Balance of payments constrained growth in Nigeria: a multi-sectoral `thirlwall's model approach

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Key words

Balance of payments, economic growth, Thirlwall`s model, sectoral comparison, structural change

Abstract

This paper examines balance of payments constrained growth in Nigeria from 1970-2010 by investigating how structural change, identified with changes in the sectoral composition of exports and/or imports, affects the extent of the external constraint. This is done with the frameworks developed by Thirlwall, (1979) and McCombie and Thirlwall, (1994), especially the theory of Multi-sectoral Thirlwall's model. Nigeria has witnessed an unfavourable balance of payments for a very long time. This has resulted in serious macroeconomic imbalances, and hence generated problems of economic development. Ordinary Least Squares (OLS) econometric technique was used to analyse the data. The data was first examined for unit roots using the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests. A co-integration regression was then used to examine the long run relationship among the variables. The short-run Vector Error Correction (VEC) model was also used to determine the speed of the adjustment to equilibrium. The results show that exchange rate, gross domestic product and world gross domestic product have significant and positive effect on Nigeria's sectoral compositions of imports and exports. Furthermore, import and export functions show that imports increase more than exports as reaction of the domestic product growth, it is undoubtedly, that the Nigerian economy has followed, "de-industrialization process" that is, importing manufactured and consumers goods from the rest of the world and relying mostly on oil for her export while it was loosing competitively. Consequently, to accelerate economic growth and possible economic development Nigeria must reduce the demand for imports and increase the supply for exports, through balance of payments constraint alleviating strategies, for instance, export-based growth policy along with supply-side policies to alter the structure of production by channeling resources to the agricultural and manufacturing sectors and advice on the characteristics of the goods produced

1.0. Background to the study

The relationship between trade, growth and balance of payments (BOP) has been a subject of considerable interest and empirical scrutiny in growth and development economics in recent years. The links between balance of payments, trade and growth are crucial from both analytical and policy standpoints. Moreover, the analysis of the balance of payments as a major constraining factor on growth has recently come to be an important research area for economists. The balance of payments is said to be essential in any theory of economic growth and trade since it represents an important restricting variable (Elitok and Campbell, 2008).

Nigeria has witnessed an unfavourable balance of payments for the past 41 years. This scenario has created serious problems for the economy, and has given rise to several economic policy measures, which has not been successful.

The persistent macroeconomic problems in the economy even after the introduction of a number of stabilization measures made the government to adopt the Structural Adjustment Programme (SAP) in 1986. This was meant to further strengthen the existing demand management policies; restructure and diversify the production base of the economy and reduce dependence on the oil sector and on imports. One of the key objectives of the Structural Adjustment Programme was to achieve fiscal and balance of payments viability over the adjustment period, among other underlying objectives (Philips, 1987). In order to accomplish this and other goals, a number of policy measures were initiated and implemented. For example, export promotion policy, different exchange rate regimes, contractionary monetary policy, import substitution industrialization policy including a market-determined exchange rate, improved trade and payments liberalization, and the provision of generous incentives to promote exports yet balance of payments continued to showed red, though the government have tried to change the course of the BOP, but up till date there is still no improvement, probably is as a result of the angle (supply side) the government have been concentrating. This research work has given us a new leeway to the understanding and possible correction of the balance of payments in Nigeria.

The problem of balance of payments in the last two decades has been heavy external debt servicing, ineffectiveness of monetary, exchange rate and fiscal policies in establishing balance of payments equilibrium. The numerous non-oil export promotion policies and other measures equally have failed to ease the balance of payments constraint. This is largely because these measures did not adequately address the problem of production, that is, the supply of exportable goods and services.

However, federal government budgets of the '90s provide an insight into the need to implement with dispatch a new approach to economic recovery through the revitalization of the non-oil sector to increase exports. As a result, in 1995 the sum of ₦2.7bilion was earmarked for the development of solid mineral and increase production of agriculture crops such as tree crops and tubers, cereals and legumes, livestock and fisheries, etc. it is sad to note that, the measures was abandon at the long run without achieving the required target. The balance of payments constrained growth model is an alternative to supply-oriented model. It was developed by Thirlwall (1979), and extended by Thirlwall and Hussain (1982). These models considered both demand and supply factors. It maintains that; trade, financial liberalization and export promotion strategies are necessary but not sufficient to lead to better growth performance.

According to Lima et al, (2008), aggregate demand plays an important role in determining economic growth in the long run. One major argument is that, accumulations of potential output are demand-determined (Setterfield, 2003). Given this scenario, the Keynesian demand-oriented approach that emphasizes the external constraint on growth is the replica of balance of payments constrained growth (Lima et al, 2008). Balance of payments constrained growth can be defined as the situation where the performance of a country in foreign markets as well as the response of the world to this performance constrained the growth of the country to a rate less than the rate required for addressing domestic economic problems (Adewuyi and

Adeoye, 2007). These problems according to Mc combie and Thirlwall, (1994) and Hussain, (1999) include: the prevalence of unemployment, underemployment high import demand by Nigerians, low export, the existence of idle resources and low capacity utilization.

