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ECONOMICS PROGRAM

ESSAYS ON BALANCE OF PAYMENT CONSTRAINEDGROWTH: The Case of Nigeria (1981-2017)

YOHANNA PANSHAK

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PhD THESIS

THESIS SUPERVISORS:

PROFESSOR.DR.IRFAN CIVCIR (Supervisor)

ASSOCIATE.PROFESSOR.DR.HÜSEYIN ÖZDEŞER (Co-Supervisor)

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ACCEPTANCE/APPROVAL

We as the jury members certify the: Essays on Balance of Payment Constrained Growth: The Case of Nigeria (1981-2017) prepared by Yohanna Panshak defended on 14.06.2019 has been found satisfactory for the award of degree of PhD

JURY MEMBERS

Prof.Dr.Irfan Civcir
(Supervisor)

Assoc. Prof.Dr.Hüseyin Özdeşer
(Co-Supervisor)

Prof.Dr.Irfan Civcir (Head of Jury)
Ankara University/Economics Department

Asst.Prof.Dr.Behiye Çavuşoğlu
Near East University/Economics Department

Asst.Prof.Dr.Husam Rjoub
Cyprus International University/Accounting and Finance Department

Asst.Prof.Dr.Hasan Rüstemoğlu
Cyprus International University/Business Administration Department

Dr.Andisheh Saliminezhad
Near East University/Economics Department

Prof.Dr.Mustafa Sağsan
Graduate School of Social Sciences
Director

DECLARATION

I,YOHANNA PANSHAK hereby declare that this dissertation entitled: Essays on Balance of Payment Constrained Growth: The Case of Nigeria (1981-2017) has been prepared myself under the guidance and supervision of Professor.Dr.Irfan Civcir (Supervisor) and Associate Professor.Dr.Hüseyin Özdeşer (Co-Supervisor) in partial fulfilment of the Near East University, Graduate School of Social Sciences regulations and does not to the best of my knowledge breach and Law of Copy rights and has been tested for plagiarism and a copy of the result can be found in the Thesis.

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DEDICATION

This thesis is ultimately dedicated to Almighty God for his faithfulness as well as to my family for the tremendous support and love.

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ABSTRACT

ESSAYS ON BALANCE OF PAYMENT CONSTRAINED GROWTH THEORY: The Case of Nigeria (1981-2017)

This thesis examines the effects of four mainrestrictions on the long-run growth performance of the Nigerian economy fromthe balance of payment constrained growth perspective. The first empirical essay discusses the implications of simultaneous rising of internal and external imbalances in growth process. The chapter modifies the internally and externally constrained version of Thirlwall's model to incorporate the implications of foreign contents in growth. The new model improves significantly explaining the long-run growth experience for Nigeria. The outcome of the chapter shows that aside internal and external imbalances; massive reliance on intermediate imports could be harmful for long-run growth.The second empirical essay disaggregated the Nigerian economy into Oil and Non-Oil export sectors.The outcome once more shows that growth strategy based on massive reliance on intermediate imports could be misleading. The third empirical essay highlights the relevance of sectoral elasticities and technological contents in growth process. The empirical outcome shows that transition from primary and natural resource-based products to the manufacturing of products with high demand in the international market is necessary and beneficial for growth. The last restriction highlights the Schumpeterian idea on the role of innovation in a balance of payment constrained growth model.The result shows that the existence of technology gap and the establishment of robust national innovation system could improve external performance and the overall growth in the long-run. The study therefore recommends, among other things policies towards: raising the share of exports; cautious reduction of various components of imports, improving the income sensitivity of exports; leveraging on the strength of regional integration and investment in *R&D* activities.

Keywords: Balance-of-payment-constrained-growth, external, internal, deficits, intermediate imports, long-run growth, exports, imports, Nigeria.

