Representation Theorem, the Error Correction Model (ECM) for the co-integrating series in the study was specified. This model represents the short run import function for sugar in Nigeria. The general specification of the error correction Model specified for the sugar import in Nigeria is explicitly shown below:

$$\Delta \text{LnSUI}_t = \varphi_0 + \varphi_1 \sum_{i=1}^{n} \Delta LnSUI_{t-1} + \varphi_2 \sum_{i=1}^{n} \Delta \text{LnX's}_{t-i} + \varphi_3 ECM_{t-1} + U_t \quad \ldots (8)$$

Variables are as defined previously in equation 7; and coefficients ($\boldsymbol{\varphi_3}$) of the ECM_t ($-1 < \boldsymbol{\beta_3} < 0$) measures the deviation from the long-run equilibrium in period ($_{t-1}$).

5.3. Augmented Dickey-Fuller (ADF) – GLS Test

Stationary of time series is needed to avoid the incidence of spurious regression. It is therefore necessary to convert non- stationary series to stationary status in order to obtain reliable regression estimates. In estimating an Error Correction Model, this study applies the Augmented Dickey- Fuller (ADF) - GLS test to examine the stationary characteristics of the series. As suggested by Dickey and Fuller (1981) equation (9) is used to test the stationary of specified variables.

$$\Delta y_t = \mu_t + \alpha_2 y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta y_{t-i} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Where 'y' represents the variables to be tested, Δ represents the first difference operator; *t* is the time drift; *k* represents the number of lags used and ε is the error term, which is assumed to be normally and identically distributed with constant means and variance;' α and δ are the model bounds. It is a one-sided test whose null hypothesis is $\alpha_2 = 0$ versus the alternative $\alpha_2 < 0$. Following the work of Elliott *et al.* (1996) ADF-GLS unit root involves estimating the standard ADF test equation after substituting the Generalized Least Squares detrended y_t^d for the original y_t as shown in equation (10). The test variant offers greater power than the regular ADF test.

$$\Delta y_t^d = \alpha_2 y_t^d + \sum_{i=1}^{k} \beta\, y_{t-1}^d + V_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

6. Results and Discussion

The descriptive statistics of variables used in the study is shown in Table 1. The result revealed high degree of volatility among specified variables. Variability was high in domestic price of sugar, per capita income and real gross domestic product. Also the finding shows that, variability was low in domestic production of sugar and capacity utilization in agro based industries in Nigeria.

Table-1. Summary Statistics, of Variables Used in the Analysis

Variable	Mean	Median	Min.	Max.	Std. Dev.	C.V.	Skewness	Ex. kurtosis
SUI	4.05e+5	3.99e+5	32395	1.09e+6	2.52e+5	0.6233	0.4934	-0.2005
RWS	14748	2504.2	133.97	80950	22418	1.5201	1.5624	1.2607
PCG	2.70e+5	2698.1	69.257	4.99e+6	8.75e+5	3.2369	3.9899	16.439
DPR	38176	36500	13000	69000	11816	0.3095	0.4326	-0.0182
POL	0.4600	0.000	0.000	1.000	0.5035	1.0945	0.1605	-1.9742
ACU	51.133	52.950	18.300	84.200	17.6220	0.3446	-0.1435	-1.0365
EXC	46.394	7.7147	0.5464	158.55	61.1560	1.3182	0.8392	-1.1138
RGP	4.54e+13	1.18e+13	4.64e+12	6.11e+14	1.13e+14	2.4944	3.6208	12.761
DPS	42036	790.94	137.27	1.47e+6	2.09e+5	4.9613	6.6197	42.775
EXR	0.08912	0.0499	0.0061	0.3119	0.0859	0.9644	1.1810	0.1621

Source: Computed by authors. Variables are as defined in equation 7.

6.1. Unit Root Test of Variables Used in the Analysis

The stationary of specified variables in the study was tested with the standard Augmented Dickey–Fuller GLS unit root test. Test statistics for each variable in level and first difference involving trend and without trend ADF-GLS equations were estimated and presented in Table 2. The ADF-GLS test result reveals that, at level all specified variables were non stationary, but were stationary at first differences.

The critical value was kept at 1% significant level to ensure the best result. The result of the ADF-GLS unit root test implies that, the analysis of the specified variables at their levels could result in spurious regression estimates and hence unreliable policy variables. This therefor implied that, specified variables should be tested for the presence of co-integration and Error Correction mechanism (Johansen, 1988; Johansen and Juselius, 1990).