The relationship that exists between the growth rate of output and the ratio of exports growth to the income elasticity of demand for imports is known as Thirlwall's Law. Thirlwall"s Law implies that a country's growth rate will rise only when the growth rate of world income increased, whereas the Multi-Sectoral Thirlwall's Law implies that a country can still raise its growth rate even when such a rise in growth of world income does not occur, provided it is able to change the sectoral composition of exports and/or imports accordingly.

The theoretical and empirical literatures have focused on supply factors when studying balance of payments constraint and economic growth determinations for a very long time. For example, Solow (1956) acknowledged that, the endogenous growth theory assumes that the growth rate of per capita income is determined solely by supply side factors, contrary to Thirlwall's law, which focused on the demand side factors.

It should be stressed that the balance of payments constrained growth approach, despite being demand-oriented, it does acknowledged the importance of the supply characteristics of goods (Thirlwall, 1997). It has been argued that there is not much difference between export-led growth model and the balance of payments constrained model since both focus on the role of foreign sector in the growth process. The original Thirlwall's model implies that the only sure and long-term solution to increase a country's growth rate, which is consistent with balance of payments equilibrium, is to diversify the economy (Thirlwall, 2002).

1.1 Balance of payments and economic growth in Nigeria

Macroeconomic problems and financial management in Nigeria is complicated by balance of payments instability attributable mostly to its oil dominated export earnings. In the short term, the Nigerian balance of payments is subject to a high degree of variability caused by changing in government spending, which often creates surges in import payments for capital projects, changes in the prices of oil and changes in capital flight caused by periodic exchange rate uncertainty. This assessment is predicated by the dynamic of balance of payments right from 1970. Over the last three decades, there has been growing trend in the fluctuations of the Nigeria's balance of payments. Balance of payments crisis distorts the working of the entire system because it creates disequilibrium between the supply and demand for money (Nwani, 2003).

In assessing the growth performance of the Nigerian economy, it is clearly shown that, growth performance of the Nigerian economy is a function of domestic production, consumption and foreign transaction in goods and services. However, the foreign trade has been acknowledged as the engine of growth and development, but in Nigeria it is hard to accept such a hypothesis. Adewuyi and Adeoye (2007) emphasized that, an economy that is characterized by macroeconomic stability and favourable investment climate, attractive trade policies would encourage foreign investment, technology advancement and exports, which will in turn attract massive inflow of foreign exchange, however, this was not the case in Nigeria. Before oil was discovered in commercial quantity in 1959, the Nigerian economy relied mostly on agricultural production and exports. Agriculture was the mainstay of the economy. It generated about 96 per

cent of the total federal government generated revenue. Hence, the Nigerian government was able to complete developmental projects through the earnings from agricultural product exports and foreign aid, although, the capacity of the economy to accumulate domestic savings to finance investment projects was inadequate (Adewuyi and Adeoye, 2007). The consequences of these inadequacies led to the government generating insufficient foreign exchange, which was largely due to persistent balance of payments problems, arising from the reliance on " mono-product and primary export" which is not competitive at the international market. The chain reactions, however, led to the unfavourable terms of trade and shortage in government generated revenue. All these have served as a check on demand (import demand) and a constraint to effective implementation of national development plans. The huge revenue and foreign exchange generated from oil exports in the 1970s was a misplaced priority, because the government was unable to undertake viable investment projects that would have laid the foundation for sustainable growth and development.

During the period 1970-1975 we saw the saving-GDP ratios ranged between 16.7 and 36 per cent, while investment –GDP ratio ranged between 16.9 and 26.0 per cent. However, the saving-investment gap/GDP showed a positive indication, these improvements was not unconnected with the massive inflow of foreign exchange receipts from exports as a result of the huge revenue generated from oil. The oil boom during this period stimulated the economy to growth in real terms at an average of 8.4 per cent. This period also witnessed positive GDP ratios, and of course the balance of payments recorded was favourable. All these positive indicators suggest that, financial resources were not a constraint to economic growth in Nigeria.

Between 1975-1980, the balance of payments positions were unfavourable for most of the years, and it triggered high savings and investment rates but low and negative saving-investment gap-GDP ratios because most of the external financial resources were utilized to execute investment projects. But in 1970-1980, the oil boom was at its peak, the balance of payments position was positive, investment rate was high, savings rate was about 30 per cent and the ratios of savings-investment gap to GDP was more than 6 per cent. But the gain realized from the oil boom was not transmitted into the economy, therefore, the real income (GDP) growth rate dropped drastically to 2.8 per cent.

According to Adewuyi and Adeoye (2007), this low growth performance of the economy was attributed to the type of development strategy adopted – the public sector -led strategy, which emphasized the expansion of public sector activities, particularly enterprises to provide basic infrastructural facilities and social amenities. It also noted that, the government embarked on income distribution policy through various awards and other welfare package. Trade policy during this period also favoured imports, which was misused and the government then had no control over expenditure and balance of payments position. Due to oil glut in 1980s, there was price shock of oil export in the international market; hence a substantial reduction in export earnings accrued to the Nigerian government. The aftermath of this oil price shock was huge and recurring fiscal deficits, unfavourable balance of payments, fall in the exchange rate, unprecedented debt crisis, due to unsustainable huge public sector expenditure and lack of diversification of export earnings. The early 1980s witnessed deficits in current accounts and the deficit-GDP ratios rose to 12 per cent in 1982 and the ratio of savings-investment gap to GDP widened and the total debt-GDP ratios increased.