ÖZ

ÖDEME DENGESİ KISITLI BÜYÜME TEORİSİNE İLİŞKİN MAKALELER: Nijerya Örneği (1981-2017)

Bu tez, uzun vadeli büyümeyle ilgili ortaya çıkan dört ana kısıtlamayı, ödeme dengesi kısıtlı büyüme modeli perspektifinden ele almaktadır. Dördüncü bölümdeki ilk analitik makalede büyüme sürecinde iç ve dış dengesizliklerin büyüme üzerindeki etkileri analiz edilmektedir. Bu bölüm, Thirlwall modelinin içsel ve dışsal olarak kısıtlanmış versiyonunu, ithal aramalı ve sermaye malı kullanımının büyüme üzerindekietkilerini içerecek şekilde genişletilmiştir.Yeni model Nijerya'daki uzun vadeli büyümeyidaha iyi açıklamaktadır. Bu modele dayalı ampirik analiz sonuçları aramalı ve sermaye malı ithalatının itharacatı ve yurtiçi yatırımları önemli ölçüde artırdığını göstermektedir.Ancak, ithal aramalına olan yüksek oranlı bağımlılık ekonomik büyümeyi olumsuz etkilemektedir. Beşincibölümdeki ikinci makale, Nijerya ekonomisini çok sektörlü bir model çerçevesinde Petrol ve Petrol Dışı İhracat sektörlerineayırarak analiz etmektedir.Analiz sonuçları bir kez daha aramalı ithalatına yüksek oranda bağımlılığın büyümeyi olumsuz etkilediğini göstermektedir.Altıncı bölümdeki üçüncü makale, büyüme sürecinde sektörel esnekliklerin ve teknolojik içeriklerin önemini vurgulamaktadır. Ampirik sonuçlar birincil ve doğal kaynak temelli ürünlerden uluslararası pazarda yüksek talep gören ürünlerin üretimine geçişin büyüme için gerekli ve faydalı olduğunu göstermektedir. Yedinci bölümdeki dördüncü makalede ise teknolojik gelişmenin ve ulusal inovasyon sisteminin sürdürülebilir büyümedeki rolünü ele almaktadır. Teknolojik ilerlemenin ve sağlam ulusal inovasyon sisteminin kurulmasının, ihracat kalitesini, dış performansı ve uzun vadede toplam büyümeyi iyileştirdiği iddia edilmektedir.

Anahtar Kelimeler: Ödeme dengesi kısıtlı büyüme, dış açık, iç açık, ara malı ithalatı, uzun vadeli büyüme, ihracat, ithalat, Nijerya

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ABBREVATIONS

ACFTA	African Continental Free Trade Area
ADF	Augmented Dickey-Fuller
AFDB	African Development Bank
AFEM	Autonomous Foreign Exchange Market
AIC	Aikaike information criteria
ARCH	Autoregressive Conditional Heteroskedasticity
ARDL	Autoregressive Distributed Lag model
BOI	Bank of Industries
BOP	Balance of Payments
BOPCG	Balance of Payments Constrained Growth
CBN	Central Bank of Nigeria
COMTRADE	United Nations Commodity Trade Statistics
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMSQ	Cumulative Sum of Squares
ECM	Error Correction Model
ECOWAS	Economic Community of West African States
EML	Extended Marshall-Lerner Conditions
FDI	Foreign Direct Investment
FEM	Foreign Exchange Market
FMOLS	Fully Modified Ordinary Least Squares
FMST	Federal Ministry of Science and Technology
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
IFEM	Inter-bank Foreign Exchange Market
IMF	International Monetary Fund
IT	Inflation Targeting
KDT	Kaldor-Dixxon-Thirlwall
KPSS	Kwiatkowski–Phillips–Schmidt–Shin
MBOPCG	Multi-Sectoral Balance of Payments Constrained Growth
ML	Marshall-Lerner
NACRDB	Nigerian Agricultural, Cooperative and Rural Development Bank

NBS	National Bureau of Statistics
NIS	National Innovation System
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
OPEC	Organization of Petroleum Exporting Countries
PP	Philips-Peron
PPI	Producer Price Index
PPP	Purchasing Power Parity
R & D	Research and Development
REER	Real Effective Exchange Rate
RMRDC	Raw Materials Research and Development Council
SAP	Structural Adjustment Programme
SCA	Soukiazis Cerqueira Antunes
SCA-BOPCG	Soukiazis Cerqueira Antunes Balance Payments ` Constrained Growth Model
SFEM	Second-Tier Foreign Exchange Market
SITC	Standard International Trade Classification
SON	Standard Organization of Nigeria
T_{CN}	Technology of Centre-North
T_{PS}	Technology of Periphery-South
UNESCO	United Nations Educational Scientific and Cultural Organization
VECM	Vector Error Correction Model
WITS	World Integrated Trade Solution
WDI	World Development Indicators
WTO	World Trade Organization
2SLS	Two Stage Least Squares
3SLS	Three Stage Least Square

