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Article

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EconomiA

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Suggested Citation: Panshank, Yohanna; Civcir, Ifran; Ozdeser, Hüseyin (2020) : Towards determining Nigeria's economic growth path: A balance-of-payments constrained growth approach, EconomiA, ISSN 1517-7580, Elsevier, Amsterdam, Vol. 21, Iss. 1, pp. 104-119, <https://doi.org/10.1016/j.econ.2019.11.004>

This Version is available at:

<https://hdl.handle.net/10419/266952>

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Towards determining Nigeria's economic growth path: A balance-of-payments constrained growth approach

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Received 14 March 2018; received in revised form 14 August 2018; accepted 22 November 2019

Available online 24 December 2019

Abstract

This paper examines Nigeria's long run growth path using the externally and internally constrained version of Thirlwall's growth model from 1982 to 2015. The present study modifies the SCA-BOPCG to take into account the effects the foreign contents in exports growth and the domestic investment. Three Stage Least Squares method is used to obtain the required elasticities for the estimation of the domestic income growth. The study affirms the robustness and validity of the modified model in determining the growth path for Nigeria. The outcome of the empirical study reveals that Nigeria's economic growth process is balance-of-payment constrained. Even though monetary policies improve growth performance, Nigeria sustainably grows faster with policies aiming at improving external balance or reducing the import components of demands, increasing export share to products with high elasticity of demand as well as keeping budget deficits within the universally acceptable limits.

Keywords: Internal and external imbalances; Relative prices and income elasticities; Balance-of-payment equilibrium growth rates; Export and investment requirement of import

JEL classification: F43; E12; O24

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1. Introduction

Following Kaldorian tradition and as a Keynesian, Thirlwall (1979) forwarded a parsimonious framework which can be used to determine the long-run growth course of any country compatible with the balance of payment equilibrium. The model contends that the degree to which an economy grows depends on the ratio of export growth to the income sensitivity of demand for import. The implication of this rule shows that in an open economy, the principal restriction that can adequately explain the growth process is the balance of payments. What this really means is that the annual rate of growth of a country's exports is a function of how fast the outside world which purchases those exported products

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is growing. Economic prosperity and output could thus be achieved by substantially increasing the country's export shares and efficiently controlling imports.

Before the development of the model, [Dixon and Thirlwall \(1975\)](#) had earlier explored the dynamic features of Kaldor's circular cumulative causative model and tested it on the UK economy. The result over predicted the growth rate for the UK. A very clear justification for the outcome was the failure of the model to take into account the balance of payments constraint as imports were completely excluded in the analysis. However, in a scenario where imports growth exceeds the growth of exports, which cannot be permanently sustained; something has to play the adjustment role to restore equilibrium. This adjustment responsibility could be immaterial in a regional framework because of the usage of a universal means of payment; hence, the necessity to implement policies toward safeguarding real exchange rate is pointless. In the context of national economies, on the contrary, two underlying types of modifications are required: relative price changes or fine-tuning in output (income). [Dixon and Thirlwall \(1975\)](#) concluded that income is the main variable that will perform this function and not the real exchange rate.¹ An incremental growth in GDP, by rising imports, has the potential to generate a distortion in the payment position. This scenario could require some reduction in demand or real exchange rate decline (a deterioration of relative prices) for the purposes of ensuring the sustainability of the current account deficit. For this reason, an unsustainable current account deficit necessitates a correction, which acts as a hold on further output expansion ([Bajo-rubio, 2014](#)).

Essentially, the law maintains that it is impracticable for any nation to experience faster and rapid growth than that guaranteed by its balance of payment equilibrium. However, a country can grow more than that permitted by the balance of payment condition if it has the capability to embark on incessant deficit financing from external sources. Unfortunately, this is a rare, unrealistic and unsustainable means of stimulating growth, particularly when viewed in the long-run. Given a scenario where foreign exchange earnings fail to address balance of payment distortions on the external account unremittingly, a faster and higher rate of growth is inevitably truncated.

It is well known that Thirlwall's BOPCG model has been adjusted to incorporate the effects of capital flows, sustainable debt, interest payment, multi-sectoral among other factors; the simultaneous distortions on internal and external accounts alongside the effects of real exchange rate in a BOPCG framework are rarely studied. The ever-increasing contemporary experiences of most countries around the globe regarding debt problems prompt a renewed interest to address this dilemma. It has also been observed that increasing government borrowing, expenditure or reducing taxes in order to achieve higher GDP and overall prosperity does not often automatically lead to the realisation of the intended objectives. This is primarily because of the fact that government borrowing could trigger the cost of investment (interest rate) to rise beyond the reach of domestic investor, and by implication, discourages domestic investment, productivity and overall prosperity of the economy ([Pelagidis and Desli, 2004](#); [Soukiazis et al., 2014](#)).

In order to contribute to the above, this research seeks to explain Nigeria's growth path using a simultaneous model developed by [Soukiazis et al. \(2014\)](#). This version of Thirlwall's model incorporates both external and internal deficits and includes relative prices as additional determinants of long run growth. The adoption of the model is informed by the recent fiscal developments in the Nigeria where Deficit-to-GDP ratio had risen to 4.46% in 2015 while public revenue is plummeting due instability in commodity prices. To further compound the issue, interest repayment on loans at the moment already takes about 30% of federal government revenue which is higher than that of Italy, Greece and even the entire European Union.² This raises concern about the sustainability of the fiscal position of the economy over the medium and long terms.

The major novelty of present study is in the modification of SCA-BOPCG model to take into account the role of foreign contents used in export growth and domestic investments within the BOPCG framework. The reason behind this extension is to take into account the structural needs of an economy from the South which significantly relies on the imports of raw material/intermediate and industrial machinery and equipment in accelerating growth. Therefore, for a correct and comprehensive determination of long run growth path of small open economy, the role of these additional variables as important restrictions ought to be included. Similarly, while substantial empirical evidence abound regarding [Thirlwall \(1979\)](#), only few studies have examined a situation where an economy is constrained simultaneously on the external and internal accounts. Most importantly, no study has been conducted on this particular issue regarding any developing country to the best of the authors' understanding.

¹ Note that we use real exchange rate interchangeably with relative prices or terms of trade.

² This is particularly so, when only debt service as % government revenue not debt-GDP ratio or debt stock-GDP is considered.

The structure of the paper is as follows: section two is literature and theoretical background to the formation of Thirlwall's (1979) BOPC growth model. Section three presents the SCA-BOPCG model. Section four covers empirical examination: descriptive statistics, estimation of the model, policy simulation analysis and recommendations. Finally, Section five concludes.

2. Thirlwall's (1979) BOPC growth model

The BOPCG model presents an attractive proposition concerning economic growth. The main implication is that global demands place the overriding constraints to which an individual country's growth adjusts. The emergence of BOPCG as an explanation to discrepancies in economic advancement of countries has triggered substantial interest among followers of Keynes as well adherents of classical economics from the period of Adam Smith to Ricardo as well as in the contemporary era. The prevailing paradigm of the classical perspective has been that the balance of payments and demand are irrelevant for long-run economic growth performance. They assume that BOP is self-regulating and economic growth is essentially determined by supply. Instinctively, the accessibility and availability of factor inputs can cause severe restrictions on economic growth. This circumstance could make economies that are constrained in "supply-side" factor inputs to stagnate and lag behind in their growth potential and performance. Unfortunately, the classical position may not be fully exploited as a result of the slow growth caused by effective aggregate demand. This remains the general idea of Thirlwall on how demand drives the real growth rate of an economy. The balance of payments effects of trade may possibly counterbalance the real income benefits obtained from trade advocated by supply-side economists. Therefore, balance of payments is critical. Thirlwall (1979) started the model by specifying two equations and an identity as follows:

$$X = a \left(\frac{P}{P^* E} \right)^{\varepsilon_{xp}} Y^{*\varepsilon_{xy*}} \varepsilon_{xp} < 0, \varepsilon_{xy*} > 0 \quad (1)$$

$$M = b \left(\frac{P^* E}{P} \right)^{\varepsilon_{mp}} Y^{\varepsilon_{my}} \varepsilon_{mp} < 0, \varepsilon_{mp} > 0 \quad (2)$$

$$PX = P^* ME \quad (3)$$

where ε_{xp} represents price sensitivity of demand for exported commodities³, ε_{mp} represents price sensitivity of import demand; ε_{xy*} represents the income sensitivity of export demand; ε_{my} represents the income sensitivity of imports; Y represents domestic output and Y^* represents world real income.

