Balance of Payments Constrained Economic Growth in Nigeria

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Abstract

This paper applies the adjusted balance of payment (BOP) constrained growth framework modified by Thirwall and Hussain (1982) on Nigeria's economic growth to estimate the determinants of the long run rate of growth in Nigeria. With Nigeria adopting the import substitution industrialization policy in 1960, we apply cointegration test on time series data to estimate the long-run relationship between Nigeria's real GDP (output) and its real export. Results signify cointegration between our variables, lending support to Thirwall's BOP constrained model as a suitable framework to explain Nigeria's long term growth and reinforces the opinion that external factors constrain Nigeria's economic growth.

Keywords: Growth, Balance of Payment, GLMM Model, Nigeria
JEL Classification: C21, C22, C23, O11, O41

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1.0 Introduction

This paper assesses the Thirwall's balance of payment (BOP) constrained model by applying it on the Nigerian economy and employing cointegration method to observe the relationship between economic growth and current account balance equilibrium. While extensive research study on economic growth concentrate on the neoclassical supply-oriented approach based on the production function and full employment, Harrod (1939) emphasized that demand generated growth determine long run economic growth and Thirwall developed a Keynesian perspective of the determinants of growth embedded on a dynamic version of the Harrod's foreign trade multiplier. Thirwall pinpoints the incapability of economic agents to increase aggregate demand indefinitely in open economies as justification for income growth differences across nations.

The balance of payment constrained growth model states that a country's economic growth rate is constrained by the desire to generate foreign exchange and reiterate the function of demand as the motivation for domestic growth. This arises because growth in export and investment growth in import substitution are the only aspect of aggregate demand that can increase GDP growth and reduce foreign constraints. This implies that growth rate is constrained by the balance of payment as the economy cannot grow faster than what is consistent with the balance of payment equilibrium.

The principle of this Keynesian demand side growth theory is that export capability and import attitude establish long run economic growth. Income derived from external trade constitute the principal medium to finance growing import due to a rise in domestic activities.
This model differs from the supply induced growth models which evaluate economic growth by using factor inputs such as savings, human and physical capital, population growth and initial per capital GDP on economic growth. Reservations about the traditional growth models stem from the fact that the factor inputs have inconclusive roles in the growth process in developing countries. Also, a lot of the neoclassical assumptions have been observed to be inapplicable in developing or transition economies.

The balance of payment constrained model infers that economic growth is stimulated by demand factors and the main constraint on demand is the balance of payment. Trade has been observed to be an important restraint to economic growth when there are BOP constraints. Thirwall BOPC model is a modified Kaldor's four-equation regional growth model with import incorporated as a balance of payment constraint. The economic growth of a country is said to be balance of payment constrained if the growth rate consistent with a current account equilibrium is below the maximum growth of the economy, often determined by the maximum growth of the supply side factors. The rationale is that Nigeria is an ideal economy where economic growth is constrained by external factors since more than ninety percent of revenue is derived from export of oil, therefore Thirwall's model is a capable medium to test Nigeria's economic growth pattern constrained by unfavorable balance of payments.

1.1 A review of the Nigerian economy

Nigeria's economic growth has been driven by both domestic production and consumption components together with external engagement in goods and services, with the externalengagement component widely accepted as a key determinant of its economic growth and development. Until the advent of petroleum in the late 1950's, the government implemented investment ventures with the assistance of overseas aid, local savings and revenue from agricultural export. Nonetheless, the extent to which the economy could acquire local savings to bankroll investment was restricted and the government was unable to raise adequate foreign exchange because of constant balance of payment issues stemming from dependence on agricultural exports which were uncompetitive in the world market.

Resultantly, there was an unfavorable balance of trade and current account deficits which acted as hindrances on import demand and as obstacles to efficient execution of the country's development plans. Upon exploration and exportation of crude oil in the 1960's, expectation of increased foreign revenue to embark on feasible developmental ventures that will lay a foundation for sustainable growth was rife. From 1971-1978, the economy was financially solvent as savings-GDP ratio ranked between 16.5 and 35 percent and investment-GDP ratio ranked between 16.7 and 25 percent. The spike in crude prices led to substantial foreign exchange earnings and a positive saving/investment-GDP ratio. This facilitated growth in real GDP at an average rate of 8.3 percent from 1971-1978. Despite a surplus in BOP, growth of income per capita was 2.7 percent. This was due to policies implemented which were geared towards public sector expansion at the expense of the private sector as well as a skewed income distribution strategy that was undertaken such as the Udoji awards.