The period 1980-1993 saw the government introducing various economic stabilization policies to address the battered economy; amongst the policies adopted was the " Demand management policy" in 1982 when the problems was perceived as demand derived. Others include: imposition of high tariff for imported goods, import substitution industrialization policy, contractional fiscal and monetary policies in order to reduce the level for aggregate demand and achieve fiscal and balance of payments equilibrium, etc. consequently, the deficit-GDP ratio fell from 12 per cent in 1982 to 4 per cent in 1985. The balance of payments position, which was negative between 1982 and 1983, became positive in the 1984-1985 periods. The total debt-GDP ratio rose from 9.6 per cent in 1980 to 24.1 per cent in 1985. Of course these constraints on the economy led to declining of the real GDP by 3.8 per cent between 1980-1985.

The period of SAP also saw the ratio of investment to GDP ranged between 11.0 and 18.5 per cent, while the ratio of savings to GDP was between 10.0 and 28.5 per cent. The saving-investment gap-GDP ratio, which was negative between 1986-1987, became positive in the subsequent years. This suggests that the SAP period was characterized by relatively low-level absorptive capacity of the economy since some proportions of savings were not translated into investment

The terms of trade and the nominal growth in trade components fluctuated during this period while there were deficits in the overall balance of payments. As a result of the poor performance of the major macroeconomic variables, the growth performance of the economy was also affected. For example, GDP growth rate, which rose from 3.2 per cent in 1986 to 10.0 per cent in 1988, declined continuously from 8.2 per cent in 1990 to 2.7 per cent in 1993. Inclusively, the relative low-level absorptive capacity of the economy continued in the subsequent period and the savings – investment gap – GDP ratio was positive, while the external trade performance indicators did not show significant improvement. The ratio of fiscal deficit to GDP reached a height of 11.0 per cent in 1994, while the real GDP growth rate was less than 4.0 per cent during the period 1994 – 2002.This study analyzes both demand and supply side factors as determinants of the Nigerian economic growth between 1970 and 2010, using the framework introduced by Thirlwall (1979), Thirlwall and Hussain (1982) and Aruojo and Lima (2007). The paper is organised as follows: after the introduction, the theoretical framework and literature review are discussed in section two, the model specification in section three, analysis of results in section four; and section five zeros in on concluding remarks

2.0 Theoretical framework and literature review

Araujo and Lima (2007) developed a Balance of Payments Constrained Growth (BPCG) model for a multi-sectoral economy in which productivity and demand varies over time at particular rates in each one of the sectors of two countries. Let A denote the advance country and U the underdeveloped one. Both countries are assumed to produce n-1 consumption goods. The physical and monetary flows of commodities in country U can be summarized by three conditions: the full employment of labour condition, full expenditure of national income and trade balance equilibrium along with the solution for the system of physical and monetary quantities.

The full employment condition can be stated as follows:

$$\sum_{i=1}^{n-1} (\alpha_{in} + \zeta\alpha_{in})\alpha_{ni} = 1 \qquad (1)$$

Where α_{in} and α_{in} are the per capita demand coefficients of final commodity i, with i=1, 2…n-1. While the former refers to local demand, the latter refers to foreign demand. Meanwhile, α_{in} coefficients of consumption goods, which represent quantities of labour employed in each sector. The household sector in country A is denoted by n and the population sizes in both countries are related to each other by the coefficient of proportionality ζ.

The condition for full expenditure of national income can be expressed as:

$$\sum_{i=1}^{n-1} (\alpha_{in} + \alpha_{in})\alpha_{ni} = 1 \qquad (2)$$

Where α_{in} is the per capita import demand coefficient for commodity i produced in country A.
The trade balance equilibrium is given by:

$$\sum_{i=1}^{n-1} (\zeta\alpha_{in} - \alpha_{in})\alpha_{ni} = 0 \qquad (3)$$

An important property of the model, as pointed out by Araujo and Lima (2007), is that the trade balance equilibrium can be written not in terms of prices, as is usual, but in terms of labour coefficients. Labour coefficients α_{ni} weight both the export demand and import demand coefficients for commodities i.

The solution of the system for physical quantities can be stated as follows:

$$X_i = (\alpha_{in} + \zeta\alpha_{in})X_n \qquad i = 1, 2\ldots\ldots n-1 \qquad (4)$$

Where X_i is the amount of production of commodity i and X_n is the population of country U.
The physical quantity of each tradable commodity that is produced in country U will be determined by the sum of foreign and domestic demands. With p_i being the price of commodity i in country U, and w_u the (uniform) wage rate, the set of solutions for prices can be expressed as:

$$P_i = \alpha_{in} w_u \qquad i = 1, 2\ldots\ldots n-1 \qquad (5)$$

Equation (5) implies that relative quantities of embodied labour continue to regulate relative commodity prices within the boundaries of each country. It is reasonable to assume that if $P_{\hat{i}} \leq P_i$, which means that country U does not have a comparative advantage in producing good i, then the foreign demand for commodity i is equal to zero. If $P_{\hat{i}} > P_i$, it is assumed that foreign demand for commodity i is given by a standard export function.