Specifying Eqs. (1) and (2) as well as trade balance identity in dynamic terms, yields the following:

$$\dot{x} = \varepsilon_{xp}(\dot{p}^* + \dot{e} - \dot{p}) + \varepsilon_{xy*} \dot{y}^* \quad \text{Export equation} \quad (4)$$

$$\dot{m} = \varepsilon_{mp}(\dot{p}^* + \dot{e} - \dot{p}) + \varepsilon_{my} \dot{y} \quad \text{Import equation} \quad (5)$$

$$\dot{p} + \dot{x} = \dot{p}^* + \dot{e} + \dot{m} \quad \text{Trade balance identity} \quad (6)$$

Substituting Eqs. (4) and (5) into (6) produces an all-encompassing specification as:

$$\dot{y}_A = \frac{(1 + \varepsilon_{xp} + \varepsilon_{mp})(\dot{p}^* + \dot{e} - \dot{p}) + \varepsilon_{xy*}(\dot{y}^*)}{\varepsilon_{my}} \quad (7)$$

Suppose that real effective exchange rate plays no or an insignificant role in the growth process. The model would thus be reduced such that Thirlwall's original law is parsimoniously obtained as:

$$\dot{y}_A = \frac{\dot{x}}{\varepsilon_{my}} \quad (8)$$

³ Note for coefficients: ε_{ij} here i indicates the equation while j indicates the variable on the right hand side.

Or,

$$\dot{y}_A = \frac{\varepsilon_{xy^*} \dot{y}^*}{\varepsilon_{my}} \quad (9)$$

Note that variables in lowercase letters with dots refer to those expressed in growth rates. Here, the growth of real GDP and world income are captured by \dot{x} and \dot{y}^* accordingly, \dot{x} represents real exports, and the aggregate income responsiveness of demand for import is represented by ε_{my} . Accordingly, the level of economic growth in any economy positively depends on the amount of export growth and negatively depends on the aggregate income responsiveness of demand for imports over a long period. Thirlwall (2011) regarded Eqs. (8 or 9) as condensed volumes of celebrated research exertion in economic development (including, Engel's law; Marshall-Lerner condition; Prebisch-Singer hypothesis; the Verdoorn-Kaldorian idea; Kaldor's paradox; and the literature on export-led growth etc.) summarizing all of these canons or doctrines in a succinct and small-sized anti-underdevelopment tablet. Moreover, the expression was preserved by the new and authoritative element of BOPCG that it is impossible for any economy to accelerate growth rapidly above the rate or limit set by the equilibrium condition, except to borrow indefinitely.

2.1. Empirical review

The original formulation of Thirlwall's law above did not incorporate the role of financial capital flows. Recognising this inadequacy, Thirlwall and Hussain (1982) modified and extended the BOPCG model by adding capital flows into the specification and tested it on a set of developing countries from 1951 to 1969. The study revealed that on average, variations in the relative prices appear to have constrained most countries, whereas the inflow of capital on the average appears to have enabled the countries to grow to some extent more rapidly than the Harrod trade multiplier result. By incorporating this restriction, the movement of capital or financial resources across countries could give a better explanation to the growth of rate of domestic income.

Nevertheless, in studies such as (Elliott and Rhodd, 1999; McCombie and Thirlwall, 1997; Moreno-Brid, 2003; Barbosa-Filho, 2005) all showed that the above extension is limited by allowing a perpetually rising ratio of net borrowing. In reality, external financing always attached with considerable costs and that must not be ignored in growth modelling. Specifically, Moreno-Brid (2003) simply solved the limitation of the long-run sustainability condition of indebtedness in the BOPCG model by explicitly incorporating interest repayment obligations on debts as an additional constraint to long run growth especially for developing countries whose net interest payments overseas are a huge withdrawal item in the current account of their balance of payments.

Using a different approach, Araujo and Lima (2007) developed a BOPCG analogous to Thirlwall's Law that integrates several sectors in a bilateral relationship following Pasinetti's structural economic dynamics (SED) model without including changes in relative prices. This extension represents the foundation of multi-sectoral version of the Thirlwall's model which has proven that diverse theoretical, empirical and policy implications could be derived from it. This is based on the inherent specification of the model that even if the various sectors of an economy are not responsive and world income growth remains unchanged, it is possible for an economy to still experience rapid growth by transferring factors of productions to produce goods with high income elasticity of demand in the international market. Gouvea and Lima (2010), Rovira et al. (2010) and Cimoli et al. (2016) followed the multi-sectoral model used by Araujo and Lima (2007) to empirically show that the model can produce similar implications in agreement with the original Thirlwall's model.

Given the understanding of the surging debt crises around the globe, Soukiazis et al. (2014) recently extended Thirlwall's original model by adjusting for both internal and external imbalances where relative prices are non-neutral. The model has been tested for four European countries with satisfactory implications in tandem with Thirlwall's Law: Portugal (Antunes and Soukiazis, 2008; Soukiazis et al., 2012, 2013); Italy (Soukiazis et al., 2014, 2015); Romania (Soukiazis et al., 2015a, 2015b) and; Greece (Soukiazis et al., 2018) A modified version of Soukiazis et al. (2014) model is tested for Turkey (Civcir and Yucel, 2020) and for Nigeria where oil sector is taken as exogenously (Pashak et al., 2019).

Nearly four decades from the appearance of Thirlwall's seminal paper; there have been tremendous developments and modifications trailing his perspective. There has been a vast amount of research on the examination of the legitimacy and soundness of the Thirlwall's law as well as fundamental criticisms regarding the validity of its indispensable propositions (constancy of relative prices in particular). Observed substantiations demonstrate that the effect of relative

prices on domestic income growth is varied. However, the overall conclusion of the studies on BOPCG affirms that income plays the most important role in restoring the economy to equilibrium rather than prices (See, McCombie and Thirlwall, 1994; Thirlwall, 2011 for history and survey of literature).

3. The SCA-BOPCG model

The model specification begins as follows:

3.1. Import demand equation

Here, the study makes use of the determinants of domestic income to elucidate and tender an explanation for import flows, contrasting the traditional model that relies on real aggregate GDP. The calibrated function in dynamic terms overtly includes:

$$\dot{m} = \varepsilon_{mc}\dot{c} + \varepsilon_{mg}\dot{g} + \varepsilon_{mk}\dot{k} + \varepsilon_{mx}\dot{x} + \varepsilon_{mp}(\dot{p}^* + \dot{e} - \dot{p}) \quad (10)$$

A cursory look at the above function shows that the growth rate in demand for imported products, \dot{m} , is a function of the growth rates of consumption \dot{c} , government sector, \dot{g} , export sector \dot{x} , domestic investment sector, \dot{k} and the real exchange rate (\dot{p}^* , \dot{p} and \dot{e} represent foreign inflation, domestic inflation and the changes in exchange rate respectively). $\varepsilon_{mp} < 0$ is relative price sensitivity of the demand for imports; hence, devaluation has the capacity of curtailing import demand by making it costlier in the home market.

3.2. The export demand equation

Specifying export equation in dynamic form is as follows:

$$\dot{x} = \varepsilon_{xy^*}\dot{y}^* + \varepsilon_{xp}(\dot{p}^* + \dot{e} - \dot{p}) \quad (11)$$

In this paper, the model is extended by adding the import growth. This inclusion is necessary given the structural need and nature of the Nigerian economy, which relies significantly on the importation of critical raw and intermediate goods, and equipment and machinery for export growth,

$$\dot{x} = \varepsilon_{xy^*}\dot{y}^* + \varepsilon_{xm}\dot{m} + \varepsilon_{xp}(\dot{p}^* + \dot{e} - \dot{p}) \quad (12)$$

The growth rate of exports is represented by \dot{x} , foreign income is represented by \dot{y}^* , \dot{m} is imports and $\varepsilon_{xm} > 0$ is import elasticity of exports, relative prices is captured by $(\dot{p}^* + \dot{e} - \dot{p})$. $\varepsilon_{xy^*} > 0$ captures the income elasticity of export. This component is the aggregation of non-price features of the export goods linked with diversification, quality, packaging and trustworthiness among others. Similarly, $\varepsilon_{xp} > 0$ represents the relative price sensitivity of the demand for exports. Given the positive sign of the product, a reduction in the value of the local currency has the potential for stimulating the demand for exports, hence making exports more competitive in the foreign market.