INTRODUCTION

The recent reappearance of massive deficits on external accounts of most countries across the globe is receiving a renewed interest in economic literature. This has re-echoed the long age dispute concerning the balance of payments (BOP) adjustments as well as the concepts of external sustainability between the mainstream and heterodox economists. This has reached the point that these concepts (external account deficits and *BOP* adjustments) are perceived to mirror resourceful intertemporal consumption decision of economic agents to maximize utility; hence, momentary current account deficits could be valuable for growth. Nevertheless, this could only be achieved when a country has the financial capacity to finance increasing imbalances; continuously mounting deficits inevitably creates an unsustainable BOP crisis and consequently leading to a reduction in aggregate demand and long-run growth (Thirlwall, 1979; Nell 2003; Thirlwall 2012; Lanzafame, 2014).

In the presence of chronic unbalanced productive structure, existence of predominantly low technological export sectors, the above quandary is even more complicated when economies face simultaneous imbalances on the external account (trade deficit) and internal account (as a result of massive fiscal deficits). Increasingly, these countries are beleaguered by these problems, while the issues themselves keep on multiplying[1]. Nonetheless, it seems that the character, the magnitude, and their effects are not at all times identical.

[1]Therefore, anytime a country is trapped in a balance of payments problem as it increases demand, earlier than the short term capacity growth rate is reached, then demand has to be reduced; supply is certainly not fully utilised; investment is dampened; technological progress lags behind and a country's goods relative to overseas goods become less attractive therefore additionally deteriorating the balance of payments, etc. This ignites vicious circle. On the other hand, the ability of a country to increase or expand demand to the level of available productive capacity, devoid of balance of payments challenges resulting; the pressure of demand upon capacity may well increase the capacity growth rate.

This thesis is focused on the Nigerian economy which is characterised by severe shortage of foreign exchange largely as a result of significant reliance on the exports of few low technological products and significant reliance of manufactured exports on the imports of intermediate goods on the one hand; and mounting budget deficits on the other hand.While the Centre-North takes advantage of exports of high technology products in the international market; Nigeria has continually lags behindover the years. Prebisch (1949) observed long ago that global diffusion of technology is sluggish and unbalanced. The Centre-North is at the front in innovation whereas the Periphery-South is following. Given that technological revolution is strongly connected with structural change and the appearance of innovative sectors, the structure of production of the Centre-North diversifies (Romero, 2019) passing through most important changes. Nevertheless, these changes and technological revolutions merely got to the localized territories of the Periphery-South productive structure. Consequently, the Nigeria as does its Periphery-South counterparts remains exceedingly concentrated in only some (with low technological content) sectors and places a huge category of its labour force in low productive and subsistent enterprises.

Given the above conundrum, Nigeria's efforts to realize stable growth, combat poverty, unemployment etc and to be among the leading industrial nations with GDP of about US $900 billion for over 180 million people by needed to execute major critical infrastructure continually moved out of the country largely for the settlement of trade deficits and financing deficits. Therefore, changing this perennial narrative has to do with purposeful of policies including the development of national innovation system to support the production of products with substantial technological content and increasing local content in final exports in the international market. This would not only facilitate the structural transformation of the productive structure but also lessens the country's dependence on foreign factor inputs; improve external performance as well as reducing the need for excessive fiscal deficits in the long-run.

CHAPTER 1
BASIS OF THE STUDY AND METHODOLOGY

1.1 Introduction

This thesis takes on a demand-sideperspective, particularly the balance of payment constrained growth (BOPCG) to explain Nigeria's long growth experience. Unlike the automatic adjustment mechanism of the main stream economics approach, *BOPCG* argues that demand and BOP problems are important determinants of long-term growth of an economy. Theoretically, the rate of growth of demand is the most essential factor that determines productivity (Kaldor, 966; McCombie, 1985); and the demand growth, in turn, is principally explained by the rate of expansion of foreign demand of domestic output (Thirlwall, 1979; Gouvêa & Lima, 2010; Romero 2019). According to this framework, exports growth permits the remaining constituents of aggregate demand to grow by soothing the *BOP* constraint to long-run growth.