Nigeria's trade strategy during this period encouraged importation, while the current account balance and balance of payment ratio was neglected. With the oil boom turning to the oil doom following shocks in crude oil prices in the 1980's, there was a significant drop in revenue from oil exploration leading to massive recurring balance of payment deficits and unattainable public sector expenditure. Efforts to stem the macroeconomic problem was undertaken culminating in the enactment of demand management policies. These include different measures aimed at stabilization such as tariffs implementation and contractionary fiscal and monetary policies. These policies were aimed at reducing aggregate demand level and attaining BOP equilibrium.

These policies improved the debt-GDP ratio and led to a positive BOP in the mid 80's, but with constraints on local finance and the inability of the private sector to stimulate economic growth and development, per capita income fell despite a BOP surplus. This led to the implementation of the structural Adjustment Program (SAP), an economic remedy suggested by the Bretton Woods institutions with the stated objective of restructuring and diversifying the productive base of the economy, achieve fiscal stability and a positive BOP, set the basis for minimal inflationary growth and reduce the dominance of unproductive investments in the public sector. Instruments to achieve the stated objectives include the straightening of demand management policies, deregulation of the foreign exchange market (FEM), and privatization of the public-sector enterprise and the adoption of appropriate pricing policies for public enterprises. From the late 80's to the mid 90's, investment to GDP ratio was between 11 and 19percent while saving to GDP ratio was between 10 and 25percent. Subsequently, there was a change in the

saving/investment gap-GDP ratio with the ratio switching from negative to positive. This imply low level absorptive capacity in the economy during the SAP era. However, with fluctuations in international trade during this era, deficits were recorded in the current account and capital account likewise the balance of payment accounts. Evidently, the weak performance of economic variables influences the economic growth with a decline in GDP growth rate from 8percent to 3percent between 1990-1993. Fiscal deficit to GDP deficit rose to 12percent between 1994-1995 with growth rate of real GDP growing at less than 5percent from 1994 to 1999. After 1999, with the advent of democracy, privatization and commercialization program has been pursued with emphasis on trade openness. This has led to increase in trade and huge current account deficits. With these precedents, there is a need to analyze the degree to which balance of payments hamper Nigeria from achieving its growth potential.

The purpose of this paper is to test Thirwall balance of payment constrained growth model on Nigerian economy by applying cointegration techniques. 1960 was selected as our initial year because import substitution industrialization has been the hallmark of successive government policies from that year. Thirwall modeled an effective method of assessing growth patterns constrained by economic growth and Nigeria is a prime example of an economy in which external factors constrain growth. His model provides us with an insight into Nigeria's growth structure during this time span as his demand-pull method indicate that increasing returns are an important component of economic growth and development.

2.0 The Balance of Payments Constrained Growth model

Thirwall's balance of payment constrained growth model is based on the notion that no country can grow faster than the rate consistent with its balance of payments equilibrium on current account, unless it can finance ever growing deficit, which in general it cannot. This insinuates limitations to the deficit/GDP ratio and international debt/GDP ratio, beyond which financial markets get nervous. Thirwall BOPC model asserts that long run growth is founded by the dynamic Harrod foreign multiplier, which states that the pace of industrial growth can be explained by the principles of the foreign trade multiplier.