3.3. Private consumption and investment function

Conventionally, aggregate consumption depends principally on total income after tax (disposable), which may include any interest gained from investment in bonds and other assets:

$$\dot{c} = \varepsilon_{cy}\dot{y}_d \quad (13)$$

The study denotes \dot{c} to represent the annual consumption growth rate; \dot{y}_d is the domestic income growth and ε_{cy} captures the income sensitivity of aggregate consumption.

Similarly, the investment model firmly follows Keynes's accelerator theory, postulating that actual domestic income (\dot{y}) and interest rate (\dot{r}) are the main drivers of total investment (\dot{k}) over a time period and the model is further extended to take into account the imports used in the investment sector, specified as follows:

$$\dot{k} = \varepsilon_{ky}\dot{y} + \varepsilon_{kr}\dot{r} + \varepsilon_{km}\dot{m} \quad (14)$$

here, ε_{ky} captures the effect of the accelerator, while ε_{kr} the investment sensitivity with respect to changes in interest rate. \dot{m} is import growth and ε_{km} is the import elasticity of domestic investment.

3.4. The government sector

The study assumes that the government budget is given in nominal values by the below equilibrium condition:

$$G_n + iB_H + i^*B_F e = tYP + D \tag{15}$$

here, nominal government spending is represented by G_n , domestically borrowed funds by home bondholders is accounted for by B_H , while B_F represents the share of government debt with overseas investors, real domestic income is given by Y , domestic price level is denoted by P and D represents the difference between government revenue and expenditure (deficit). Interest rates valued at market prices given to domestic as well as overseas holders of debt instrument are captured by i and i^* , respectively. The nominal exchange rate is captured by e , while tax rate is t . Following the above identity, a deficit occurs when tax revenues fall short of total current spending, i.e., when:

$$tYP < G_n + iB_H + i^*B_F e$$

In the long-term, real government expenditure growth (\dot{g}) is consistent with the restriction (15), and can be obtained as:

$$\dot{g} = \frac{t\dot{x}}{W_G} + (\dot{d} - \dot{p}) \frac{W_D}{W_G} - [\Delta i + i(\dot{b}_H - \dot{p})] \frac{W_{BH}}{W_G} - [(e\Delta i^* + i^*\Delta e) + i^*e(\dot{b}_F - \dot{p})] \frac{W_{BF}}{W_G} \tag{16}$$

From the above expression, the budget deficit ratio is represented by $W_D = \frac{D}{YP}$, the government expenditure ratio is represented by $W_G = \frac{G}{YP}$, while, $W_{BH} = \frac{BH}{PY}$, and $W_{BF} = \frac{BF}{PY}$ represents the government obligation in the hands of domestic and overseas investors (as a fraction of GDP), in that order. We denote \dot{d} to capture the annual increase in budget deficit, while \dot{b}_H and \dot{b}_F are annual increases in government borrowed funds owned by home and foreign bond holders, respectively.

3.5. The balance of payments condition

Concluding part of BOPCG specification with the below identity can be seen as:

$$XP + D_F e - i^*B_F e = MP * e \tag{17}$$

Starting from the export component of the equilibrium condition indicates the amount of foreign exchange that will be used for importation (export earnings + government deficit financed by foreigners –compensation to overseas bondholders in the form of interest payment). The final identity can be represented as:

$$\dot{x} + \dot{p} + (1 - \zeta) \frac{W_D}{W_X} (\dot{p} + \dot{y} - i^*) - (1 - \zeta) \frac{W_B}{W_X} \Delta i^* = \left(\frac{W_M}{W_X} \right) \left(\frac{P * e}{P} \right) (\dot{m} + \dot{p} * + \dot{e}) \tag{18}$$

Accordingly, \dot{x} , \dot{m} , \dot{y} , \dot{p} , \dot{p}^* , and \dot{e} , measure the growth rates of exports, imports, domestic income, domestic prices, foreign prices, and nominal exchange rate, respectively. Furthermore, W_D , W_B , W_M and W_X are correspondingly the ratios of budget deficit, public or government debt, imports and exports on income. In conclusion, $(1 - \zeta)$ measures the degree of public deficit (or debt) financed by foreign markets.

3.6. The growth rate of domestic income

The growth rate of domestic income with non-neutral relative prices is given by: $\dot{y}_C = A/B$

$$\begin{aligned}
 A = & \left\{ \varepsilon_{xy^*} - \varepsilon_{mx}\varepsilon_{xy^*} \left(\frac{W_M P^* e}{W_X P} - \varepsilon_{xm} \right) \left(\frac{1}{(1 - \varepsilon_{mx}\varepsilon_{xm} - \varepsilon_{mk}\varepsilon_{km})} \right) \right\} \dot{y}^* \\
 & \left\{ +\varepsilon_{xp} - \left(\frac{W_M P^* e}{W_X P} - \varepsilon_{xm} \right) \left(\frac{1}{(1 - \varepsilon_{mx}\varepsilon_{xm} - \varepsilon_{mk}\varepsilon_{km})} \right) \varepsilon_{xp}\varepsilon_{mx} \right\} (\dot{p}^* + \dot{e} - \dot{p}) \\
 & \left\{ -\varepsilon_{mp} \left(\frac{W_M P^* e}{W_X P} - \varepsilon_{mx} \right) \left(\frac{1}{(1 - \varepsilon_{mx}\varepsilon_{xm} - \varepsilon_{mk}\varepsilon_{km})} \right) \right\} \\
 & + \left(\dot{p} - \frac{W_M P^* e}{W_X P} (\dot{p}^* + \dot{e}) \right) + (1 - \zeta) \frac{W_D}{W_X} (\dot{p} - i^*) - (1 - \zeta) \frac{W_B}{W_X} \Delta i^* \\
 & - \left(\frac{W_M P^* e}{W_X P} - \varepsilon_{xm} \right) \left(\frac{1}{(1 - \varepsilon_{mx}\varepsilon_{xm} - \varepsilon_{mk}\varepsilon_{km})} \right) \left\{ \begin{aligned} & \varepsilon_{mc}\varepsilon_{cy} \left(\frac{(\Delta i - \Delta \dot{p})\zeta W_B}{(1 - t) + \zeta r W_B} \right) \\ & + \varepsilon_{mg} \left(-\Delta i \frac{\zeta W_B}{W_G} - e \Delta i^* \frac{(1 - \zeta) W_B}{W_G} \right) \\ & + \varepsilon_{mk}\varepsilon_{kr} (\Delta i - \Delta \dot{p}) \end{aligned} \right\} \quad (19) \\
 B = & \left(\frac{W_M P^* e}{W_X P} - \varepsilon_{xm} \right) \left(\frac{1}{(1 - \varepsilon_{mx}\varepsilon_{xm} - \varepsilon_{mk}\varepsilon_{km})} \right) \left\{ \varepsilon_{mc}\varepsilon_{cy} + \varepsilon_{mk}\varepsilon_{ky} \right. \\
 & \left. + \varepsilon_{mg} \left(\frac{t}{W_G} + \frac{W_D}{W_G} - \frac{i\zeta W_B}{W_G} - \frac{i^* e (1 - \zeta) W_B}{W_G} \right) \right\} \\
 & - \left((1 - \zeta) \frac{W_D}{W_X} \right)
 \end{aligned}$$

The domestic income growth model comprehensively specified above shows inter alia that the growth of real *GDP* is a function of public debt caused by budget deficit (internal) and external imbalances, real exchange rate and foreign contents. Precisely, the numerator, (i.e. *A* part) is disintegrated into diverse components: the initial expression captures the shock of external demand on real *GDP* (\dot{y}^*); the next expression reveals the impact of substitution via the adjustments or changes in the real exchange rate; the third expression identifies how trade volume affects domestic income growth; and the last component of the numerator captures the influence of public debt and deficit on the growth rate of real *GDP*. The study basically measures the role and effect of the individual import demand contents' sensitivity to the annual growth rate of real *GDP* in the lower part of the model (denominator, *B*). Eq. (19) will be employed to determine the real growth for the Nigerian economy.