These conditions can be expressed as follows:

$$x_{ni} = \begin{cases} 0 & \text{if } p_{\hat{i}} < p_i \\ \left(\dfrac{p_i}{p_{\hat{i}}}\right)^{\eta_i} Y^{\beta_i}{}_A & \text{if } p_{\hat{i}} \geq p_i \end{cases} \qquad (6)$$

Where X_{in} is foreign demand for commodity i, η_i is the price elasticity of demand for export of commodity i ($\eta_i < 0$), while β_i is the income elasticity of demand for exports and Y_A is the national income of country A. The per capita coefficient for foreign demand of commodity i, expressed in (7), can be obtain by dividing both sides of (6) by X_{in} , where we denote per capita income of country A by y_A:

$$\alpha_{in} = \begin{cases} 0 & \text{if } p_{\hat{i}} < p_i \\ \left(\frac{p_i}{p_{\hat{i}}}\right)^{\eta i} y^{\beta i}{}_A X^{\beta i-1}{}_n & \text{if } p_{\hat{i}} \geq p_i \end{cases} \qquad (7)$$

Likewise, if the country A has no comparative advantage producing good i the per capita import demand for commodity i in county U is equal to zero, that is, $x_{in} = 0$. But if $p_{\hat{i}} > p_i$, then let consider that the import demand coefficients are by a standard import demand function, which is given by the following functional form:

$$m = \alpha_{in} = \begin{cases} 0 & \text{if } p_{\hat{i}} < p_i \\ \left(\frac{p_i}{p_{\hat{i}}}\right)^{\psi i} Y^{\phi i}{}_u & \text{if } p_{\hat{i}} \geq p_i \end{cases} \qquad (8)$$

Where ψ_i is price elasticity of demand for imports of commodity i ($\psi_i < 0$), ϕ_i is the income elasticity of demand for imports and Yu is the real income of country U. Taking natural logarithms on both sides of equations (7) in the case of $P_i > P_i$, and differentiating them with respect to time, we obtain the growth rate of per capita export demand for commodity i:

$$\alpha_{in} = \begin{cases} 0 & \text{if } p_{\hat{i}} < p_i \\ \left(\frac{p_i}{p_{\hat{i}}}\right)^{\psi i} Y^{\phi i}{}_u X^{\phi i-1} & \text{if } p_{\hat{i}} \geq p_i \end{cases} \qquad (9)$$

In case $P_i > P_{\hat{i}}$, we can take natural logarithm in both sides of (7) and differentiate it with respect to times, we obtain the growth rate of per capita export demand for commodity i.

$$\frac{\alpha_{in}}{\alpha_{in}} = \begin{cases} 0 & \text{if } p_{\hat{i}} < p_i \\ \eta_i (\sigma^u{}_i = \sigma^A{}_i) + \beta_i \sigma^A{}_y + (\beta_i - 1)g & \text{if } p_{\hat{i}} \geq p_i \end{cases} \qquad (10)$$

In equation (10) the following convention was adopted:

$$\frac{pi}{pi} = \sigma^u{}_i, \quad \frac{pi}{pi} = \sigma^A{}_i, \quad \frac{y_A}{y_A} = \sigma^A{}_y \text{ and } \frac{X_n}{x_n} = g$$

By adopting the same procedure with respect to equation (9) where $P_{\hat{i}} > P_i$ and by adopting the convention that

$$\frac{y_A}{y_A} = \sigma^u{}_y \text{ and } \frac{X_n}{x_n} = g \text{ we obtain its}$$

dynamic version:

$$\frac{\alpha_{in}}{\alpha_{in}} = \begin{cases} 0 & \text{if } p_i < p_i \\ \psi_i(\sigma^{A_i} = \sigma^{u_i}) + \phi_i \sigma^{u_y} + (\phi_i - 1)g & \text{if } p_i \geq p_i \end{cases} \quad (11)$$

Let us assume that the rate of change of price of commodity i is equal in both countries, that is $\sigma^{u_i} = \sigma^{A_i}$, and that g = g =0, which means that the population in both countries remains constant. In this case equation (10) and (11) can be respectively simplifies to:

$$\frac{\alpha_{in}}{\alpha_{in}} = \beta_i \sigma^{A_y} \quad (12)$$

$$\frac{\alpha_{in}}{\alpha_{in}} = \beta_i \sigma^{A_y} \quad (13)$$

Instead, only one of the two above equations is valid. In order for the equilibrium in the balance of payments to be maintained, it is necessary that the rate of change of equation (3) be equal to zero. Formally:

$$\sum_{i=1}^{n-1} (\zeta\alpha_{in} - \alpha_{in})\alpha_{ni} + \sum_{i=1}^{n-1} (\zeta\alpha_{in} - \alpha_{in})\alpha_{ni} = 0 \quad (14)$$