6.2. Result of Trend Analysis of Sugar Import Demand in Nigeria (1965 – 2014)

Estimates of the exponential trend equation for sugar import are presented in Table 3. The result revealed that, sugar import in Nigeria has a positive significant relationship with time. This implies that, sugar import increases as time increase. An average exponential growth rate of about 3.49% was obtained in sugar import from 1965 to 2014 in Nigeria. This means that, sugar import demand has continuously witnessed upsurge over the years under consideration.

Table-2. Result of the Unit Root test for Variables Used in the Analysis

Variable		ADF-GLS Unit Root Test						
		With Constant			With Constant and Trend			
	Lag	Level	1st Diff.	OT	Lag	Level	1st Diff.	OT
SUI	0	-1.3175	-8.2110***	1(1)	0	-1.9851	-8.8653***	1(1)
RWS	0	0.3837	-5.3772***	1(1)	0	-1.9164	-5.7131***	1(1)
PCG	0	1.6244	-8.2292***	1(1)	0	-2.6281	-7.3762***	1(1)
DPR	0	-2.2052	-8.7119***	1(1)	0	-3.0985	-11.628***	1(1)
ACU	0	-2.6854	-8.6332***	1(1)	0	-2.9312	-8.7636***	1(1)
EXC	0	0.9061	-5.3757***	1(1)	0	-1.3142	-5.5727***	1(1)
RGP	0	-0.1369	-7.7672***	1(1)	0	-0.2453	-7.4163***	1(1)
DPS	0	2.3826	-6.5094***	1(1)	0	-0.9048	-6.0099***	1(1)
EXR	0	-2.6208	-6.2957***	1(1)	0	-2.6909	-6.4782***	1(1)
CV at 1%			-3.77			-3.77	-3.77	
	Test of Residuals from the long run estimates							
CV at 1%	0	-3.898***	–	1(0)		-4.254***	–	1(0)

Note: OT means order of integration. Critical value (CV) is defined at 1% significant level and asterisks *** represents 1% significance level. Variables are expressed in logarithm and are as defined previously in equation 7.

Table-3. Exponential Trend Analysis of Sugar Import in Nigeria

Variable	Coefficient	Standard Error	t-value
Constant	11.7473	0.1967	59.71***
Time	0.0349	0.0067	5.208***
F- cal.	27.121***		
R-square	0.361		
Exp. GR (%)	3.49%		
Quadratic trend Equation estimates			
Constant	10.518	0.1948	52.98***
Time	0.1768	0.0176	10.03***
Time Square	-0.0028	0.00034	-8.299***
F- cal.	67.177***		
R-square	0.7408		

Note: Values in bracket represent t-values. The asterisk *** represents 1% significance level.

Coefficient of the square time in the quadratic trend equation indicates that, there is a significant negative relationship between sugar import and square of time in Nigeria. The result showed marginal decrease in sugar import over doubled increase in time. Decline in sugar import over increase time implies that, government policies on increase domestic production of refined sugar has gained momentum over increase time. This result revealed the marginal efficacy of the long term policies in the sugar sub sector in Nigeria. Alternatively, the result means that, the various fiscal, monetary as well as trade policies in addition to incentives implemented by various government regimes in the country to reduce sugar import and intensify domestic production as well as promote backward integration of the sub sector marginally and adversely affected sugar imports in the long run.

To further validate the trend behaviour of sugar import in Nigeria, Figure 1 shows the linear trend graphs of tonnage of total sugar imported in the country. Sugar import demand in Nigeria was insignificant in the 1960s and early 1970s as depicted by a low undulated trend line in this period. In this period, it is noticed that smuggling was very minimal and the policy of Import substitute were vigorously pursuit by the federal government. Following this policy thrust, two integrate sugar refineries (Bacita and Savanna) were established during this period. Also in his period, domestic and industrial utilization were minimal in the country. Interest of government then was focused on domestic production through government interventions.

The period 1975 to 1985 marked an era of oil boom and the corresponding Dutch disease as sugar import also witnessed remarkable increase during this period in Nigeria. The country external reserve escalated and there were incentives for importation. The per capita income of Nigerian increase remarkably. Preferences for imported food items during this era increase among Nigerian. During the early period of this era, tariffs on sugar were favorable. Following favorable environment for importation, the country witnessed large tonnage of sugar import as depicted by upward movement in the trend in this period. During this period, the import substitution policy in the sugar sub sector was not sustainable because domestic production was far below industrial and household demands. This forced sugar based industries to import sugar in order to sustain production. Towards the end of this period, the country witnessed increase volatility in macroeconomic variables, which resulted in the draining of her foreign reserve. In 1985, the country foreign reserves could not supports importation. Smuggling was predominant during this era.