4. Empirical examination

4.1. Descriptive statistics and overview of the Nigerian Economy

Nigeria is the 26th largest economy in the global ranking; in addition, it is the leading economy in Africa where it is the principal exporter of oil products, and with the biggest natural gas reserves. Due to its rebasing exercise, Nigeria's *GDP* approximately doubled from US\$270 billion in 2013 to US\$510 billion in 2014. This *GDP* increase by about 90% resulted from, inter alia, re-estimation of the contributions of certain sectors of the economy such as telecommunications, entertainment, and retail, which were previously not captured or underreported; the informal sector was re-estimated to account for about 44% of *GDP* (WTO, 2017).

In order to fully understand the dynamics of the overall economy, a descriptive statistics is conducted and presented in Table 1. By observing the historical tendency of the growth performance of the economy, average growth of the economy is about 4.26% with maximum and minimum values at 21.18% and -10.75% respectively. The minimum

Table 1
Descriptive statistic.

	Real GDP growth	Export growth	Import growth	Inflation growth rate	Interest rate growth	Nominal exchange rate	Real exchange rate (PPI based)	Import of goods and services (% of GDP)	Exports of goods and services (% of GDP)	Public Debt % of GDP	Budget Deficit% of GDP	Govt. Expenditure% of GDP
Mean	4.26235	6.19507	4.06399	22.56284	2.01414	73.6235	127.7683	20.7383	30.4706	62.629	−2.000000	9.2756
Median	5.15500	2.63605	6.16130	12.44872	2.34210	57.3722	124.4717	19.7824	31.5478	62.819	−1.745000	8.2053
Maximum	21.1800	60.2177	85.5144	113.0764	33.7619	193.279	219.2717	36.4817	51.7303	181.87	8.140000	17.943
Minimum	−10.7500	−30.7018	−37.1430	−5.665685	−43.5289	0.67290	33.43970	7.90345	10.6567	1.3430	−15.75000	4.8332
Std. Dev.	6.02376	22.0915	31.2892	28.13321	14.8865	66.1192	56.54826	8.13627	10.3634	53.962	5.090718	3.4976
Skewness	−0.10466	0.62510	0.59396	1.878248	−0.49188	0.17612	−0.098682	0.42626	−0.16618	0.4117	−0.469644	0.7335
Kurtosis	4.34978	3.00724	2.74486	6.086473	4.31367	1.33787	1.923654	2.33994	2.23085	2.1287	3.525211	2.4746
Jarque-Bera	2.64311	2.21432	2.09141	33.48658	3.81586	4.08953	1.696419	1.64685	0.99458	2.0363	1.640655	3.4406
Probability	0.26672	0.33049	0.35144	0.000000	0.14838	0.12941	0.428181	0.43892	0.60817	0.3612	0.440287	0.1790
Sum	144.920	210.632	138.175	767.1365	68.4808	2503.20	4344.121	705.103	1036.00	2129.4	−67.83000	315.37
Sum Sq. Dev.	1197.42	16105.1	32307.6	26118.76	7313.07	144267.	105524.3	2184.56	3544.22	96092.	855.2087	403.71
Observations	34	34	34	34	34 34	34	34	34		34	34	34

Source: Authors' computation

growth rate could arguably be regarded as the initial effect of the structural adjustment programme (SAP) in 1987. The economy moved from the lowest negative growth to the highest growth in 2002; perhaps due to the positive impact of private sector-led development pursued by the democratic government after the collapse of military regime. Considering the value of standard deviation which stood at 6.02%, it could be said that there is a considerable dispersion in the series which is supported by the high value of measure of kurtosis 4.30 indicating that real GDP growth is leptokurtic. The Jarque–Bera statistics indicates that the variable is normally distributed. As for the distribution of the entire series, Jarque–Bera statistics reveal that the variables are normally distributed except the rate of inflation.⁴

Nigeria's local currency-the Naira has struggled against the dollar since the 80 s which makes its management very challenging. Looking at the average value of real exchange rate index-127.0, it could be asserted that the Nigerian economy experiences low competitiveness over the sample period. The country has passed through different foreign exchange rate policy regimes. Before 1985, exchange rate policy was fixed parity exclusively with the British pound sterling and the US dollar. Between 1982 and 1985 following a sharp rise in the oil led to a significant appreciation of the real exchange rate causing loss in competitiveness for the manufacturing and other non oil sectors. The policy shifted to market determined (monetary targeting) from 1986 with little improvement in the value of currency. Similarly, following the transition to democratic rule, the need to broaden and deepen the foreign exchange prompted the implementation of the inter-bank foreign exchange market (IFEM) 2000–2015. It was recorded that at the inception of IFEM, the real exchange rate index oscillated approximately on a constant drift with indication of appreciation of the exchange rate index (148) compared with the initial period. Given this situation, it cost the CBN approximately US\$100 million each day to preserve the local currency within the conventional band of 160–176 to the US dollar before 2015 causing 25% reduction in foreign reserves to roughly US\$33billion. However, the intervention could not prevent the local currency from plummeting in the face oil price decline. The CBN further imposed controls on deposit money banks' foreign exchange transactions, blocked the authorized foreign exchange auction platform/window, and route those trading activities to the interbank market. The interventions however, continued to widen the gap between the rates existing in the interbank market and unofficial markets or bureau de change operators. Nigeria recently had to abandon the pegged/fixed exchange rate for floating exchange system to see if it could achieve stability in the foreign exchange market.

There has been a significant fall in public revenue from its recent peak of 29.9% of GDP in 2011 to 7.8% in 2015 (WTO, 2017). Except for a slight surplus in some few periods, Nigeria's budget was in deficit over the period under review. It stands at 4.45% of GDP in 2015 which is greater than the annual average of about –2.0% of GDP and still shows further signs of increasing especially with the expansionary fiscal policy adopted by the government towards creating jobs and solving structural deficiencies in the succeeding year.

Nigeria recorded the highest public debt as percentage of GDP of about 181.87% in 1993. One of the possible explanations for this is the deregulation of interest rate prescribed by SAP which led to an increasing obligation to service public. After achieving the highest growth of about 60.21% a year before the global financial crisis, the export sector significantly slowed down in 2015 with a growth rate of about 0.13%. This slow is attributed to the fall of commodity prices in the international market as well the unbalanced productive structure of the economy. With debt service already taking about 30% of government revenue, falling government revenue, deteriorating exchange rate and rising interest rate in the US; the stability and fiscal sustainability of the Nigerian economy over the medium and long terms is gloomy.

4.2. *Application of the modified SCA-BOPCG model on the Nigerian economy*

The basic research question fundamental to this study can be overtly stated as follows: to what extent does the modified SCA-BOPCG model explain Nigeria's economic growth process? In achieving this objective, Eqs. (10), (12), (13) and (14) are concurrently estimated in order to determine the elasticities essential for the computation of the growth rate of domestic income growth, as specified in expression (19).

This paper assumed that other variables (those not included in 10, 12, 13 and 14) are exogenous. A substantive description, explanation, and sources of the series are clearly presented in Appendix A. As earlier indicated, this paper uses the dynamic rates of the entire variables spanning 1982–2015 to estimate the derived four system equation. It

⁴ We only consider real GDP growth rate in more detail. However, analogous explanation could be given to the remaining variables.

Table 2
Computation of the growth rates of domestic income, Nigeria 1982–2015.

