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Growth Rate Analysis for Domestic Production and Import of Beer of Barley in Nigeria

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ABSTRACT

Nigeria is Africa's largest beer consuming country and beer of barley is a major ingredient in the beer production process. Beer of barley is imported and also produced in Nigeria, however domestic production is important because of the multiplier effect in terms of job creation, industrialization and overall market opportunities the beer market holds in Nigeria. It is therefore of utmost importance to measure the growth in domestic production vis-à-vis import, in order to identify which policy regimes augur well for increasing domestic production. The structural adjustment programme (SAP) is used as basis for comparing policy regimes, the study is therefore delineated into Pre-SAP (1961-1985), SAP (1986-1998) and Post-SAP era (1999-2014). Semi-log model is used to measure growth rates, quadratic- log model is used to determine growth pattern and time (years) taken to double production and import is also determined. The findings show that post-SAP era was the most favourable period for domestic production of beer of barley and domestic production was twice ahead of import. Post-SAP policies in particular import ban on bottled or canned beer coupled with a stable democratic and political environment might have accounted for the favourable domestic production of beer of barley for the post-SAP period, hence these policy environment should be strengthened and sustained.

***Keywords*:** Beer of Barley, Doubling time, Growth rate, import, Nigeria, Production, Structural Adjustment Programme (SAP)

Introduction

Barley *(Hordeum vulgare* L.*)* is ranked fourth as the most important cereal crop in the world only surpassed by wheat, rice and corn (Whole Grains Council, 2018). More importantly, majority of Barley cultivated is destined for beer production and the Beer market on the African Continent is predicted to grow at a faster rate over the next five years (2015-2020) at an average growth rate of 5% compared to other continents due to a rising middle class, Population and urbanization (Arthur, 2016). This growth is clearly visible by the increasing number of international beer companies expanding and consolidation in Africa and nowhere is the growth in beer market more visible than in Nigeria, considering her large population, which is expected to become the world's third most populated with a working age population set to outnumber India and China by 2050 (Associated Press, 2017).

According to Taiwo (2017), Nigeria is the highest beer consuming country on the African Continent, with annual beer consumption, averaging 12.28 litres at present production capacity of 17.72 million hl/a produced from eight breweries mostly located in the Southern region of Nigeria. Beer consumption is further heightened by the preponderance of local bars in the nook and crannies of major cities mostly in Southern Nigeria. This growth in consumption has implications across the beer value chain by offering opportunities for barley farmers, input suppliers, beer processors, logistics and haulage providers, wholesalers and retailers to take advantage. It is therefore of utmost importance that growth in production of beer of barley in Nigeria; (hereafter referred to as BoB), which is the major product derived from processing barley for beer production also experiences increasing output, so as to take advantage of increases in beer consumption in Nigeria.

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To this end, the general purpose of this study is to assess the growth rates in domestic production and import of BoB in Nigeria. The rationale of the study is to compare the growth rates between domestic production of BoB and imported BoB. According to Uma *et al.,* (2014), Nigeria being an enormous food importing country implies that Nigeria is lagging behind in food production. Hence, importing BoB into Nigeria may also imply that the country is not self-sufficient in the production of BoB, hence have to rely on imports to augment for the shortfall in domestic production. Thus, by comparing growth rates between domestic production and imports, the study aims to identify where growth is more pronounced and recommend appropriate policies in view of the market potentials of beer in Nigeria. To our knowledge, this is the first time a study of this nature will be carried out as such; this study fills a gap in our understanding of the Nigerian beer market in the context of BoB production and import.

According to Udom (2006), growth rates in food production do not just occur, but are often driven by policy measures aimed at enhancing or sustaining production overtime. Therefore, studies aimed at measuring food production growth rates in Nigeria are often delineated into periods reflecting policy regimes. More often than not, Structural Adjustment Programmes (here after referred to as SAP) is used as basis for delineation.

This gives rise to pre-SAP, SAP and post-SAP policy regimes, in general the pre-SAP era focused on direct government involvement in agriculture through the use of marketing boards that were solely in charge of setting producer prices as such provided ready markets for farmers. This period also witnessed the establishment of the World Bank assisted agricultural development programmes (ADPs) that largely involved distribution of inputs such as fertilizers etc., extension services, provision of rural infrastructure such as potable water, small-scale irrigation systems, construction of rural feeder roads and seeds distribution as well as imposing import restrictions. Agricultural credit policies were also initiated during the pre-SAP period through the establishment of Nigerian Agricultural and Cooperative Bank, Agricultural Credit Guarantee Schemes and Rural Banking (Ileso, 2000). Other notable pre-SAP policy initiatives was the launch of operation feed the nation (OFN) and Green revolution that were specifically designed to increase domestic food production.