In the period 1986-1990, sugar import assumes a low and declining trend on average. Many analysts attributed the occurrence of this trend to restrictive trade policies on sugar. This policy direction was intended to stimulate domestic production through private initiatives and competitive market structure. The introduction of the Structural Adjustment Program (SAP) in 1986 reinforced the already restricted policies on sugar import in Nigeria.

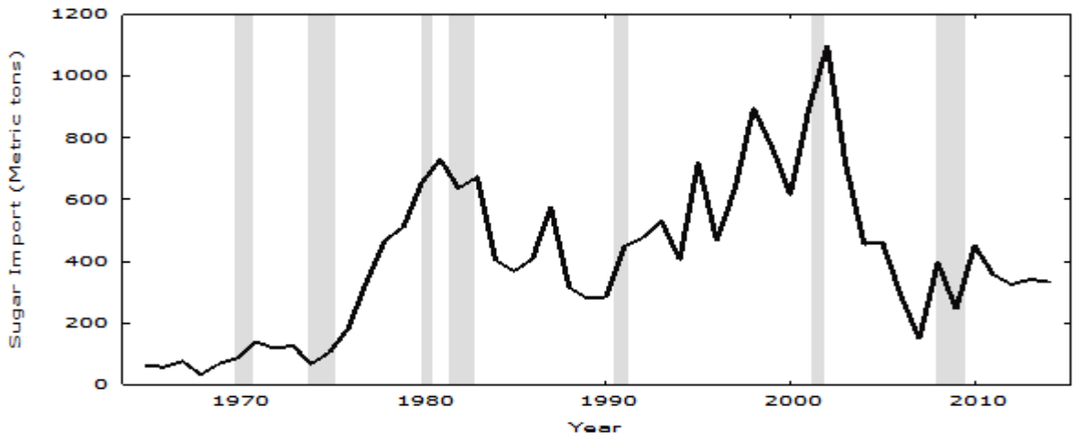

Figure-1. Trend in Sugar Import in Nigeria (1965-2014)
Source: Data from FAO, CBN and World Bank. Plot was done by authors using gretl software.

Despite the stringent policies on sugar trade, significant quantity of sugar imports was still found in the Nigeria's markets. Again, economists linked this scenario to the porous nature of the nation borders and issues on corruption (Akande, 2003). Also, during this period, the nation witnessed the highest level of macroeconomic volatility and continuous draining of the external reserves. During the early period of this era, importation was economically disabled, while domestic production shrink and this encourages massive smuggling through the boarders. Towards the end of the period, (i.e. 1990), restrictions on sugar import were lessen and this encourages gradual inflow of sugar imports.

The period 1991 to 2002 saw a massive renaissance in sugar importation with lesser restrictions and more favorable tariff regimes. Sugar import trended upward during this period. In this era, the country economy was liberalized and some restrictions on sugar importation were lifted. Several institution and fiscal policies were put in place to promote domestic production. Despite these programmes and policies, sugar import continues to grow upward. In 2002, privatization of major sugar companies begun in Nigeria. The rehabilitation of the privatized industries was delayed and this hindered domestic production. From 2003 to 2014, the country witnessed massive importation of semi processed sugar from Brazil. Tariff incentives and outright ban on cubed sugar encourage production of refined sugar from imported semi processed brown sugar. This policy direction drastically lowered importation of refined sugar in Nigeria during this period. As revealed in the graph, the trend exhibited average downward fluctuation in the period 2003 to 2014. In summary, it is observed that, trend in the sugar import in Nigeria has been consistence with the various trades, fiscal and institutional policy regimes in the country. The trend assumes undulated pattern with troughs and crests responding to several policies, economic and political environments in the country.

6.3. Co-Integration Test for Sugar Import Function in Nigeria

The study applied the Engle and Granger two-step technique and Johansen cointegration approach to examine the co-integration relationship among specified variables. The result of the Engle and Granger two-step technique of cointegration test is presented in the lower portion of Table 2. The results showed that at 1% significance level of critical value, the Engle–Granger cointegration tests rejected the null hypothesis of no cointegration. Hence, there exists a long run equilibrium relationship between the sugar import and selected macroeconomic variables in Nigeria. The results showed that at 1% probability level of significance, the Augmented Dicker-Fuller –GLS (ADF-GLS) test for the residuals at level is greater than the critical value at 1% probability value.