ε_{xy}^* 2.083112	ε_{mx} 0.66215	ε_{cy} 1.183838	ε_{mc} 2.161911	ε_{ky} 1.13615	ε_{mk} 0.363804	ε_{mg} -0.1718	ε_{kr} -0.33793	ε_{mp} -0.02271
ε_{xp} 0.10869	t 0.179518	r 0.020141	\dot{p} 0.225628	y^* 0.023691	W_D -0.01995	W_G 0.198182	W_B 0.63	ζ_D 0.51
ζ_B 0.49	W_M 0.207383	W_M 0.304706	i 0.128215	i^* 0.060724	Δi 0.002697	Δi^* -0.00325	e 0.74	\dot{e} 0.06
$\left(\frac{P^*e}{P}\right)$ 1.48	$(\dot{p}^* + \dot{e} - \dot{p})$ 0.032398	$\Delta i - \Delta \dot{p}$ 0.003293	\dot{p}^* 0.035632	$\dot{p} - i^*$ 0.164905	$\Delta \dot{p}$ -0.00058	ε_{xm} 0.171009	ε_{km} 0.278284	ε_{my} 1.971938
\dot{x} 6.19507	$\dot{y} = 4.26\text{Actual}$	$\dot{y}_A = 3.141\%$	$\dot{y}_B = 5.03\%$	$\dot{y}_C = 4.70\%$				
<i>growth</i>	Thirlwall law	SCA-BOPCG Model	Modified SCA-BOPCG model					

Note: ε_{xy}^* , ε_{mx} , ε_{cy} , ε_{mc} , ε_{ky} , ε_{mk} , ε_{mg} , ε_{kr} , ε_{mp} , ε_{xp} , ε_{xm} and ε_{km} are obtained from Appendix B.

W_M , W_x , W_D , W_G , W_B , t , c , r , i , i^* , e , p , p^* and y^* yearly mean growth rates from 1982 to 2015, $\left(\frac{P^*e}{P}\right)$ = average RER after the implementation of the inter-bank foreign exchange market (IFEM (i.e. from 2000 to 2015)).

ζ_B & $\zeta_D = 0.51$ are assumed fixed over time.

relies on the robustness of Three-Stage Least Squares (3SLS). This econometric method is a multivariate regression which combines seemingly unrelated regression (SUR) and two stage least squares 2SLS to get efficient estimates by taking into consideration the contemporaneous interrelationships between equations. Therefore, it is more efficient and its usefulness increases with the strength of the interrelations among the error terms as in the present study.

From a brief assessment of the overall results from Table 2, it can be asserted that the parameter estimates are observably in agreement with the fundamental theoretical postulations. Most importantly, the research produces results that are in line with the SCA-BOPCG model as well as Thirlwall’s original version. Generally, the elasticities demonstrate their expected signs and significance. Beginning with the import equation, an important point to note relates to the significance and sensitivity of the coefficients of the estimated import demand variables. Consumption elasticity surpasses unity ($\varepsilon_{mc} = 2.161911$) and is significant at 0.01 percent level. This signifies that Nigeria’s import demand is highly elastic in comparison with changes in consumption. Looking at imports responsiveness to export ($\varepsilon_{mx} = 0.66215$), which is significant at 0.05 percent, reveals a substantial import substance in export demand in Nigeria. Similarly, the contribution of investments to imports is positive and statistically significant at 0.1 per cent ($\varepsilon_{mk} = 0.363804$). The elasticity of imports with respect to government final expenditure ($\varepsilon_{mg} = -0.1718$) is also statistically significant at 0.01 percent level. The negative sign perhaps affirms the direction of government policy and expenditure in favour of domestic goods, since the introduction of an import substitution strategy ushered in the indigenisation policy of 1972. This policy led to the development of the petrochemical industries, as well as the iron, steel, textile, breweries, agro-allied and infant industries, and the creation of assembly outlets that utilised imported finished products in the automobile and cement plants; and the 2012 Nigeria Industrial Revolution Plan (NIRP) towards encouraging domestic manufacturing of goods that were hitherto bought from outside and to transform the country from an economy that only exports primary products to one that has a concrete mechanized foundation. This perhaps also indicates the effects of the local content and raw material policies of 1987 and 2004 and the recent restriction of importation of frivolous items as well as the encouragement towards the consumption of “made in Nigeria” products in 2015.

From the export equation, world income growth is statistically significant with an elasticity of ($\varepsilon_{xy}^* = 2.083112$) at the 0.1 percentage level and takes on the expected positive sign. Similarly, the study seeks to verify whether relative price is an important policy variable in the Nigerian economy. It was found that relative prices is significant at 0.1 percent ($\varepsilon_{xp} = 0.10869$) in the export function and in the import function ($\varepsilon_{xp} = -0.02271$). The overall conclusion on the role of relative prices in determining long run growth is that it is an important policy variable when the outcome of the price elasticity of demand for the aggregate imports from Eq. (20) alongside the result in the export equation is considered. In view of the magnitudes of income and price elasticities of demand, it could be said that the study confirms the broad-spectrum of findings in this area of enquiry that trade largely depends on income comparative to price changes. The value of export requirement of imports (export content of import) is statistically significant at 0.01 percent ($\varepsilon_{xm} = 0.171009$). Hence, it is concluded that gross exports in Nigeria contains approximately 17% of converted imported factor inputs in the country.

From the investment function, it can be asserted that investment sensitivity to income follows the accelerator principle, given that the elasticity of investment is elastic and significant at 0.05 percent in respect to domestic income

($\varepsilon_{ky} = 1.13615$); that is, greater than unity. The interest rate is significant at 0.1 percent and negatively influences investment as expected ($\varepsilon_{kr} = -0.64766$). The result points to the fact that investment decisions are mostly anchored on both income and interest rate expectations in Nigeria. Similarly, the domestic investment requirement of imports $\varepsilon_{km} = 0.278284$ is statistically significant at 0.01 percent. Finally, consumption demand is income elastic in the consumption equation. This conforms to our a priori expectations ($\varepsilon_{cy} = 1.183838$) and is statistically significant at 0.01 level of significance.

Two-stage least squares regression was also estimated relying on the same instruments. The results are given in Appendix C. Residual tests to confirm the validity of the results were conducted. This was initiated by conducting the Sargan-J test that gives information about over-identification. The test reveals that instruments used are valid and uncorrelated with error terms. It also demonstrates that the excluded instruments are correctly removed from the estimated equation. The second is the Breusch–Godfrey test of heteroskedasticity. The results show that the errors in the long-run converge to an equilibrium point; hence, they are homoskedastic. The *LM* test shows that there are no problems of serial correlation in the system equation residuals. Finally, the Normality hypothesis of residuals also confirms that the variables are distributed normally, since their Jarque–Bera values are superior to all the probability statistics.

Moving further, the estimates from 3SLS in Appendix B as well as the actual averages of some of the variables over the time period analysed are used for the estimation of the equilibrium growth rates in Table 2. The paper estimated three main equilibrium growth rates. The first one is the original Thirlwall (1979) model (\dot{x}_A). The second one is the original SCA-BOPCG with relative prices non-neutral (\dot{x}_B). The third one is the modified SCA-BOPCG model with relative prices non-neutral as well as the export and investment requirements of import as defined in Eq. (19).

Thirlwall's initial model requires computing the aggregate income responsiveness of demand for imports. We estimated the following model for that purpose:

$$\dot{m} = const + \varepsilon_{my}\dot{y} + \varepsilon_{mp}(\dot{p}^* + \dot{e} - \dot{p}) + v \quad (20)$$

The model is estimated with two stage least squares (2SLS). It uses growth rates of private consumption; government spending and exports plus their respective first period lag values as instruments. The aggregate income and price elasticities are obtained as $\varepsilon_{my} = 1.971938$ and $\varepsilon_{mp} = 0.589786$ respectively. Comparing the income elasticity of demand for imports with demand for exports ($\varepsilon_{xy}^* = 2.088112$), it is observed that Nigeria experiences marginal gains from international trade.