Following this perspective, Thirlwall (1979) contended that neoclassical models are generally inappropriate for the investigation of open economy especially where foreign exchange is consistently a scarce resource working to restrict the pace of growth. Therefore, the ratio of export growth and import elasticity of demand defines the rate at which an economy grows without facing BOP crises. Therefore, external imbalance can stand as a restriction on long-run growth, given that it places a hindrance on the pace of growth in the level of effective demand to which supply can adjust. Accordingly, an incremental growth in *GDP*, by rising imports, has the potentials of generating a distortion in the balance of payment position. For this reason, an

unsustainable current account deficit necessitates a correction, which acts as a hold on further output growth(Bajo-Rubio, 2014).Since the emergence Thirlwall's law, there have been growing empirical evidences that support the idea that BOP and demand pressures perform a crucial function in the explanation of long-run growth of domestic income (Beko, 2014; McCombie, 2011; Moreno-Brid, 2003; Razmi, 2005, 2011; Soukiazis, Cerqueira, & Antunes, 2014).

In line with this perspective, this thesis strongly highlights the implications of four emerging issues that matter for growth of a Periphery-South economy as shall be discussed later in Chapters 4 to 7.

1.2 Statement of the Research Problem

Large-scale payments imbalances are harmful to the viability of the global economy. They tend to produce colossal, unstable and speculative capital movements; they largely precipitate currency volatility and the necessity for countries to maintain huge foreign exchange reserves to interfere in foreign exchange markets when required (Thirlwall, 2011). In addition, they contribute to an illogical reallocation of assets between surplus and deficit countries, often from the Periphery-South to the Centre North. Consequently, growth differences between the developed and developing countries continue to widen with little or no sign of bridging.

Achieving sound and stable growth rate that guarantee overall economic prosperity has being a challenging task in Nigeria over the years. In the light of the overview of the Nigerian economy, this situation is necessitated not only by external instabilities occasioned by unbalanced productive structure but also by internal factors relating budget deficit. As at 2016, oil sector contributes to over 90% of Nigeria's government revenue (CBN, 2017). Accordingly, this places the economy on a vulnerable and disadvantage position in the international market. This is anchored on the observation that trade in primary based products tend to have low demand international trade compare to medium and high technology products which tend to have superior demand (Prebisch, 1949; Romero & McCombie, 2016). Similarly, these products (primary based) are generally inelastic to variations of world real income and their prices are susceptible to volatility and fluctuation

emanating from international trade. The repercussions of this dilemma is manifesting in the continued decline in government revenue as budget deficit increases incessantly. In fact, budget deficit is projected to broaden somewhat in the upcoming fiscal years. To compound the problem, interest repayment on loans at the moment already takes about 30% of federal government revenue which is higher than that of Kenya (12.3%), South Africa (10.2%), India (25.7%) and even the entire Sub-Saharan Africa (3.3%), South Asia (11.2%), East Asia (6.3%) and Latin America & Caribbean (10.5%)[2]. This raises concern about the sustainability of the fiscal position of the economy over the medium and long term periods (Panshak, Irfan & Huseyin, 2019b).

Given the above understanding, the recent fiscal developments where Deficit-to-GDP ratio had risen to 4.5 % in 2015 while public revenue is plummeting; finding an optimal threshold of budget deficit within *BOPCG* framework that permits Nigeria to grow faster without harming BoP equilibrium is desirable.

The International Monetary Fund (IMF) recently asserted that lower export prices of the dominant oil sector considerably remain Nigeria's problem in achieving stable growth performance. This is comprehensible when one connects the fall in global commodity prices of the late 1970s to the subsequent economic recession of the early 1980s. Similarly, a logical explanation could be given in respect of the most recent fall in oil prices in the 2014/2015 and the ensuing economic recession of 2016. This awful situation slowed growth sharply from 6.2% in 2014 to an estimated -1.58 per cent in 2016 (IMF, 2016; NBS, 2017).