The balance of payments equilibrium growth model can be stated as:

$$P_d X + EF = EP_z M \tag{1}$$

Here, P_d and P_z are the domestic price and foreign price, E is the exchange rate, X and M represents exports and imports, F denotes capital inflows. From eq. (1), the share of export as a ratio of total earnings can be stated as:

$$\phi = {}^{P_d X}/_{P_d X + EF} \tag{2}$$

Also, applying standard demand theory, the traditional export function can be stated as:

$$x = ({}^{P_d}/_{EP_z})^{\phi} Z^{\varepsilon} \tag{3}$$

With θ, Z *and* e as the price elasticity of exports, world income and the income elasticity of demand for exports. The import function can also be stated as:

$$M = \left({}^{EP_z}/_{P_d}\right)^{\tau} Y^{\pi} \tag{4}$$

With τ, Y *and* π as the price elasticity of demand for imports, GDP and income elasticity of demand for imports. Differentiating Eq. (3) and (4):

$$x = \phi(P_d - P_z - e) + \varepsilon z \tag{5}$$

$$m = \tau(P_z + e - P_d) + \pi y \tag{6}$$

$$x + P_d = m + P_z + e \tag{7}$$

Eq. (5) implies that export growth is determined by the rate of change of relative prices and world income while eq. (6) implies import growth is determined by the rate of change of relative prices plus income elasticity of demand for imports. Eq. (7) is the current account equation. Substituting eq. (5) and (6) into eq. (7) and solving for growth:

$$\phi(P_d - P_z - e) + \varepsilon z + P_d = \tau(P_z + e - P_d) + \pi y + P_z + e$$

$$\phi(P_d - P_z - e) + \varepsilon z + P_d - [\tau(P_z + e - P_d)] - -P_z - e = \pi y$$

$$y = {}^{\phi(P_d - P_z - e) + \varepsilon z + P_d - [\tau(P_z + e - P_d)] - -P_z - e}/_{\pi}$$

$$y = {}^{(\phi + 1 + \tau)(P_d - P_z - e) + \varepsilon z}/_{\pi}$$

However, changes in relative prices has minimal effect on growth rates of x and m because (1) Marshall-Lerner condition holds (2) oligopolistic competition (3) national wage bargaining. Thus:

$(\phi + 1 + \tau)(P_d - P_z - e) = 0$ and since growth of z determines growth of x

$$y = {}^{\varepsilon z}/_{\pi} = y = {}^{x}/_{\pi}$$

Equation (13) is known as the balance of payments constrained growth model or Thirwall's law and it asserts that the higher the π , the lower the balance of equilibrium growth rate. This means that a country's economic growth y is determined by its export growth rate in the long run. Using the above framework, our study aims to analyze the relationship between export and growth in Nigeria.

3.0 Empirical Analysis and Findings

Data applied on the empirical analysis are from the period 1960-2012 obtained from theGlobalEconomy.com because of its large span of data on GDP and export in dollars using purchasing power parity. Much of "classical" economic theory is based on the assumption that the observed data is derived from a stationary process, implying a process with constant mean

and variance over time Clements and Henry (1998). However, a peek at most economic time series graph discloses the invalidity of such an assumption since economies evolve, grow and change over time in both real and nominal terms. Still economic forecasts and predictions are better made when the variables are stationary thus necessitating the need for stationarity test. Cointegration is an equilibrium relationship between time series that individually are not in equilibrium, Hendry and Juselius (2000). Cointegration is the foundation upon which statistical arbitrage is built, however cointegration does not say anything about the direction of causality, Johansen (1998). We apply cointegration method because of the inability of least squares regression to disclose the long run relationship between our variables. Our econometrical analysis is undertaken in three stages. First, we employ the Augmented Dickey Fuller test (ADF) to check for stationarity among the variables and then we apply the Johansen cointegration test to establish the order of integration. If an order of integration is verified, this implies the existence of a long run relationship, upholding the premise that Thirwall's law can be applied on Nigeria's annual time series data. Then we apply the vector error correction test to determine the direction of causality of our variables. As earlier stated, we aim to apply cointegration technique to estimate the Thirwall's model. A proportionate number of studies argue that if GDP and exports do cointegrate in the long run, it implies validity of the Thirwall's law. Figure 1 shows the graphical movement of GDP and export from our data:

Figure 1: growth & lexp movement

The plots on the graph suggests that all the series are trending and potentially integrated of order one I(1). From the graph, the log scale shows proportional changes in GDP and exports though the GDP growth path seem to grow more steadily than the export growth path. The effect of oil price decline after the 1979 and 1990 oil crisis can be clearly seen on Nigeria's export after 1980 and 1990. The graphic view does not provide conclusive evidence of cointegration. Cointegration may or may not exist between variables that do or do not look cointegrated and the only way to find out is through a careful statistical analysis, rather than relying only on visual inspection. This process requires different testing of the individual variables and culminates with test on the direction of causality. Noted that a likely outcome of spurious regression results can be attributable to non-stationarity of the data, our first objective is to execute crucial statistical test to verify the stationarity of the variables used in our study with the stated intent of ensuring that the variables are integrated in the order 1(0). It is a stylized fact that most economic time

series data are non stationary at levels, and cointegration can occur at different order. If two series are integrated of different orders, cointegration cannot be achieved thus determining the order of integration is our first act. However, studies have shown that most economic variables are often integrated of order one. The Augmented Dickey-Fuller Unit root test is employed to verify the order of the variables.

The unit root test can be specified as

$$X_1 = \beta_1 + \beta_2 + \delta X_{t-1} + \sum_{i=1}^{n} \Delta X_{t-1} + \varepsilon$$

$$Y_1 = \beta_1 + \beta_2 + \delta Y_{t-1} + \sum_{i=1}^{n} \Delta Y_{t-1} + \varepsilon$$

With β_1 as the constant term, $X and\ Y$ as GDP growth and export growth, $t\ and\ \varepsilon$ as the trend and error term and ΔX_{t-1} & ΔY_{t-1} as lagged values of $X and\ Y$. We analyze the null hypothesis of unit roots against the alternative of no unit roots. If the variables are stationary, we reject the null hypothesis.