When a comparative analysis of the real growth rate of GDP for the period 1982–2015 (4.26%) with the equilibrium growth rates is conducted, the below bold conjectures can be outlined:

- (i) From the weak version, $\dot{y}_A = \frac{\dot{x}}{\varepsilon_{my}}$, the growth rate is obtained as ($\dot{y}_A = 3.141\%$). This result underpredicts the growth rate realized ($\dot{x} = 4.26$) in Nigeria for the time frame examined. Without considering capital accounts, one may assert that Nigeria grew 1.118 percentage points higher per annum than is permitted by the balance of payment equilibrium condition. This under prediction could possibly be as a result of non inclusion of other relevant determinants of growth in estimation.
- (ii) When SCA-BOPCG version of Thirlwall's model where internal and external imbalances with non-neutral relative prices is considered; a higher outcome ($\dot{x}_B = 5.03\%$) is obtained compared to the original Thirlwall's model. This higher growth rate shows that Nigeria grew at a slower rate than that permitted by BOP equilibrium. It should be noted at this point that the effects of foreign contents used in export growth and domestic investment is not captured.
- (iii) When the effects of exports and domestic investment requirements of imports (foreign contents) alongside the preceding determinants are incorporated, the predicted equilibrium growth rate of domestic income is obtained a $\dot{y}_C = 4.70\%$ per annum. The over-prediction of the SCA-BOPCG model (\dot{y}_B) is essentially adjusted for the effects of foreign content as given by the modified SCA-BOPCG model (\dot{y}_C). Hence, it is concluded that Nigeria has higher chance and potential to accelerate growth without causing BOP problems than it actually did.
- (iv) Note that the actual growth rate of domestic income ($\dot{x} = 4.26\%$) is less than modified SCA-BOPCG ($\dot{y}_C = 4.70\%$); i.e., the growth predicted by the model which accounts for external and internal imbalances, relative prices as well as the effects of foreign contents used in the production of exports and domestic investment. This growth rate (\dot{x}_C) represents the optimal growth rate that Nigeria ought to grow at in order to: firstly avoid balance of

payment disequilibrium challenges; secondly, to achieve economic gain from international trade that improves the welfare of the masses; and thirdly, to be on a sustainable growth path where domestic factor inputs are important drivers of growth. This conclusion is based on the understanding that if foreign exchange earnings are not eroded by massive importation to create exports and investment, then employment, output and long-run growth could rapidly be achieved.⁵

4.3. Scenario analysis and policy recommendation

Here, we carefully crafted some possible and executable policy scenarios to enable us identify the most suitable policies that will assist in positioning Nigeria on the path of rapid and sustainable growth and development. This analysis is carried out in the dimension of the modified SCA-BOPCG given in Eq. (19).

As stated earlier, the novelty of this research is a proposal to incorporate foreign contents used in enhancing export and domestic investment in BOPCG framework. Foreign contents supplies important insights to the occasionally complex workings of global supply chains. It is worthy of mention that internationalisation of markets, countries, and regions in a global setting has made trade even easier and efficient. Because of this leverage, what really matters for domestic income growth is not really the degree of importation to manufacture or produce for export that is the issue but the optimal conversion of imported products into exports that could generate high foreign exchange.

- i Therefore, assuming that a deliberate policy towards reducing export and domestic requirement of imports from $\alpha_x = 0.17$ and $\varepsilon_m = 0.27$ to say 0.05 each such that gains from international trade largely reflects trade in value added, growth of domestic income increases from $\dot{y}_C = 4.70\%$ to 5.02% . This novelty suggests that Nigeria stands to gain more from judiciously utilising local resources to advance growth than relying substantially on foreign content to increase export and accelerate domestic investment.
- ii An expansionary income tax policy adjustment: a fiscal policy aimed at lowering tax revenue from 17.9% to 15% ceteris-paribus, the modified SCA-BOPCG model turns out to be $\dot{y}_C = 4.66\%$ from the initial value of 4.70% in [Table 2](#). Therefore, it could be said that tax reduction alone may not deliver the much needed result.
- iii However, if the federal authority simultaneously reduced tax to 15% and budget deficit W_D from -1.99 to -1.5% as percentage of GDP; domestic income growth rose from $\dot{y}_C = 4.70\%$ to 4.725% . Hence, income tax policy ought to be implemented with a complementary fiscal policy for an improved growth performance.
- iv Similarly, an attempt towards curbing fiscal indiscipline by reducing W_D from to -1.99% to -1.50% and reducing public debt- $W_B = 63\%$ to 50% of GDP below the target of the Stability and Growth Pact in the Eurozone, domestic income growth increased from the initial value of $\dot{y}_C = 4.70\%$ to 4.78% . Though the improvement is minimal, it is particularly meaningful for the Nigerian economy given the poor state of institutional quality and high tendency of financial recklessness by public officials. This policy option may possibly complements the current government policy of single treasury account (TSA) where all public funds are kept in one account to avoid fiscal indiscipline.
- v Monetary policy adjustment: from the investment function, it was discovered that investment decisions are also anchored on interest rate expectation. Priority should then be given to exporters to access credit at a single digit interest rate. Therefore, an expansionary monetary policy of the central bank by reducing interest rate by 50% i.e. from 12.8% to a single digit of 6.4% increased the predicted growth rate from $\dot{y}_C = 4.70\%$ to 4.72% .
- vi One of the major hypotheses of the paper is to determine whether relative prices are important adjustment policy variables. If $(\dot{p}^* + \dot{e} - \dot{p}) = 0$, $\dot{p}^* e / \dot{p} = 1$, $\dot{e} = 1$, $e = 0$, this equally suggests that $\dot{p}^* = \dot{p} = 0.035$, the obtained growth ($\dot{y}_C = 4.70\%$) dramatically reduced to 0.96% suggesting a 3.74% fall in growth. Similarly, assuming same instance however, putting foreign price level identical to domestic price level- $\dot{p}^* = \dot{p} = 0.225$, the obtained growth rate equal (\dot{y}_C) 2.79% suggesting a reduction of 1.91% . Both situations offer divers outcomes. It follows that if relative prices are taken for granted in estimation, underestimation of the actual growth of the economy is inevitable. Therefore, it would not be completely appropriate to conclude that relative prices are constant in the long run growth as forwarded by conventional BOPCG models.
- vii It is exciting to observe the responsiveness of the various components import demand. A reduction in import sensitivity of final private consumption (ε_{mc}) from 2.16% to 1.35% ; predicted growth of the domestic economy

⁵ This conclusion is line with studies such as (Moreno-Brid, 1999; Pacheco-López and Thirlwall, 2004).

substantially increased to $\dot{y}_C = 7.08\%$. And when ε_{mc} maintained at 1.35% and private investment- ε_{mk} is reduced from 0.363% to 0.25, the predicted domestic income growth similarly improved to $\dot{y}_C = 7.56\%$. This is a good approach to help Nigeria meet her over $\dot{y}_C = 7.0\%$ growth target by the year 2020. Therefore, reduction of frivolous import demand that the economy has the capacity to produce (such as: tooth pick, water, frozen chicken, flour, textile) etc will be a commendable policy option. In the same vein, if import content of export is reduced from 0.66% to 0.3%, growth rate of domestic increases to 5.22%.

- viii A 5% reduction in the share of import (W_M) from 0.208 to 0.103%, growth performance of the Nigerian economy increased from $\dot{y}_C = 4.70\%$ to 6.31%. If export share (W_X) is raised from 0.302% to 0.319%, the predicted growth rose from $\dot{y}_C = 4.70\%$ to 4.86. Therefore, Nigeria's growth can be substantially improved by restructuring the external sector.
- ix Assuming that the growth rate of rest of the world proxied by growth rate of OECD members increased from $y^* = 2.36\%$ to 3.7% per annum, the growth of the Nigerian increased to 5.0%. In a similar fashion, when there is 50% approximate increase in export elasticity as in the case of South Korea from the present $\varepsilon_{xy^*} = 2.08\%$ to 4.16%, the predicted growth of domestic income turned out to be $\dot{y}_C = 5.23\%$

Generally, though monetary policy improved the predicted growth of domestic income; reducing import components of demand; especially final consumption and export components proved to be the most viable policy option for small open Nigerian economy. Similarly, reducing public debt and keeping budget deficit within the universally acceptable threshold also improved growth prospects.