Table-4. Unrestricted Johansen Cointegration Test Results

Hypotheses (Null)	Hypotheses (Alternative)	Eigenvalue	Trace Statistic	0.05 Critical Value	Max-Eigen Statistic	0.05 Critical Value
r = 0	r ≥ 1	0.9940	493.926	197.371***	245.929	58.434***
r ≤ 1	r ≥ 2	0.7862	247.996	159.529***	74.047	52.363***
r ≤ 2	r ≥ 3	0.7121	173.949	125.615***	59.769	46.231**
r ≤ 3	r ≥ 4	0.6009	114.179	95.754***	44.091	40.078**
r ≤ 4	r ≥ 5	0.4729	70.089	69.819**	30.736	33.877
r ≤ 5	r ≥ 6	0.3397	39.353	47.856	19.922	27.584
r ≤ 6	r ≥ 7	0.1834	19.431	29.797	9.722	21.132
r ≤ 7	r ≥ 8	0.1458	9.708	15.495	7.566	14.265
r ≤ 8	r ≥ 9	0.0436	2.142	3.841	2.142	3.841

Note: Trace test indicates 12 co-integrating equations at 5% significant level. * denotes rejection of the null hypothesis at 0.05 level. ** MacKinnon *et al.* (1999) p-values.

For the Johansen co-integration approach, the tabulated trace and maximum eigenvalue test statistics were significant at various rank levels. The result as presented in Table 4 revealed that the calculated trace test and maximum eigenvalue test statistics are greater than the critical values at various conventional probability levels. This result confirms the presence of cointegration between sugar import and some determinants of sugar imports in Nigeria. Following the presence of cointegration in the sugar import demand function in Nigeria, the long run sugar import demand function was estimated and presented in Table 5. The estimated coefficients represent the long run sugar import demand elasticity with respect to each specify macroeconomic variable.

Table-5. Long run Sugar import demand estimates in Nigeria

Variables	coefficient	Standard Error	t-test
Constant	24.8668	6.7075	3.707***
PCG	0.75688	0.1646	4.598***
DPR	0.71040	0.2370	2.997**
ACU	− 0.6590	0.2566	− 2.568**
EXC	− 0.4968	0.1957	− 2.538**
RGP	− 0.7092	0.2483	− 2.856***
DPS	− 0.2862	0.1139	− 2.511**
POL	0.3058	0.1794	1.704*
RWS	0.1131	0.2079	0.544
EXR	− 0.0388	0.1101	− 0.353
Diagnostic Tests			
R- Square	0.7678		
F-Cal.	14.6966***		
LM(1)	9.9589***		
Normality Test	1.3789		
RESET test	11.6172***		
DWatson	1.1719		

Note: Variables are expressed in logarithm

6.4. Stability of the Long Run Sugar Demand Function in Nigeria

Testing the stability of the long run sugar import demand function is very important especially when formulating policies to promote trade and domestic production. In testing the model stability, it is observed whether the estimated sugar import demand function remain stable within a certain probability over the specified period of time. The study used CUSUM tests and Recursive coefficients to check the sugar import demand function. The CUSUM test is based on the cumulative sum of the recursive residuals.