Considering the case in which there is no technical progress, that is, $\alpha_{ni}(t) = 0$, expression (14) becomes:

$$\sum_{i=1}^{n-1} (\zeta\alpha_{in} - \alpha_{in})\alpha_{ni} = 0 \quad (15)$$

By substituting equation (10) and (11) into equation (15) we obtain the following, after some algebraic manipulation

$$\sigma^{U_y} = \frac{\sum_{i=1}^{n-1} \zeta\beta_i\alpha_{in} - \alpha_{in}}{\sum_{i=1}^{n-1} \phi_i\alpha_{in}\ \alpha_{ins}}\sigma^{A_y} \quad (16)$$

Equation (16) shows the relationship between the growth rate of per capita income in countries U and A. let us define Δ as:

$$\Delta = \frac{\sum_{i=1}^{n-1} \zeta\beta_i\alpha_{in}\alpha_{ni}}{\sum_{i=1}^{n-1} \phi_i\alpha_{in}\alpha_{ni}} \quad (17)$$

A situation of uneven development will follow in the case of Δ < 1, which implies that per capita income of the advanced country grows at a higher rate than the per capita income of the underdeveloped one. It can be shown that Δ < 1 if and only if:

$$\sum_{i=1}^{n-1} (\phi_i\alpha_{in} - \zeta\beta_i\alpha_{in})\alpha_{ni} < 0 \quad (18)$$

This inequality holds if the share of consumer expenditure in A for U goods is smaller than the share of consumer expenditures in U for A goods, a phenomenon that could be explained by so-called Engel's Law.

By summing over equation (12) and after some algebraic manipulation we obtain:

$$\sigma^{A}_{y} = \frac{\alpha_{in}}{\sum_{i=1}^{n-1} \alpha_{in}} \Big/ \sum_{i=1}^{n-1} \beta_i \qquad (19)$$

Substituting (19) in (16) we obtain

$$y_w = \sigma^{U}_{y} = \frac{\dot{y}_\theta \sum_{i=1}^{n-1} \zeta \beta_i \alpha_{in} \alpha_{in}}{\sum_{i=1}^{n-1} \frac{ain}{ain} \left[\sum_{i=1}^{n-1} \phi_i \alpha_{in} \alpha_{ni} \right] \left[\sum_{i=1}^{n-1} \beta_i \right]} \qquad (20)$$

Equation (20) is the multi-sectoral version of what Thirlwall, (1979) called the balance of payments equilibrium growth rate, Araujo and Lima, (2007) called it the Multi-Sectoral Thirlwall's Law. Equation (20) asserted that a country growth rate of per capita income is directly proportional to the growth rate of its exports, with such proportionality being inversely (directly) related to sectoral income elasticities of demand for imports (exports). These elasticities, in turn, are weighted by coefficients that measure the share of each sector in total exports and imports, respectively.

According to Lima et al, (2007) a major implication of the Multi-Sectoral Thirlwall's Law is that changes in the composition of demand or in the structure of production, which are not reflected in changes in income elasticities but come through changes in the share of each sector in aggregate exports or imports, are important for growth. Given the structural multi-sectoral model, Bairam (1997) uses a sample of developing and developed countries and found evidence that suggests not only that the ratio of income elasticity of exports to income elasticity of imports (Harrod foreign trade multiplier) is larger for developing countries than for developed countries, but also that there could be an inverse relationship between the level of economic development and the value of that ratio for any given country.

Thirlwall (1997) expresses his concern, however, with the inference drawn by Bairam (1997), which would imply that developing counties are less balance of payments constrained in their growth than developed countries because the income elasticity of demand for exports is apparently negatively related to the level of per capita income, Thirlwall pointed out that, to draw inference from such a small, selected sample of developing countries that contains mainly newly industrializing countries and very few really poor countries is dangerous. With a full range of countries from very poor to very rich, Thirlwall would expect an inverted-U relationship showing the income elasticity of exports rising as countries move from primary

product exports to light manufactures and then decreasing as richer countries get locked into antiquated industrial structure.

Anderson (1993) carried out an extensive study with wider coverage; he applied a co integration technique to Thirlwall's model for 16 European countries over the period 1960-1990. His conclusion reveals that growth rate of their real GDP was indeed constrained by balance of payments thereby providing empirical support to the long-term model . Gouvea and Lima (2008) applied the balance of payments constrained growth model to four Latin American countries (Argentina, Brazil, Colombia and Mexico) and four Asian countries (South Korea, Malaysia, Philippines and Singapore) over the period 1962-2006. This research was carried out within a structural economic dynamic framework by Aroujo and Lima (2007), to determine how the effect of sectoral composition of exports and /or imports affect the extent of the balance of payments constraint within a multi-sectoral Thirlwall's law. Their result was supportive of Thirlwall's law for all the countries except South Korea. Other studies that are in support of Thirlwall's law or multi-sectoral Thirlwall' law include: Parikh (2002), Moreno-Birid and Perez (1999), Moreno-Birid (1998, 1999),

In Africa, there have been some few studies that investigated the relevance of Thirlwall's law or Thirlwall and Hussain (1982) model to the dismal growth performance of African countries. In an empirical study of growth differences between African and Asian countries Hussain (1999) used Thirlwall-Hussain (1982) model to explain the low growth rates experienced by African countries in terms of their low export expansion relative to the import required for the process of growth. According to him African poor performance is due to the low magnitude of the dynamic Harrod foreign trade multipliers. He concluded that this is a direct outcome of their dependence on primary commodity exports.