5. Conclusion

This research has determined Nigeria's economic growth path from an internally and externally balance of payment constrained growth perspective from 1982 to 2015. The paper started with a brief review of the theoretical development of Thirlwall (1979) model. Based on the objective of this paper, the paper extended Soukiazis et al. (2014) model by taking into account foreign content used export and domestic investment. The research outcome showed that the coefficients of the variables used in estimation conformed to apriori expectation in terms of signs, magnitude and significance. The results obtained from the extended versions of the Thirlwall's model are generally in agreement with the original. One of the major outcomes of the study is that when all relevant factors are incorporated in the model, domestic income growth compatible with BOP equilibrium could be accurately estimated. When foreign contents are ignored in growth accounting, domestic income growth could possibly be over exaggerated.

Given that relative prices matter for growth in the Nigerian context, a purposeful and sound policy ought to be evolved to dampen the import sensitivity of demand for imports especially the final consumption component of imports which the country largely has the capacity to produce for the overall long-run growth of domestic income. Sustaining this policy requires making local manufactured products more desirable and attractive in the domestic market (for instance, by enhancing the supply characteristics of the products-quality, packaging, designs and product differentiation) and placing thorough tariffs on luxurious imports.

In the context of internal imbalances, it should be noted that the desirability of budget deficits depends on how government borrowing is being used (i.e., to finance government consumption or investment in critical infrastructure), the sustainability of such a deficit and how it is financed. Therefore, the gradual rise in public deficit in the face of the continued decline in government revenue in the most recent year needs to be contained below or within the acceptable region of 3% of GDP in line with the universal standard analogous to the Stability and Growth Pact in the Euro zone. Similarly, there is need to enhance fiscal discipline and embark on a very truthful sustainability examination for local and external public debts. If debts ought to be acquired, economic feasibility ought to be the standard.

Appendix A. Explanation of the series and sources of data used

- \dot{m}_t — Imports of goods and services (annual% growth) is based on constant local currency.
- \dot{c}_t —Yearly average growth of private consumption expenditure at 2000 price (national currency; annual percentage change).
- \dot{x}_t — Yearly average growth of real exports—Exports of goods and services based on constant local currency.
- Inv_t — Gross fixed capital formation (annual% growth) based on constant local currency.

\dot{g}_t — General government final consumption expenditure (annual % growth). Annual percentage growth of general government final consumption expenditure is based on constant local currency.

\dot{r}_t —interest rate annual (%) is the lending interest rate by commercial banks.

\dot{x}_t —Annual percentage growth rate of GDP at market prices aggregates are based on constant local currency.

y_{dt} — Annual percentage growth rate of GDP per capita based on constant local currency.

y_t^* — Annual growth rate of real foreign income (OECD countries).

\dot{p}_t — Annual growth rate inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.

\dot{p}_t^* — Yearly average growth rate of inflation of OECD countries.

(P^*e/P) — The real exchange rate (index 2010 = 100) is a nominal effective exchange rate index adjusted for relative movements in national price or cost indicators of the home country Computed by the authors using data from the Federal Reserve of Saint Louis and Central Bank of Nigeria.

i_t^* — Nominal long-term interest rates (percent) for United States.

i_t —nominal long-term interest rates (percent).

W_X —Exports of goods and services (% of GDP).

W_M — Imports of goods and services (% of GDP).

Data on $\dot{m}_t, \dot{c}_t, \dot{x}_t, inv_t, \dot{g}_t, y_t^*, \dot{x}_{dt}, \dot{p}_t, \dot{p}_t^*, W_X, W_m, i_t,$ and i_t^* were Sourced from WorldBank national accounts extracted on March 11, 2017.

W_G — Share of government’s expenditure on GDP includes all non-repayable payments by government, whether for current or capital.

W_D — Share of government’s deficit on GDP computed by the author using data from Africandevlopment bank.

W_B — Share of government’s debt on GDP—General government consolidated gross debt (percent of GDP).

t —Proportion of revenue accruing to the national government on GDP (percent).Sum of current revenue includes all non-repayable government receipts, requited and unrequited, other than those non-compulsory.

Data on $w_G, w_D, w_B, t, \dot{x}$ were extracted on the 19th April, 2017 from African Development Bank Group available at: <http://dataportal.opendataforafrica.org/resource/embed/xedzxdg>.

e — Effective exchange rate (nominal measure, 2010 = 100) extracted on February 20th, 2017from Central Bank of Nigeria statistical bulletin.

Appendix B. Three stage least squares estimation results

	Coefficient	Std. Error	t-statistics	Probability	R ²
Import growth					
Constant	-6.094952	5.261212	-1.158469	0.2492	
Consumption, \dot{c}_t (ϵ_{mc})	2.161911	0.640385	3.375958	0.0010***	
Investment, \dot{k}_t (ϵ_{mk})	0.363804	0.204436	1.779546	0.0780*	0.55
Gov. expenditure, \dot{g}_t (ϵ_{mg})	-0.177177	0.054601	-3.244925	0.0016***	
Relative price, $\dot{p}_t^* + \dot{e} - \dot{p}_t$ (ϵ_{mp})	-0.022707	0.129759	-0.174991	0.8614	
Exports, \dot{x}_m (ϵ_{mx})	0.662150	0.270876	2.444478	0.0161**	
Consumption growth					
Constant	-0.793379	3.985399	-0.199071	0.8426	
Disposable income, \dot{x}_{dt} (ϵ_{cy})	1.136150	0.557601	2.037567	0.0440**	0.49
Investment growth					
Constant	0.278284	0.115087	2.418025	0.0173**	
Domestic income, \dot{x}_t (ϵ_{ky})	1.136150	0.557601	2.037567	0.0440**	0.35
Real interest rate, \dot{r}_t (ϵ_{kr})	-0.337929	0.197233	-1.713345	0.0895*	
Inv. req.of imports, \dot{m}_t (ϵ_{km})	0.278284	0.115087	2.418025	0.0173**	

Export growth

Constant	1.315435	4.738940	0.277580	0.7819	
World income, \dot{x}^* , (ε_{xy^*})	2.083112	1.221992	1.704686	0.0911*	0.12
Relative price, $(\dot{p}^* + \dot{e} - \dot{p})$, (ε_{xp})	0.108692	0.059372	1.830703	0.0699*	
Export req. of imports, \dot{m} , (ε_{xm})	0.171009	0.064536	2.649807	0.0093***	

Notes: Endogenous variables: $\dot{m}_t, \dot{c}_t, \dot{k}, \dot{x}_t, \dot{g}_t, \dot{y}_t, \dot{y}d_t, \dot{r}_t$ and $\dot{p}_t^* + \dot{e}_t - \dot{p}_t$.

Exogenous variables: WB, WB(-1) WG WG(-1), WD, WD(-2), rt(-1), it(-2), i*(-1) i*(-2), pt, pt,(-1), pt*, pt*(-1), ct(-1), invtt,(-2), invtt,(-3), x(-1), gt(-1), gt(-2), xt*(-2), mt(-3), xt(-3), (p*+e-p)(-2), p*+e-p(-3).

***Estimate significant at 0.01.

**Estimate significant at 0.05.

*Estimate significant at 0.1.