Table 1: Augmented Dickey-Fuller Test

```
Augmented Dickey-Fuller test for unit root         Number of obs   =        49

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)              1.033            -3.587            -2.933            -2.601
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9946
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Augmented Dickey-Fuller test for unit root         Number of obs   =        48

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -5.035            -3.594            -2.936            -2.602
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
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Table 2: Augmented Dickey-Fuller Test

Augmented Dickey-Fuller test for unit root Number of obs = 49

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-1.234	-3.587	-2.933	-2.601

MacKinnon approximate p-value for Z(t) = 0.6589

Augmented Dickey-Fuller test for unit root Number of obs = 48

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-4.725	-3.594	-2.936	-2.602

MacKinnon approximate p-value for Z(t) = 0.0001

Table 1 test for the stationarity of GDP growth. The null hypothesis is the presence of unit root. The test statistic of 1.033 lies outside the acceptance critical value region at $1\ percent$, $5\ percent$, and $10\ percent$ respectively hence we reject the null hypothesis of unit root in this variable. The first difference of the variable show a test statistic of -5.035. This lies inside the critical acceptance region signifying no unit root. Table 2 test for unit root in export growth. The null hypothesis is the presence of unit root. The T-statistics of -1.234 also lies outside the acceptance critical value region at $1\ percent$, $5\ percent$, and $10\ percent$ respectively while the first difference of the variable at -4.725 lies inside the critical acceptance region indicating no unit root. From the ADF test, while the null hypothesis (H_0) is accepted at the levels of GDP growth and export growth, the null hypothesis (H_0) is rejected at first difference at $1\ percent$, significance. We can thus infer that the first difference of the series is stationary and integrated of order one.

With this result, we can now investigate the long run relationship between our variables. Next, we estimate the unconstrained VAR model to determine the lag length. The goodness of fit test is performed for residuals, the Lagrange Multiplier test is conducted to test for residual autocorrelation and finally the Jarque-Bera test for normality is performed. All these tests are performed to check for the stability of our model. The cointegration test checks if Nigeria's GDP growth can be assumed to be balance of payment constrained from 1960-2012. The cointegration method based on Johansen's maximum likelihood framework has been observed to be particularly useful in several comparative studies, including Gonzalo (1994) and Elitok and Campbell (2008). Subsequently, we apply the Johansen cointegration test to tests the null and alternative hypothesis of the variables:

$H_0: r = 0, H_1: r \geq 1$

$H_0: r = 1, H_1: r \geq 2$

The results obtained from cointegration analysis are stated below:

Table 3: Johansen Test for Cointegration

Johansen tests for cointegration

Trend: constant — Number of obs = 50

Sample: 1963 - 2012 — Lags = 2

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	6	-393.41493	.	41.3450	15.41
1	9	-373.79404	0.54381	2.1033*	3.76
2	10	-372.74242	0.04119		

$*$ denotes rejection of the hypothesis at $5percent$ significance level.

$H_0: r = 0, H_1: r \geq 1$ and $H_0: r = 1, H_1: r \geq 2$ are 15.41 and 3.76 respectively. Trace statistic of 41.3150 is greater than critical value of 2.1033 indicating condition of cointegration Johansen's testing procedure starts with the test of zero cointegrating equations (a maximum rank of zero) and then accepts the first null hypothesis that is not rejected. From table 3, the trace statistic is observed to be greater than the 5percent critical value when the null hypothesis maximum rank is 0. This implies that the null hypothesis of no cointegration can be rejected in favor of the alternative hypothesis of cointegration between the variables. Thus, we accept the null hypothesis of one cointegrating equation in our model. This confirms the balance of payments constrained long run relationship between GDP growth and export growth in Nigeria, upholding the notion that Nigerian economic growth between 1960-2012 was constrained by its balance of payment pattern. Having determined that there is a cointegrating equation between GDP growth and export growth series, we now want to estimate the parameters of a bivariate cointegrating vector error correction model for the two series by using vector error correction method (VEC). While cointegration can assist us in evaluating GDP and export relationship and the income elasticity of demand for imports, it feels inadequate because there is no causal relationship involved in the cointegration technique. We therefore, apply a VEC model to assist us in deriving the short run relationship between the variables. The VEC estimation can be written as:

$$\Delta y_t = \alpha 1(y_{t-1} - \mu\text{-}\beta x_{t-1}) + \varepsilon t$$
$$\Delta x_t = \alpha 1(x_{t-1} - \mu\text{-}\beta y_{t-1}) + \varepsilon t$$

With y_t and x_t as growth and export growth, and μ as the intercept. The results of the VEC is presented in table 4 below:

Table 4: Vector Error Correction Model

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Vector error-correction model

Sample:  1963 - 2012                            No. of obs      =        50
                                                AIC             =  15.31176
Log likelihood =  -373.794                      HQIC            =  15.44282
Det(Sigma_ml)  =  10678.71                      SBIC            =  15.65593

Equation           Parms      RMSE     R-sq      chi2     P>chi2
----------------------------------------------------------------
D_growth               4     21.2567   0.7633   148.3233   0.0000
D_expg                 4     6.46417   0.8436   248.1814   0.0000
----------------------------------------------------------------

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
D_growth     |
        _ce1 |
         L1. |   .4815553   .3436539     1.40   0.161    -.1919939    1.155104
             |
      growth |
         LD. |  -.3982203    .255363    -1.56   0.119    -.8987226    .1022821
             |
        expg |
         LD. |   -1.45496   .6209773    -2.34   0.019    -2.672053   -.2378669
             |
       _cons |   1.391889   3.159666     0.44   0.660    -4.800943    7.584721
-------------+----------------------------------------------------------------
D_expg       |
        _ce1 |
         L1. |   .7055144   .1045052     6.75   0.000      .500688    .9103408
             |
      growth |
         LD. |   -.211898   .0776559    -2.73   0.006    -.3641009   -.0596952
             |
        expg |
         LD. |  -.0544644   .1888393    -0.29   0.773    -.4245826    .3156538
             |
       _cons |  -.9500467    .960855    -0.99   0.323    -2.833288    .9331946
------------------------------------------------------------------------------

Cointegrating equations

Equation           Parms    chi2     P>chi2
-------------------------------------------
_ce1                   1   175.3444   0.0000
-------------------------------------------
```

The estimation table contains the estimates of the short run parameters, along with their standard errors. The result suggests that lagged value of export is robust enough in predicting GDP growth, and that lagged value of GDP is significant in predicting export. These findings prove the validity of