3.0 Model specification

As far as the Multi-Sectoral Thirlwall's Law is concerned, the choice of the level of sectoral aggregation is based upon both theoretical and empirical considerations.(Gouvea and Lima, 2009). Given the inexistence of sectoral price indexes for the whole time span, we used the aggregate real exchange rate as a proxy for the sectoal real exchange rates. Thus;

$$\Delta LMt = \alpha_0 + \alpha 1 \Delta LGDPt + \alpha_2 \Delta LNEERt + \mu_1 \quad 3.1$$

$$\Delta LM_{it} = \lambda_0 + \lambda 1 \Delta LGDPt + \lambda 2 \Delta LNEERt + \mu \quad 3.2$$

$$\Delta LX_{it} = \beta 0 + \beta 1 \Delta LWGDPt + \beta 2 \Delta LNEERt + \mu_3 \quad 3.3$$

$$\Delta LCGI_1 t = \alpha_0 + \alpha 1 \Delta LGDPt + \alpha 2 \Delta LNEERt + \mu_4 \quad 3.4$$

$$\Delta LCAPGI_2 t = \psi_0 + \psi \Delta LGDPt + \psi \Delta LNEERt + \mu_5 \quad 3.5$$

$$\Delta LRMI_3 t = \emptyset_0 + \emptyset_1 \Delta LGDPt + \emptyset_2 \Delta LNEERt + \mu_6 \quad 3.6$$

$$\Delta LAGEXPO_1 t = \sigma_0 + \sigma 1 \Delta LWGDPt + \sigma 2 \Delta LNEERt + \mu_7 \quad 3.7$$

$$\Delta LOILEXPO_2 t = \gamma_0 + \gamma_1 \Delta LWGDPt + \gamma_2 \Delta LNEERt + \mu_8 \quad 3.8$$

$$\Delta LMANEXPO_3 t = \theta_0 + \theta 1 \Delta LWGDPt + \theta 2 \Delta LNEERt + \mu_9 \quad 3.9$$

Where: $\alpha_0 - \alpha_2 > 0$, $\lambda_0 - \lambda_2 > 0$, $\beta 0 - \beta 1 > 0$, $\beta_2 < 0$, $\alpha_0 - \alpha_2 > 0$, $\psi_0 - \psi_2 > 0$, $\emptyset_0 - \emptyset_2 > 0$, $\sigma_0 - \sigma_1 > 0$, $\sigma_2 < 0$, $\gamma_0 - \gamma_1 > 0$, $\gamma_2 < 0$, $\theta_0 - \theta_1 > 0$, $\theta_2 < 0$, ΔLMt = Log of aggregate import at time t ,ΔLM_{it}= Log of sectoral import at time t ,ΔLX_{it} = Change in log of sectoral export at time t, $\Delta LGDP$ = Change in log of gross domestic product at time t, $\Delta LNEERt$ = Change in log real exchange rate at time t, $\Delta LWGD$=Change in log of world gross domestic product at time t, $\Delta LCGI_1 t$ = Change in log of

consumer goods import at time t, $\Delta LCAPGI_2t$ = Change in log of capital goods import at time t , $\Delta LRMI_3t$= Change in log of raw materials and intermediate goods import at time t, $\Delta LAGEXPO_1t$ = Change in log of agricultural export at time t, $\Delta LOILEXPO_2t$ = Change in log of oil export at time t, $\Delta LMANEXPO_3t$ = Change in log of manufacturing export at time t, Δ = Change, $\alpha_0, \lambda_0, \beta_0,$ = Constant terms, $\lambda_1 - \lambda_3, \beta_1 - \beta_3, \alpha_1 - \alpha_2$ = Parameters to be estimated, $_i$ = Represent different sectors, $\mu_1 - \mu_9$ = Stochastic error terms

This study adopted the Ordinary Least Squares (OLS) econometric technique. Before estimation, it would be useful to determine the underlying properties or processes that generate our time series variables, whether the variables are stationary or non-stationary. Macroeconomic data often appear to posses a stochastic trend that can be removed by differencing the variables. Hence, co-integration technique, the Augmented Dickey Fuller (ADF), and Phillips- Perron (PP) tests are also used to test for the order of integration. We assumed a linear relationship between the dependent variable and the independent variables in all the equations specified.

4.0 Presentation and analysis of results

All the series used in this project are integrated in one order or the other, so that we used Johansen's (1995) methodology to test if the series are co-integrated, that is, if at least one co-integration vector exists. When the null hypothesis of co-integration was not rejected, we estimated a vector error correction to obtain the elasticities. In case of rejection these elasticities were obtain by OLS in first difference.

Unit root test was carried out using both ADF and PP tests for all the variables in the multi-sectoral balance of payments constraint growth mode (table 4a). The results show that, almost all the variables are stationary at first difference in both ADF and PP tests and at 5 per cent level of significance. However, ΔLWGDP was stationary at first difference of ADF test and at 10 per cent level of significance while it was significance at 1 per cent level at first difference of PP test. From table 4b the results of the import demand equation show that Gross Domestic Product has a strong and positive relationship with import, in other case exchange rate has a negative relationship with import, and this substantiate the economic apriori expectation. The Error Correction Model has the correct sign and confirmed stability in the adjustment process with 82 per cent of import diequilibrium of the previous year shock adjusting towards its long run equilibrium in two years. Our adjusted coefficient of multiple determination (R^2) was very high at 66 per cent.