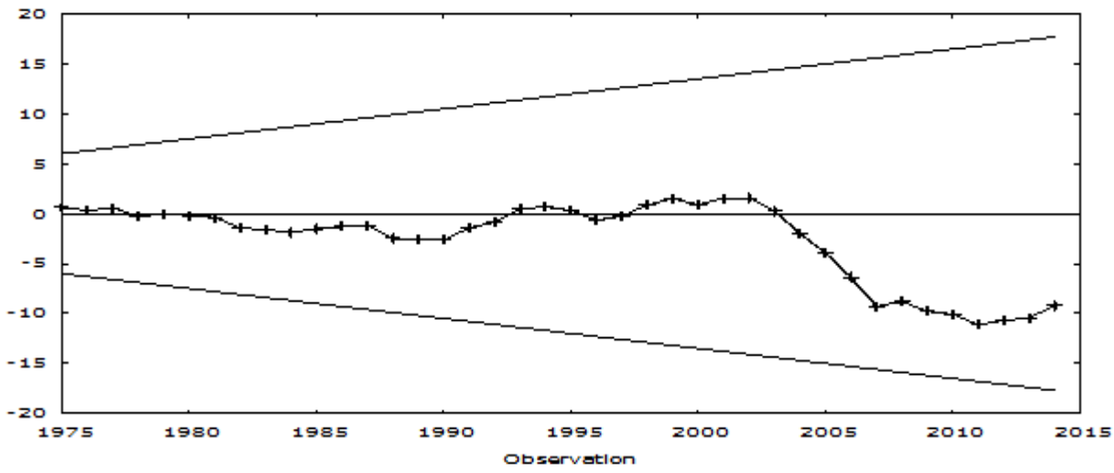

Figure-2. CUSUM plot with 95% confidence band

Source: Product of analysis using E-view software.

Figure 2 shows that, the long run sugar import demand function is stable during the sample period specified because the cumulative sum revolves between the two critical lines. The result of the stability test shows that all estimated coefficients of the explanatory variables revolve within the two critical bands, so all coefficients estimated in sugar import demand function are stable in the long run.

6.5. Generating Optimal Lag- Length for the Co-Integrating Variables

Appropriate lag length for the co-integrating series is needed to generate the error correction model (ECM) for the co-integrating variables. The Akaike criterion (AIC), Schwarz Bayesian criterion (BIC) and Hannan- Quinn criterion (HQC) tests were employed to determine the appropriate lag length. The test result as shown in Table 6 indicates that the optimum lag length appropriate for generating the ECM is at lag 1.

Table-6. Determination of Optimum Lag length

Lag	Loglike	P(LR)	AIC	BIC	HQC
1	-10.101	—	0.938*	1.379*	1.102*
2	-9.743	0.398	0.966	1.448	1.146
3	-9.009	0.226	0.978	1.500	1.173
4	-8.902	0.643	1.018	1.579	1.227
5	-8.320	0.281	1.036	1.639	1.261

The asterisks below indicate the best (that is, minimized) values of the respective information criteria, AIC = Akaike criterion, BIC = Schwarz Bayesian criterion and HQC = Hannan-Quinn criterion.

6.6. Error Correction Model for Sugar Import in Nigeria

The primary reason for estimating the ECM model was to capture the dynamics in the sugar import and identify the speed of adjustment as a response to departure from the long-run equilibrium.

Table-7. Short run Demand Function of Sugar Import in Nigeria

Variables	coefficient	Standard Error	t-value
Constant	0.0829	0.1056	0.785
Δln SUI_{t-1}	-0.0935	0.1194	-0.783
ΔlnRWSt	0.0129	0.1614	0.080
ΔlnPCGt	0.1191	0.3749	0.318
ΔlnDPRt	-0.0737	0.2461	-0.299
ΔlnACUt	-0.3090	0.2124	-1.455
ΔlnEXCt	0.0813	0.1577	0.516
ΔlnRGPt	-0.1679	0.3721	-0.451
ΔlnDPSt	-0.2177	0.0818	-2.662**
ΔlnEXRt	-0.1894	0.0638	-2.969***
POLt	-0.0619	0.1084	-0.571
ECM_{t-1}	-0.3326	0.1410	-2.359**
Diagnostic Tests			
R- Square	0.3588	F-cal	5.5342***
Loglik.	-13.8607	Normality test	3.8295
DW test	1.8397	RESET Test	0.5397

Note: Variables are expressed in logarithm

The study adopted Hendry (1986) approach in which an over parameterized model is initially estimated and then gradually reduced by eliminating insignificant lagged variables until appropriate model is obtained. The result of the exercise is presented in Tables 7. The slope coefficient of the error correction term is negative and statistically significant at 5% significant level. The result validates the existence of a stable long-run symmetric equilibrium relationship in the specified sugar import demand function in Nigeria, and also indicates that sugar import is sensitive to the departure from its equilibrium value in the previous periods. The slope coefficient of the error correction term (-0.3326) represents the speed of adjustment and also is consistent with the hypothesis of convergence towards the long-run equilibrium once the equilibrium status of sugar import demand is disturbed. The stronger the negative value of the ECM, the shorter the period it takes sugar import demand to adjust to equilibrium position amidst specified explanatory variables in the long run and vice versa.

The diagnostic test for the ECM model revealed R^2 value of 0.3588. The Durbin-Watson value for the sugar import demand equation indicates significant effect of serial correlation. The ECM model has been shown to be robust against residual autocorrelation. Therefore, the presence of autocorrelation does not affect the estimates (Laurenceson and Chai, 2003).