The SAP era's central focus was the disbandment of marketing boards which invariably eliminated readily available market for farmers. SAP also emphasized removal of government subsidies on agricultural inputs. Trade liberalization which involved removing or lowering tariff on imports and removal of protectionist measures was vigorously enforced. This period was also politically unstable with three military regimes and an annulled presidential election, which did not encourage both domestic and foreign investment. For the post-SAP era, most of the SAP policies were reversed, in particular import ban policy on major agricultural commodities were re-introduced. For instance, in the present study, import of canned or bottled beer for trade is banned. In addition, pre-SAP policies in which government was directly involved in input supply, credit and rural infrastructural development was implemented in line with the agricultural transformation agenda which focused on enhancing agricultural value chains. The post-SAP period also witnessed a smooth democratic process and a stable political environment which ultimately encourages domestic and foreign investments.

Accordingly, Antia-Obong and Bhattarai, (2012) delineated oil palm and groundnut production from 1960-2007 into four periods, namely: 1960-1969, 1970-1985, 1986-1993 and 1994-2007. The rationale for their study was to identify which policy era achieved higher growth rates and hence horn in on that policy era in a bid to draw insights on policy measures that support increasing production. Similar delineation is observed in a study by Antia-Obong *et al.,* (2013) on growth rates of oil palm import and export quantities. Oyakhilomen *et al.,* (2012) in their study on growth of maize production in Nigeria, delineated pre-SAP era to cover 1970-1985, SAP era from 1986-1994 and post-SAP era from 1995-2007. Furthermore, Ojiako and Olayode (2008) in their study on trend analysis of livestock production in Nigeria from 1970-2005, delineated pre-SAP era from 1970-1985, SAP era from 1986-1998 and post-SAP era from 1999-2005. In slightly similar fashion, Ibitoye, *et al,* (2017) in assessing growth rate of cotton in Nigeria from 1960-2014, delineated pre-SAP era from 1960-1985, SAP era from 1986-1998 and post-SAP era from 1999-2014.

The central position drawn from these studies is that policy periods are nuanced and overlapping, hence different studies tend to vary in the range of years dedicated to capture pre-SAP,

SAP and post-SAP. Nevertheless, for each policy era a greater proportion of the years attributed to each policy period are captured. Therefore, for the present study, the policy era outlined by Ibitoye, *et al,* (2017) is employed i.e. pre-SAP era from 1961-1985, SAP era from 1986-1998 and post-SAP era from 1999-2014, these delineated periods provide a wide enough time to take account of any overlapping policy regime.

Accordingly, the specific objectives of this study are as follows:

1. To measure percentage growth rates in BoB production and import quantities.
2. To measure percentage compound growth rates in BoB production and import quantities.
3. To estimate time in years expected to double production and importation of BoB.
4. To determine the pattern of growth (acceleration, deceleration, stagnation) in BoB production and import quantities.

Materials and Methods

Data Source

Secondary data was used for this study and was obtained from FAOSTAT database available at (www.fao.org/faostat/en/#data/RF). The dataset fall under the domain 'crops processed' which contains annual BoB production data in tonnes from 1961-2014, with year 2014, being the most current data year available. In addition, dataset for import of BoB fall under 'crops and livestock products' domain and is also measured in tonnes. FAOSTAT is the official database of the United Nations Food and Agricultural Organization (UN-FAO), housing country and regional food and agricultural data from 1961 to the most recent year. The dataset for this study was delineated into four periods to ease comparison and the periods cover; pre-SAP era (1961-1985), SAP era (1986-1998), post –SAP era (1999-2018) and pooled data covering the entire period (1961-2014). STATA 13.1 statistical software was used for analysis of the dataset.

Modelling Growth Rates

Instantaneous growth rates refer to growth occurring at a point in time. For instance, growth occurring at any given year (a point in time) for a delineated period. The semi-log or log-linear model is generally used for this purpose (Maikasuwa, M.A. and Ala, A.L.;, 2013; Mech, 2017; Onu *et al.,* 2015) and takes the form.

$$InY_t = b_0+b_1T+e \quad \text{----------} \quad (1)$$

Where InY_t = Natural logarithm of BoB production measured in tonnes at period t.

$$InImp_t = b_0+b_1T+e \quad \text{----------} \quad (2)$$

Where $InImp_t$ = Natural logarithm of BoB import quantity measured in tonnes at period t.
b_0 = estimated constant regression line
b_1 = estimated growth coefficient
T = time trends for each period
e = error term
Instantaneous percentage growth rate is obtained as follows:

$$\text{Growth rate} = b_1 * 100 \quad \text{----------} \quad (3)$$

Equation 3, gives the percentage growth rate at a point in time.