Aside external and internal imbalances occasioned by trade deficits and budget deficit respectively; the present study contends that sound and stable growth could be achieved if three major issues addressed. First, lessening the reliance of manufactured exports on intermediate imports is critical. This is in line with Blecker & Ibarra (2013) that the massive use of imported intermediate inputs in producing those exports also diminishes gains in terms of soothing the constraints on the domestic income growth rate compatible with the BOP equilibrium. Note that intermediate imports have risen to over

[2]This is so, when we consider debt service as % government revenue only, not debt-GDP or debt stock-GDP ratio

56% of total imports since 1981 to date. This study asserts that foreign content-led growth policy could be misleading.Second; the thesis argues that external performance could also be achieved when Nigeria encourages structural change by moving away from oil to the high-tech and medium-tech manufacturing. These technological sectors tend to have higher income elasticities than the primary, natural resource-based and low-tech manufacturing in the long-run (Gouvêa, et al. 2010, 2013, Araujo Paiva & Santos, 2016, Soukiazis et al. 2017a,). Similarly, they aid faster in alleviating constraints on long-run growth emanating from the balance on payments (Tregenna, 2008). However, achieving this objective is dependent several factors. The third important constraint identified by this thesis is issues technological gap. Establishing a robust National Innovation System is very essential in shaping export quality, enhancing, structural change, robust external performance and sound growth. Ex ant studies such as Schumpeter (1943) and Romero (2019) have highlighted the essential function of technological competitiveness for external performance.

This is very pertinent and timely for the Nigerian economy given the global shift from primary and natural resource-based products toward technologically inclined sources of energy. Recently, the UK, France and many advanced European countries signed an agreement with the aim of prohibiting the use of combustion engines by the year 2040. The implication of this move is that Nigeria, as well as other oil-dependent economies, would suffer a substantial external disequilibrium and slower growth as gasoline demand would invariably be reduced. It is on the records that it was the 18th Century industrial revolution that encouraged continuous manufacturing sector productivity growth around the Europe and the United States in the initial instance, leading to the distribution of the global economic system into wealthy and poor nations. Similarly, it was industrialization that contributed to the catching-up and convergence with the advanced Western economies by a comparatively smaller number of non-Western economies – Japan beginning in the last periods of 19th century, South Korea, Taiwan, Singapore and some others from 1960 and beyond. Economies that still linger or caught up in poverty, especially those in sub-Saharan Africa, numerous researchers and policy makers generally hold the same view that future economic optimisms

depend significantly on the encouragement of innovative manufacturing industries. The level of growth experienced by the Western Economies and Asian Tigers is achievable if issues relating to internal and external deficits; lessening of foreign content in exports; technological content of exports and national innovation system are considered in growth process.

1.3 Objective of the Study

The *BOPCG* theory formalized by Thirlwall (1979) and extended by Soukiazis et al. (2013, 2014) and others does not envision the effect of intermediate imports as a determinant of the long-run growth rate of domestic income. Similarly, the effect of technology gap in growth process was completely disregarded in the analysis.

Therefore, even though this thesis follows a demand-driven approach, it incorporates some evolutionary insight for a correct and comprehensive explanation of Nigeria's growth path. Therefore, the research is built on two unlike economic paradigms. From one particular point of view, demand-led growth framework focuses on the relevance of effective demand, whose growth is dependent on Balance-of-Payments constraint as in the present context. This approach fundamentally underscores the decisive connection that subsists between the production structure, external deficits and the expansion of effective demand. On the other hand, the evolutionary or Schumpeterian idea is incorporated into the demand-led model in the last chapter to capture the role of technology gap. The relevance of this blending is to examine how export competitiveness and overall growth could be facilitated by sound national innovation system.

The specific objectives include:

i. To investigate whether the demand-led tradition is suitable and robust in explaining Nigeria's growth path.
ii. To investigate how internal and external imbalances constrained growth in the long-run. Accordingly, the effects of trade deficits, budget deficits, relative prices, intermediate imports, among others are examined within a simultaneous version of *BOPCG* model.

iii. To further buttress the implication of growth strategy based on massive imports of intermediates goods in a disaggregated or multi-sectoral framework.

iv. To investigate how technological contents of products give rise to differences in sectoral elasticities and overall growth of domestic income. In this context, the research uses a multisectoral version of BOPCG to identify technological sectors that could aid faster in alleviating constraints on long-run growth.

v. To link more robustly Post-Keynesian macroeconomics with the evolutionary microeconomic thought related to the role of technological gap in shaping export quality, structural change and sustained growth of the economy. Accordingly, the relevance of national innovation system is essentially highlighted.

vi. The study seeks to prescribe pragmatic recommendations in the light of the empirical results in order to position the country on a formidable growth trajectory.