6.7. Stability of the Short Run Sugar Demand Function in Nigeria

The test result revealed that all estimates of the short run model are stable at 5% probability level within the period under consideration. The CUSUM test is based on the cumulative sum of the recursive residuals. Figure 3 show that the long run sugar import demand function is stable during the sample period specified because the cumulative sum revolves between the two critical lines.

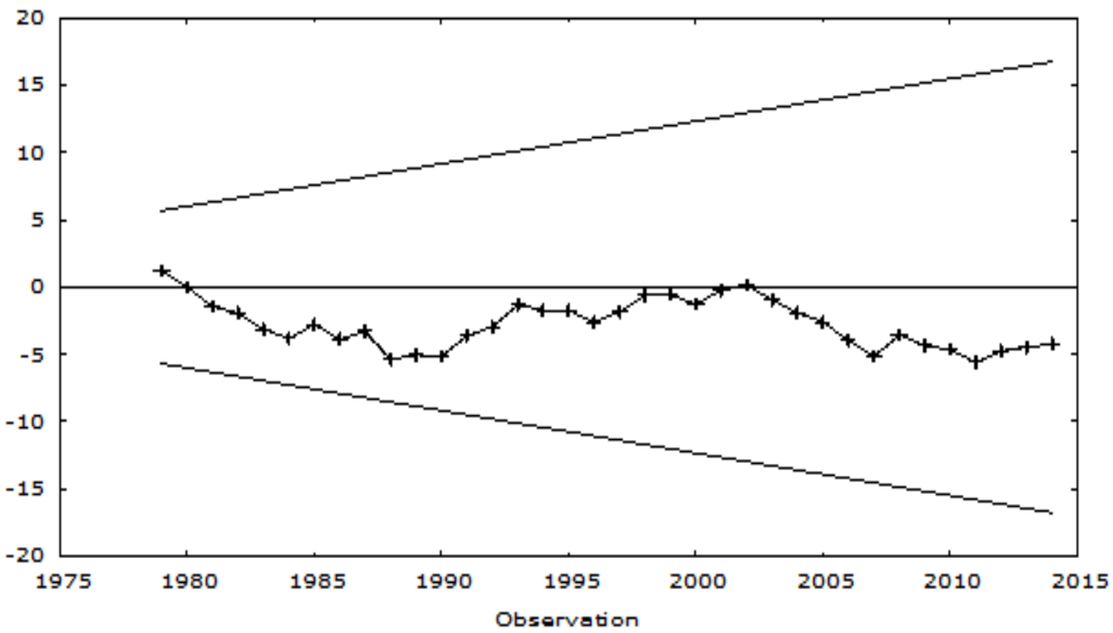

Figure-3. CUSUM plot with 95% confidence band

Source: Product of analysis using E-view software.

The CUSUM of Squares Test indicates that residual variance is stable over the sample period because cumulative sum of squares line does not go outside the 5% critical lines. The result of the stability tests show that all estimated coefficients of the explanatory variables revolve within the two critical bands, so all coefficients estimated in sugar imports demand function are stable in the short and long runs.

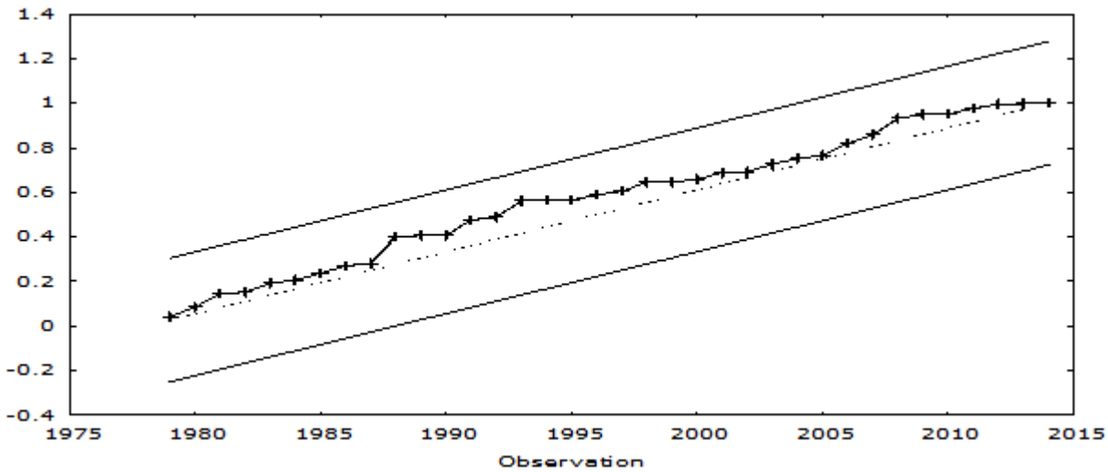

Figure-4. CUSUMSQ plot with 95% confidence band

Source: Product of analysis using E-view software.