Compound Growth rate

To compute compound growth rate, which captures growth occurring overtime in a particular period is expressed as follows:

$$CGR = (\text{antilog } b_1 - 1) * 100 \quad \text{----------} \quad (4)$$

Otherwise expressed as:

$CGR = (e^{b_1} - 1) * 100$ ---------- 5 (Mech, 2017) (Ibitoye *et al.,* 2017)

Where;
CGR = Compound Growth rate
e = Euler's exponential constant, given a value of 2.71828.

Doubling Time

The time in years expected to double production and importation of BoB is given as:

$TDG = 69/r$ ---------- 6 (Maikasuwa and Ala, 2013) (Nmadu, 2009).

Where;
TDG = Time to double growth
r = Compound growth rate as in equation (5).

Estimating patterns of growth

Three patterns of growth, namely; accelaration, deceleration and stagnation, are explored (Oyenweaku, 2004). A quadratic model is fitted for this purpose as follows:

For Production of BoB in tonnes:

$InY_t = b_0+b_1T+ b_2T^2+e$ ---------- 7

For Import quantity of BoB in tonnes:

$InImp_t = b_0+b_1T+ b_2T^2+e$ ---------- 8

For equation (7) and (8), the coeficient of interest is b_2, since the quadratic time variable T^2 enables identification of acceleration, deceleration and stagnation.

Accordingly,

a. Acceleration is observed, when b_2 is positive and statistically significant.
b. Deceleration is observed, when b_2 is negative and statistically significant.
c. Stagnation is observed, when b_2 is either negative or positive but not statistically significant.

Results and Discussion

Growth Rate Analysis

The results from Table 1, show percentage growth rates for both instantaneous (at a point in time) and compound growth rates for production and import of BoB for the periods delineated in this study.

Table 1: Percentage growth rates and compound growth rates

	Production growth rate (%)	Production compound growth rate (%)	Import growth rate (%)	Import compound growth rate (%)
Pre-SAP 1961-1985 (n=25)	14.39*** (0.005)	15.48	0.13 ^{NS} (0.041)	0.13
SAP 1986-1998 (n=13)	-0.01^{NS} (0.007)	-0.01	0.44 ^{NS} (0.052)	0.44
Post-SAP 1999-2014 (n=16)	7.14*** (0.006)	7.40	-25.52*** (0.040)	-22.52
Pooled 1961-2014 (n=54)	7.21*** (0.004)	7.48	-4.03*** (0.012)	-3.95

*** represent P<0.01
^{NS} represent Not Significant
Figures in Parentheses are standard errors

The findings show that for BoB production, Pre-SAP, Post-SAP and pooled data witnessed positive and statistically significant ($p<0.01$) growth rates of 14.39%, 7.14% and 7.21% respectively. As earlier noted, the Pre-SAP and post-SAP era have somewhat similar agricultural production policy frameworks especially the restriction on importation and direct government involvement in supply of subsidised inputs might have contributed to the positive growth rates. However, a look at the SAP era show that growth rate was negative at -0.01%, which is a pointer that policies such as trade liberalization, whereby quantitative restrictions on imports were relaxed as well as de-subsidization policy on agricultural inputs that mostly hurt smallholder farmers did not augur well for production of BoB. Nevertheless, with the pooled data (1961-2014) witnessing positive growth, the decline in production for the SAP era did not overly distort entire production which is a further pointer to the overall increase in production of BoB for the period under review.

In addition, the compound growth rates of 15.48%, 7.40% and 7.48% for the Pre-SAP, post-SAP and pooled data respectively are higher than the instantaneous growth rates for the same periods indicating that overtime production of BoB was on the rise.

Furthermore, the post-SAP era witnessed statistically significant ($p<0.01$) negative growth rate of -25.52% for import of BoB. Considering the positive and statistically significant ($p<0.01$) growth rate of 7.14% in the same period for BoB production, the findings support the earlier notion that increase in domestic production is often associated with a decrease in import. This is further supported by the negative and statistically significant ($p<0.01$) growth rate of -4.03% for the pooled data. i.e. for the entire period, growth rate in import of BoB was decreasing at ($p<0.01$) significant level, while growth in production of BoB was increasing at an equally ($p<0.01$) significant level.

Time in years expected to double production and import of beer of barley

Table 2 presents the time in years that production and import of BoB is expected to double based on current trends. The findings show that the rate of decrease in import of BoB would double in the next 18 years and the rate of increase in production of BoB would double in 9 years.