The aggregate export supply function shown in table 4c shows that, the log of World GDP had a positive relationship with export, while that of exchange rate the relationship is negative. The ECM had the correct sign, confirming stability in the adjusting process with 40 per cent of export disequilibrium of the previous year shock adjusting towards its long run equilibrium in one year, though the adjustment is sluggish. All the variables are statistically significant at 5 per cent level of significance using the student t-test. The adjusted coefficient of multiple determination (R^2) of 0.581965 shows that, all the variables in the export supply function accounted for 58 per cent variation in export, there is, therefore, strong goodness of fit in the model. The import and export functions show that imports increased more than the exports as reaction of the domestic product growth, it is undoubtedly that, the Nigerian

economy has followed "de-industrialization process" that is, importing manufactured and consumers' goods from the rest of the world while it was loosing competitively.

The results of sectoral import of the Multi-sectoral Thirlwall's model in table 4d shows that, the logged GDP has a positive relationship with Raw Material Import (RMI) and this relationship supported the economic expectation, but the exchange rate has a positive sign, it indicates a positive relationship with RMI, this is absolutely unaccepted because it does not conform with economic theory. The Error Correction Model satisfied the economic expectation with 66 per cent speed of adjustment in one year, it indicates stability and swiftness in the adjustment process. The two variables including the ECM are statistically significant at 5 per cent level. The adjusted coefficient of multiple determinations (R^2) was very high; it shows a strong goodness of fit in the model.

In our Consumer Goods Import equation the result shows that, ΔLGDP has a positive relationship with ΔLCGI while exchange rate is negatively related to ΔLCGI. This relationship conformed to the economic apriori expectations. The ECM satisfied the economic expectation with 41 per cent speed of adjustment in one year; it indicates sluggishness in the adjustment process. All the variables including the ECM are statistically significant with the t-test. The adjusted coefficient of multiple determinations (R^2) is very high with 75 per cent variation in ΔLCGI accounted by the independent variables. It shows strong goodness of fit in the model.

Finally, the results of Capital Goods Import show that ΔLGDP has a positive relationship with ΔLCGI, while exchange rate has a negative relationship. The signs conformed to the economic expectations. The ECM has the correct sign with 57 per cent speed of adjustment in one year; it indicates swiftness in the adjustment process. All the variables including the ECM are statistically significant at 5 per cent level. The adjusted coefficient of multiple determinations (R^2) is moderately high with 51 per cent variation in ΔLCGI accounted by the independent variables.

The results of sectoral export of the multi-sectoral Thirlwall's model in table 4e shows that, in agricultural export equation, the world GDP has a negative relationship with agricultural export, but exchange rate has a positive relationship, the relationship of the two variables does not conform with the economic expectations. The negative relationship in the WGDP and Agricexpo goes to substantiate the facts that, our agricultural products cannot compete favourably with that of other countries in the international market. The ECM satisfied the economic expectation with 94 per cent speed of adjustment in one year; it indicates swiftness in the adjusting process. All the variables including the ECM are statistically significant at 5 per cent level using the student t-test. The coefficient of multiple determinations R^2 is moderately high with 46 per cent variation in AGRICEXPO being accounted by the independent variables
Estimation of manufacturing export shows that, the WGDP and exchange rate have negative signs, indicating a negative relationship between WGDP and ΔLNEER with ΔLMANUEXPO. This relationship did not conformed with economic expectations with 57 per cent speed of adjustment in one year. All the variables including the ECM are statistically significant at 5 per cent level. The coefficient of multiple determinations R^2 was very high with 52 per cent variation in ΔLMANEXPO being accounted by the independent variables

Oilexpo equation shows that, the WGDP was positive. It conforms to the economic expectation. But exchange rate has a negative sign and does not conformed with economic

expectation. The ECM conformed to the economic expectation with 39 per cent speed of adjustment. The speed of adjustment here is very slow for one year. All the variables including the ECM are statistically significant at 5 per cent level. Our co-efficient of multiple determinations R^2 is very high with 70 per cent of total variation in Δ LOILEXPO being accounted by the independent variables

5.0 Concluding remarks

This research work is based on the hypothesis proposed by the Multi-sectoral thirlwall's law. It has been shown to have noteworthy empirical results and policy implications as well. The extent of our uneven development can be explained along the two dimensions identified in the multi-sectoral BP-constrained growth model; Nigeria has a lower sectoral income elasticities of the demand for exports and higher sectoral income elasticities of the demand for imports, a lower foreign trade multiplier, and hence worse sectoral composition of exports and imports.

Balance of payments position in Nigeria constitutes a structural problem that can hinder the attainment of potential growth. The research shows clearly that, these problems can be addressed by diversifying the structure of production; reduce dependency on imports, making exports more attractive and competitive in the international markets, effective management of our external debt through macroeconomic stability, improvement in the state of infrastructure, human capital development, and eradication of corruption.