6.8. Discussion of the Long Run Elasticity of Sugar Import Demand Function in Nigeria

The Long run model results revealed that, sugar import has a significant negative and inelastic relationship with respect to the agro industrial capacity utilization rate in Nigeria. This means that, 1% change in the agro based capacity utilization rate will lead to less than 1% change in the quantity of sugar imported in Nigeria. This implies that, the rate at which agro based capacity utilization rate change is greater than the rate at sugar import demand changes in Nigeria. The result also indicates that, the volume of sugar import has a negative causal relationship with the agro based capacity utilization rate in Nigeria. This result is contrary to a priory expectation. However, the finding could suggest that, some agro based industries have backward integration policy with some sugar firms in the country. Also, issues related to increase smuggling of sugar through the country porous border could cause this relationship. In another perspective, it could be the inefficiency of the agro based firm or increase in the used of sugar substitute in their production processes or even the case of diversification in production.

Similarly, the quantity of sugar import exhibited inverse and inelastic relationship with the nominal exchange rate in the long run in the country. Explicitly, 1 unit change in the nominal exchange rate will result at less than I unit change in sugar import demand in Nigeria. This means that, as the exchange rate (₦/$) decreases, it becomes cheaper to import sugar and vice versa. As the value of Naira appreciates, it strangles the availability of foreign exchange resulting in the reduction of the quantity of sugar import. It is also noted, that within the period under consideration several exchange rate policies were implemented to reduce sugar import and give buffer to the domestic economy. This result is in line with the findings of Safoulanitou and Mathias (2007); Ogundele (2007) and Fatukasi and Bernard (2010).

In a similar manner, sugar import showed significant negative and inelastic relationship with the country's real GDP. This means that, 1% change in the country's GDP will result to a less than 1% change in sugar import demand in Nigeria. This result suggests the prevalence of high rate of sugar smuggling along the country's international borders. This is because, the country has enunciated several tight trade; fiscal and monetary policies to check excessive sugar import; but it seems these measures were not very effective or implemented adequately. The negative relationship between these variables could also be explained by the fact that, Nigeria's government has invested heavily on the development of the domestic sugar sector and issues related to corruptions. Several institutional frameworks, programmes and policies have been enunciated and implemented to upsurge domestic sugar production in the country. Hence, as GDP increases, more domestic investments are initiated to reduce capital flight which certainly has an inverse impact on sugar import in the country. This result corroborate he findings of Frank and Maylene (2005) as well as Nassr (2013).

In the same direction, sugar import has an inelastic and negative correlation with the domestic price of sugar in Nigeria. This means that, 10% increase in the domestic price of sugar will lead to less than 10% increase in sugar import. This means that a change in domestic price of sugar is greater than a change in sugar import. This result could be substantiated by the fact that, the domestic price of sugar is not competitive relative to international price of sugar in Nigeria. This is because currently the domestic production constitute less than 5% of the total sugar consume in Nigeria. The quality of domestic sugar production and the preference as well as the utility of consumers could also help to explain this relationship. For instance, if consumers prefer imported sugar to domestic sugar, irrespective of price change in the domestic sugar, the demand for imported sugar will increase. This result agrees with the finding of Frank and Maylene (2005).

On the other hand, sugar import has a positive and inelastic correlation with the political environment (i.e. the civilian regimes in Nigeria) in the long run in Nigeria. This means that, variation in the political environment in the country is more compared to changes in sugar import demand in the long run. The causation relationship shows that, periods of civilian rules promoted sugar import in Nigeria. This could be due to the porosity of most trade and tariff policies in this era. The issue of corruption among government officials played a very important role in this relationship. Lançon and Hélène (2007) have reported similar result earlier.