Appendix C. Two-stage least squares

	Coefficient	Std. error	t-Statistic	Prob	Sargan Norm (J-stat)	Norm	Hetero	LM
Import growth								
Constant	-7.651497	5.326917	-1.436384	0.1538				
Consumption, \dot{c} , (ε_{mc})	2.623898	0.659378	3.979351	0.0001***	24.77(0.30)	2.49(0.28)	0.33(0.30)	0.21
Investment, \dot{k} , (ε_{mk})	0.206770	0.212374	0.973612	0.3324				
Gov. expenditure, \dot{g} , (ε_{mg})	-0.205440	0.056488	-3.636871	0.0004***				
Relative price, $\dot{p}^* + \dot{e} - \dot{p}$, (ε_{mp})	-0.013716	0.133183	-0.102986	0.9182				
Exports, \dot{x}_m , (ε_{mx})	0.771547	0.280020	2.755327	0.0069***				
Consumption growth								
Constant	2.419389	1.546907	1.564017	0.1206				
Disposable income, $\dot{x}d$, (ε_{cy})	1.209453	0.234741	5.152278	0.0000***	24.92(0.49)	1.80(0.40)	0.65(0.63)	0.07
Investment growth								
Constant	-1.587096	4.069427	-0.390005	0.6973	22.7(0.53)	2.08(0.35)	0.30(0.27)	0.37
Domestic income, \dot{x} , (ε_{ky})	1.464620	0.586512	2.497170	0.0140**				
Real interest rate, \dot{i} , (ε_{kr})	-0.383904	0.208247	-1.843500	0.0680*				
Inv. req. of imports, \dot{m} , (ε_{km})	0.177194	0.121415	1.459407	0.1474				
Export growth								
Constant	-2.319620	7.403690	-0.313306	0.718				
World income, \dot{x}^* , (ε_{xy^*})	4.195817	2.698778	1.554710	0.1229	25.43(0.38)	1.19(0.35)	0.30(0.28)	0.15
Relative price, $\dot{p}^* - \dot{e} - \dot{p}$, (ε_{xp})	0.215817	0.123633	1.745624	0.0837*				
Export req. of imports, \dot{m} , (ε_{xm})	0.049610	0.141481	0.350650	0.7265				

Endogenous variables: $\dot{m}_t, \dot{c}_t, \dot{k}, \dot{x}_t, \dot{g}_t, \dot{y}_t, \dot{y}d_t, \dot{r}_t$ and $\dot{p}_t^* + \dot{e}_t - \dot{p}_t$.

Exogenous variables: WB, WB(-1) WG WG(-1), WD, WD(-2), rt(-1), Δ it(-2), i*(-1) i*(-2), pt, pt,(-1), pt*, pt*(-1), ct(-1), invtt,(-2), invtt,(-3), xt(-1), gt(-1), gt(-2), xt*(-2), x*(-3), mt(-3), xt(-3), (p*+e-p)(-2), p*+e-p(-3).

***Estimate significant at 0.01.

**Estimate significant at 0.05.

*Estimate significant at 0.1.

References

- Antunes, M., Soukiazis, E., 2008. How well the balance-of- payments constraint approach explains the Portuguese growth performance. Empirical evidence for the 1965-2008 period. Chart, 1–28.
- Araujo, R.A., Lima, G.T., 2007. A structural economic dynamics approach to balance-of-payments-constrained growth. *Camb. J. Econ.* 31 (5), 755–774, <http://dx.doi.org/10.1093/cje/bem006>.
- Bajo-rubio, O., 2014. Balance-constrained growth rates: generalizing Thirlwall' s law. *Appl. Econ. Lett.* 21 (9), 593–596.
- Barbosa-Filho, N.H., 2005. International liquidity and growth fluctuations in Brazil. *Financ. World Econ.*, 334–355.
- Cimoli, M., Lima, G.T., Porcile, G., 2016. The production structure, exchange rate preferences and the short-run-medium-run macrodynamics. *Struct. Change Econ. Dyn.* 37, 13–26, <http://dx.doi.org/10.1016/j.strueco.2015.11.006>.

- Civcir, I., Yucel, M.E., 2020. Sage Open. In preparation.
- Dixon, P.B., Thirlwall, A.P., 1975. A model of regional growth rate differences on Kaldorian lines. *Oxf. Econ. Pap.* 27 (2), 201–214.
- Elliott, D.R., Rhodd, R., 1999. Explaining growth rate differences in highly indebted countries: an extension to Thirlwall and Hussain. *Appl. Econ.* 31 (9), 1145–1148, <http://dx.doi.org/10.1080/000368499323634>.
- Gouvea, R.R., Lima, G.T., 2010. Structural change, balance-of-payments constraint, and economic growth: evidence from the multisectoral Thirlwall's law. *J. Post Keynes. Econ.* 33 (1), 169–204, <http://dx.doi.org/10.2753/PKE0160-3477330109>.
- McCombie, J.S.L., Thirlwall, A.P., 1994. *Economic Growth and the Balance-of-Payments Constraint*. St. Martin's Press, New York, Retrieved from <https://mirlyn.lib.umich.edu/Record/002866690-CN-HG-3882-M3961-1994>.
- McCombie, J.S.L., Thirlwall, A.P., 1997. The dynamic Harrod foreign trade multiplier and the demand-orientated approach to economic growth: an evaluation. *Int. Rev. Appl. Econ.* 11 (1), 5–26.
- Moreno-Brid, J.C., 1999. Mexico's economic growth and the balance of payments constraint: a cointegration analysis. *Int. Rev. Appl. Econ.* 13 (2), 149–159, <http://dx.doi.org/10.1080/026921799101634>.
- Moreno-Brid, J.C., 2003. Capital flows, interest payments and the balance-of-Payments constrained growth model: a theoretical and empirical analysis. *Metroeconomica* 54 (2/3), 346, Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=edb&AN=10193271&site=eds-live>.
- Pacheco-López, P., Thirlwall, A.P., Canterbury 2004. Trade Liberalisation in Mexico: Rhetoric and Reality (03 No. 4).
- Pashak, Y., Civcir, I., Ozdeser, H., 2019. Explaining Nigeria's economic growth: balance of payments constrained growth approach with external and internal imbalances. *South African J. Econ.* 87 (3), 376–413, <http://dx.doi.org/10.1111/saje.12216>.
- Pelagidis, T., Desli, E., 2004. Deficits, growth, and the current slowdown: what role for fiscal policy? *J. Post Keynes. Econ.* 26 (3), 461–469, <http://dx.doi.org/10.1080/01603477.2004.11051408>.
- Rovira, S., Cimoli, M., Porcile, G., 2010. Structural change and the BOP-constraint: why did Latin America fail to converge. *Camb. J. Econ.* 34 (2), 389–411.
- Soukiazis, E., Antunes, M., Kostakis, I., 2018. The Greek economy under the twin-deficit pressure: a demand orientated growth approach. *Int. Rev. Appl. Econ.* 32 (2), 215–236, In this issue.
- Soukiazis, E., Antunes, M., Stoian, A., Coimbra 2015a. The Effects of Internal and External Imbalances on Romanian's Economic Growth (No. 2012–03)).
- Soukiazis, E., Cerqueira, P.A., Antunes, M., 2012. Modelling economic growth with internal and external imbalances: empirical evidence from Portugal. *Econ. Model.* 29 (2), 478–486, <http://dx.doi.org/10.1016/j.econmod.2011.12.001>.
- Soukiazis, E., Cerqueira, P.A., Antunes, M., 2014. Explaining Italy's economic growth: a balance-of-payments approach with internal and external imbalances and non-neutral relative prices. *Econ. Model.* 40, 334–341, <http://dx.doi.org/10.1016/j.econmod.2014.04.014>.
- Soukiazis, E., Cerqueira, P., Antunes, M., 2013. Growth rates constrained by internal and external imbalances and the role of relative prices: empirical evidence from Portugal. *J. Post Keynes. Econ.* 36 (2), 275–298, <http://dx.doi.org/10.2753/PKE0160-3477360205>.
- Soukiazis, E., Cerqueira, P., Antunes, M., 2015b. Causes of the decline of economic growth in Italy and the responsibility of EURO. A balance-of-payments approach *faculdade de economia. Rev. Keynes. Econ.* 3 (4), 491–516.
- Thirlwall, A.P., 1979. The balance of payments constraint as an explanation of the international growth rate differences. *PSL Q. Rev.*, 46–53.
- Thirlwall, A.P., 2011. Balance of payments constrained growth models: history and overview. *PSL Q. Rev.* 64 (259), 307, Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=edb&AN=75339729&site=eds-live>.
- Thirlwall, A.P., Hussain, M.N., 1982. The Balance of Payment Constraint, Capital flows and Growth rate differences between developing countries. *Oxf. Econ. Pap.* 34 (3), 498–510.
- WTO, 2017. Nigeria's Trade Policy Review, WT/TPR/S/356. https://www.wto.org/english/tratop_e/tp_r_e/s356_e.pdf accessed 15/05/2018.