Thirwall's BOPC model for the Nigerian economy. The LD.expg coefficient gives the elasticity of growth with respect to export $[(1/\pi = 1.45696)]$. The adjustment matrix (Cointegrating equation 1) of 0.482 and 0.706 measures the speed at which the variables approach their equilibrium. This coefficient is known as the Harrod foreign trade multiplier. Our result is

similar to findings by Abaidoo (2011) and Bairam (1998). The result suggests that the main factor that restricts growth in an open economy is the balance of payments and as such, long run growth is determined by export growth and income elasticity of import. Inferences on the parameters depends crucially on the stationarity of the cointegrating equations, so there is a need to check the specification of the model. For the VAR model to be stable, inverse roots of the characteristic polynomial of the AR should be within the circle.

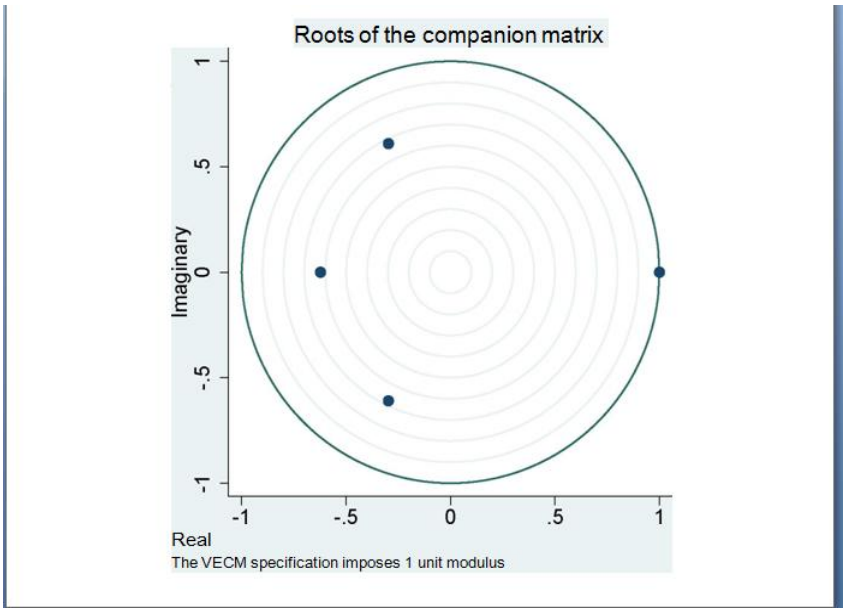

Figure 2: Inverse Roots of AR Characteristic Polynomial

The graph of the eigenvalues shows that none of the remaining eigenvalues appear close to the unit circle. The stability test thus, does not indicate that our model is misspecified.

3.1 Policy Implications

The Johansen cointegration test which verifies the long-run relationship between economic growth and export growth should be useful for stakeholders and policy makers in Nigeria. It can act as a guide on the most efficient ways to steer available resources towards proper maximization of economic growth through exports. An increase in exports will subsequently lead to an increase in growth and a reduction in unemployment, which has been a major social problem in Nigeria. Also, with a confirmed long-run relationship between exports and economic growth, efforts should be made at export upgrading and diversification as well as strengthening of export oriented firms. Furthermore, faster growth and convergence in income per capita can be speedily achieved if a gradual real depreciation of the Naira is effected.

4.0 Conclusion

Several analyses have dealt with the growth prospects for Nigeria. A lot of this studies are inclined towards supply oriented models, with economic growth prediction based on macro production functions and assumptions about technological, resource and institutional development. This study presents a model for Nigeria, where growth is demand driven and

constrained by balance of payments concerns. Several literatures have tested and verified the BOPC model in both developing and developed economies. This study expands the trend by testing the Thirwall BOPC model on Nigerian economy from 1960-2012 using time series data. The results of our econometrical analysis render satisfactory explanations of changes in the long term economic growth of Nigeria. The results seem to indicate that the main factor that restricts growth in an open economy is the balance of payments and as such, long run growth is determined by export growth and income elasticity of imports and with improved export performances and a lower income elasticity of demand for imports, its growth performance will be faster. Further studies on analyzing the impact of the oil price shocks on income elasticity of demand will make an interesting research.

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