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Appendices

Table 4a Unit Root Test using ADF and PP

Variable	ADF Level	First Difference	PP Level	First Difference	Decision
ΔLIMPO	-1.304532	-6.110342**	-0.419091	-8.791324**	1(1)
ΔLNEER	-1.334048	-5.577512**	-1.538401	-5.588264**	1(1)
ΔLGDP	-0.135880	-7.736183**	0.46940	-7.705929**	1(1)
ΔLCAPI	-0.629493	-9.434843**	-0.704214	-18.177682**	1(1)
ΔLRMI	-0.103350	-10.28108**	0.193629	-.20.121740**	1(1)
ΔLCGI	0.053416	-9.8271472**	-0.253957	-10.47166**	1(1)
Variable	ADF Level	First Difference	PP Level	First Difference	Decision
ΔLEXPO	-0.711695	-6.791179**	-0.696895	-6.866782**	1(1)
ΔLNEER	-1.334048	-5.577512**	-1.538401	-5.588264**	1(1)
ΔLWGDP	-0.511609	-3.710404***	-0.291865	-3.743461*	1(1)
ΔLAGEXPO	-0.555932.	-10.138714**	-0.843971	-17.78842**	1(1)
ΔLMANEXPO	-1.334048	-.6753139**	-1.287760	-8.956540**	1(1)
ΔLOILEXPO	-1.004043	-6.847946**	-1.012131	-6.934367**	1(1)

Note: * Significant at 1%, ** Significant at 5%, *** Significant at 10%

Table 4b Estimation of Import Demand Function

Dependent Variable: ΔLIMPO
Method: Least Squares
Date: 07/28/11 Time: 14:18
Sample (adjusted): 1971 2010
Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.069231	0.137386	0.503918	0.6174
ΔLGDP90	4.283559	1.557908	2.749558	0.0093
ΔLNEER	-0.157903	0.177428	4.889957	0.3794
ECM2(-1)	-0.824055	0.166979	4.935066	0.0000
R-squared	0.709310	Mean dependent var		0.218637
Adjusted R-squared	0.660085	S.D. dependent var		0.984085
S.E. of regression	0.787216	Akaike info criterion		2.454011
Sum squared resid	22.30951	Schwarz criterion		2.622899
Log likelihood	-45.08021	Hannan-Quinn criter.		2.515075
F-statistic	8.315208	Durbin-Watson stat		2.276989
Prob(F-statistic)	0.000248			

Note: Figures in parentheses are t-statistics

Table 4c Estimation of Export Supply Function

Dependent Variable: ΔLEXPO
Method: Least Squares
Date: 07/28/11 Time: 14:23
Sample (adjusted): 1971 2010
Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.216850	0.062601	3.463977	0.0014
ΔLWGDP	0.070710	0.223771	3.315994	0.7538
ΔLNEER	-0.096195	0.068779	-2.398602	0.1705
ECM1(-1)	-0.398230	0.089228	-4.463037	0.0001
R-squared	0.629506	Mean dependent var		0.230705
Adjusted R-squared	0.581965	S.D. dependent var		0.409586
S.E. of regression	0.321997	Akaike info criterion		0.666088
Sum squared resid	3.732544	Schwarz criterion		0.834975
Log likelihood	-9.321750	Hannan-Quinn criter.		0.727152
F-statistic	9.034414	Durbin-Watson stat		2.214275
Prob(F-statistic)	0.000136			

Table 4d Estimates of Sectoral Import of the Multi-Sectoral Thirlwall's Model

Variables	Δ**LRM**	Δ**LCGI**	Δ**LCAPGI**
C	0.142379	0.221319	0.0550548
	(3.758822)	(1.810545)	(3.511190)
Δ**LGDP**	2.993387	0.905246	4.326531
	(1.609057)	(2.670964)	(4.324172)
Δ**LNEER**	0.049288	-0.034287	-0.279445
	(2.210438)	(-0.219591)	(2.2311431)

ECM (-1)	-0.663280	-0.410863	-0.568685
	(-3.786653)	(-3.162342)	(-3.744107)
Adjusted R^2	0.746889	0.752930	0.509227
F- statistic	5.261737	4.107657	14.48881
Durbin-Watson	2.303480	2.583498	2.295545

Note: Figures in parentheses are t-statistics

Table 4e Estimates of Sectoral Export of the Multi-Sectoral Thirlwall's Mode

Variables	ΔL**AGRIEXPO**	ΔL**MANEXPO**	ΔL**OILEXPO**
C	0.240031	0.407868	0.232353
	(2.347640)	(3.737314)	(3.614444)
Δ**LWGDP**	0.628066	1.558372	0.057062
	(3.972588)	(6.859235)	(2.248609)
Δ**LNEER**	0.143436	-0.069178	-0.100775
	(4.686410)	(4.270507)	(3.431154)
ECM (-1)	-0.935087	-0.580841	-0.388409
	(-5.410402)	(-4.254203)	(-4.705791)
Adjusted R^2	0.459816	0.518619	0.697770
F- statistic	12.06587	7.078892	9.586450
Durbin-Watson	1.875504	1.176187	2.298182

Note: Figures in parentheses are t-statistics