The coefficient of per capita income in the long run model shows significant positive and inelastic relationship with the volume of sugar import in Nigeria. It means that, a percentage change in sugar import is less than equivalent change in per capita income. The causation relationship satisfies *a priori* expectation, as increase in the per capita income will likely increase incentives for consumers to either buy more or go for more superior quality of sugar in the market. Alternatively, increase in per capita income will likely increase effective demand for sugar in the country. Where domestic supply falls short of demand, the economy will be force to import in order to fill the supply

gap in the country. Continuous increase in per capita income can even encourage smuggling in a situation of restrictive trade policies or quantitative restriction as well as outright ban in the country. The finding is in consonance with Ogundele (2007) result.

The result also revealed that, the sugar import has significant positive inelastic association with the domestic production of sugar in Nigeria. This means that, sugar import demand expanded less than proportionate increase in the domestic production of sugar in the country. The insignificant proportion of the domestic production in the total quantity consume in the country could be responsible for this result. It also reveals that, the domestic sugar industry is not competitive relative to the internal market. Reasons for this result could also be linked to the low installed capacity and obsolete technology in the country's sugar refineries. The low productivity of sugar cane and low technical know-how in the industry are worth mentioning. Issues such as policy insincerity in the part of government and corruption contributed to this relationship in Nigeria. Safoulanitou and Mathias (2007) have reported similar result elsewhere.

6.9. The Short Run Elasticity of Sugar Import Demand Function in Nigeria

The short run elasticity of sugar import demand showed the responsiveness of sugar import demand to changes in factors that affect it. In this regards, the sugar import demand has an inelastic and negative relationship with the domestic price of sugar in the short run. This connotes that, 1% increase in the domestic price of sugar will result to less than 1% increase in sugar import demand in the short run in Nigeria. The causation relationship revealed negative significant association between sugar import demand and domestic price of sugar. This means that, as domestic price of sugar increases, demand for imported sugar decrease in Nigeria. This implies that domestic sugar and exotic sugar are substitute goods. Similar relationship has been reported by Frank and Maylene (2005) as well as Nassr (2013).

Similarly, inelastic and adverse relationship exists between the sugar import demand and the external reserves in the short run. This implies that 10% increase in the country external reserve will result in less than 10% increase in quantity of sugar import in the short run. The several ad hoc trade and monetary policies enunciated by the federal government to reduce sugar import and boost domestic production could help to explain this finding. Following these policies, increase in the country's external reserve did not have strong positive relationship with sugar import in Nigeria. This result also connotes that, large proportion of imported sugar in the country's economy enter through illegal ways. If all imported sugar should pass through the legal ways, it will definitely be determine positively by the external reserve. The result coincided with the finding of Fatukasi and Bernard (2010).

7. Conclusion and Recommendations

Sugar import is a reoccurring phenomenon in Nigeria. Nigeria has form several policies and programmes to boost domestic sugar production. Despite these several attempts by the government of Nigeria, sugar import has continuously trended upward in recent years. The study has been able to identify the role of political and economic environments on sugar import demand in Nigeria. The study revealed an exponential growth rate of about 3.49% from 1965 to 2014. The coefficient of time in the quadratic trend equation was negative which connotes that, over increase time the policy trust on domestic sugar production paid up marginally in the country. The long run import demand function of sugar had a negative significant inelastic relationship with agro based industrial capacity utilization rate, nominal exchange rate, real gross domestic product and domestic price of sugar. The long run sugar import demand also reacted positively to period of civilian rule, per capita income and domestic production of sugar. The study discovered symmetric adjustment coefficient of 33.26% per annum in sugar import demand in the country. In the short run, sugar import had a significant negative and inelastic relationship with the domestic price of sugar and external reserves of Nigeria.

Based on the findings, the following recommendations are proposed;

- The federal government as a matter of urgent policy should designed programmes and incentives to boost industrial capacity utilization in the sugar industry in the country. Such policy should encourage backward integration between industries and sugar firms in the country.
- Market determines nominal exchange rate should be maintained in line with the liberalization policy in the country. In this regards, sugar import demand will be based on equilibrium market determine exchange rate and not at subsidize or intervene rate.
- The country should regulate its foreign reserve policy by setting a threshold, above which excess deposit should be plough back to the domestic economy inform of investments rather than support excessive sugar importation
- Civilian regime in Nigeria should strive to reduce corruption and ensured policy tight from conceptualization to implementation. This will remove some of incentives that encourage sugar import and encourage domestic production.
- Government should also ensure full commercialization of all privatized sugar refineries in the country. This will allow the domestic price of sugar to float on market determined level.
- Government should develop the economy and maintained increase GDP and should endeavor to invest on the agro sector such as sugar industry in order to boost domestic production.

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