Table 2: Production and import doubling time for BoB

	Production	Import
Pooled 1961-2014	69/7.48 = 9 years	
Pooled 1961-2014		69/3.95 = 18 years

In other words, based on production trends for the entire period under review, it would take 9 years to double production of BoB i.e. by year 2023, while importation of BoB based on import trends would double in 18 years i.e. by year 2032. The findings imply that production of BoB is 9 years ahead of imports or imports is 9 years behind production; since it will take twice the number of years for import to catch up with production. This finding further show that growth rate in production of BoB is ahead of import of BoB.

Estimating pattern of growth

Three patterns of growth namely: Acceleration, Deceleration and Stagnation are possible. Acceleration refers to growth occurring at a fast rate and is measured when the quadratic coefficient b_2 is positive and statistically significant. Deceleration is growth occurring at a slow rate and is measured when the quadratic coefficient b_2 is negative and statistically significant. While Stagnation is the absence of statistically significant acceleration or deceleration and is measured when the quadratic coefficient b_2 is negative or positive but not statistically significant, in other words, any growth occurring is infinitesimal.

The findings on patterns of growth show that production of BoB in the pre-SAP era experienced stagnation which implies that there was no significant change in growth. However, considering that growth rate was increasing during the Pre-SAP as observed in table 1, the findings underscore the need for an understanding of growth patterns. In this case, a positive growth rate was associated with a stagnated growth pattern.

Pattern of production growth in the SAP era also show stagnation which means that negative growth rate as observed in table 1 was associated with a stagnated growth pattern. However, the pattern of production growth in the post-SAP era experienced acceleration, for this period, the positive growth rate as observed in table 1, was occurring at a fast rate. The pattern of production growth for pooled data show deceleration, in otherwords, positive growth rate associated with the entire period was occurring at a rather slow or sluggish rate.

Table 3: Patterns of Growth

	Production	Import
Pre-SAP 1961-1985 (n=25)	-0.001 ^{NS} (0.001) (Stagnation)	-0.004 ^{NS} (0.007) (Stagnation)
SAP 1986-1998 (n=13)	0.003 ^{NS} (0.002) (Stagnation)	0.041 *** (0.010) (Acceleration)
Post-SAP 1999-2014 (n=16)	0.004 *** (0.001) (Acceleration)	0.009 ^{NS} (0.009) (Stagnation)
Pooled 1961-2014 (n=54)	-0.002 *** (0.000) (Deceleration)	-0.000 ^{NS} (0.001) (Stagnation)

*** represent P<0.01
^{NS} represent Not Significant
Figures in Parentheses are standard errors

Whilst pattern of import growth in the pre-SAP, post-SAP and pooled data experienced stagnation, the SAP era show acceleration, which means that as pattern of production growth was stagnating, import growth pattern for the SAP period was moving at a fast rate. This finding is not surprising and only goes to supports the earlier premise that import moves fast when domestic production slows down or stagnates. The reverse pattern is also observed in the post-SAP era where production growth pattern experienced acceleration and import growth pattern stagnated.

Conclusion and Recommendation

This study was aimed at measuring growth rates and the patterns with which growth occurred for domestic production and import of BoB taking into account three specific policy regimes while also accounting for the entire period from 1961 to 2014. Country wide dataset is used for the study which is a perceived weakness, since it is not possible to measure regional or state-specific production growth rates. Nevertheless, the study found out that SAP era policies might have negatively impacted production of BoB. In particular, trade liberation policy whereby importation of beer was permitted is likely to have made it unattractive for companies to profitably engage in beer production which might have contributed to the decline in domestic beer production as evidenced from the SAP era. In the post-SAP era, bottled or canned beer imported for trade is banned in Nigeria (Amadi and Sunday, 2013), as was the case in the pre-SAP era. It is therefore not surprising that the post-SAP era showed greater promise by way of significantly positive production growth rate and significantly negative import growth rate, this period is also the on set of democracy in Nigeria. Therefore, this situation should be sustained as the effect of the ban is seen in the number of multinational beer companies setting up shop in Nigeria which is good for both direct and indirect job creation as well as strengthening the country's agro-allied industrial base. The pattern of growth also indicate that post-SAP era performed better than other periods as it shows that production was moving at a faster rate while import stagnated. However, for the entire period, production growth pattern was slowing down which is a possible reason why in general BoB was still imported despite production outstripping import.The findings further show that it would take double the number of years for import to catch up with production. Hence, these levels should be sustained or improved upon to further shorten production doubling time and this can be done if beer companies increase current installed production capacity possibly through government waivers to enable importation of modern machineries in the short-term while looking to develop local content in beer machinery manufacturing in the long -term.

Author's Contribution

Antia-Obong, Essien Akpan prepared the manuscript, while Otung, Idorenyin Antigha helped in writing the crop component of the introduction section and also checked for typograhpical errors throughout the manuscript.

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