1.4 Research Motivations

BOPCG models are largely one-sided approach. The traditional model as well as various extensions mostly focus on trade deficits emanating from trade in final goods in achieving equilibrium. Even though Soukiazis et al. (2013 & 2014) attempted to bridge this gap by simultaneously incorporating external and internal imbalances in growth explanation; the controversy over the relevance of intermediate imports as a sound driver of long-run growth has increasingly remained unresolved. One argument in support of this is that intermediate imports allow a country to increase its share in the global economy (Blecker & Ibarra, 2013). This is because it spurs manufacturing export growth, whose production significantly relies on such imported factor inputs. Accordingly, firms could profit from global trade through their enhanced accessibility to previously non-existent resources, hence generating stable gains from trade. However, this argument may not hold when intermediate imports (leakages) used in export production are excessively high. In this context, a foreign content-led growth strategy could be misleading. Therefore, apart from internal and external deficits, the massive import of intermediate

goods is a major concern and could have some implications on long-run growth[3].

Similarly, only few *BOPCG* studies have examined the role of technological sectors (Araujo et al. 2016; Romero & McCombie, 2016, Gouvêa et al. 2013); technological gap (Porcile, Dutra& Meirelles, 2007; Panshak, et al. 2019a) and technological competitiveness (Romero, 2019) of exports in growth determination. While the existence of technology gap and competitiveness of technological sectors may not necessarily be the most binding constraints in the Centre-North; they are critical in improving the export sophistication, increasing the demand and income elasticity of exported products from the Periphery-South. It is however, sickening that the global transmission of technology is slow-moving and unbalanced (Prebisch, 1949) and hardly reaches the interior of the developing countries.

In addressing this, the central role of National Innovation System is necessary. This is to enable Nigeria take advantage of the high-tech imports not only towards improving export share and performance but by adapting the foreign technologies which would encourage the process of technological upgrading through technological diffusion. This would sustainably enhance sectoral composition of exports, the technological content, elasticities. This process cumulatively improves productivity products (Soukiazis, et al. 2017b) and demand for manufactured in the international markets; hence, evading *BOP* crises in the long-run.

1.5 Brief Overview of the Methodological Approach

The research employed two different econometric strategies to achieve the predetermined objective of the study: Three Stage Least Squares (3SLS) and autoregressive distributed lag model (ARDL). The *3SLS* method simply refers to a simultaneous equation system that takes into consideration the

[3]It should be noted that this motivation is not in opposition to growth policy driven by foreign contents given that it enables a country to increase its income elasticity of exported products. The major concern being advanced here, as in Araujo et al. (2016), is that countries that implement this policy should strive to significantly reduce their reliance on intermediate imports, especially when they have high elasticity with respect to exports. This is particularly instructive for a Periphery-South country such as Nigeria with vast untapped resources

contemporaneous interrelationships between equations. The first empirical essay (Chapter 4) makes use of elasticities obtained from 3SLS to explain growth using an internally and externally constrained version of Thirlwall's model–*SCA-BOPCG*. This is necessary to overcome the inadequacy and weakness of other econometric techniques such as the ordinary least squares (OLS) regression technique; which may not resourcefully identify the structural parameters of the system equation because of problems relating identification, inconsistency and efficiency.

Regarding the last three empirical Chapters (Chapters 5, 6 and 7), *ARDL* econometric technique proposed by Pesaran, Shin & Smith (2001) is used. The rationale behind this approach is that it outperforms other cointegration techniques when the sample size is small and when the variables are integrated of different order.

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1.6 Brief Overview of the Thesis

Apart from the introductory and preliminary sections, the thesis comprises seven chapters: the basis of the study, theoretical and empirical review of literature and four empirical analyses of main emerging subjects in four distinct Chapters (Chapters 4, 5, 6 and 7) within the Post-Keynesian economic paradigm. The general background and an overview of the Nigerian economy are presented in Chapter 2. Theoretical and empirical review of literature is in Chapter 3. In Chapter 4, the study adequately investigated how internal and external imbalances could constrain long-run growth; hence addressing first two questions presented in section 1.3. Aside clearly demonstrating the implication of intermediate imports within a modified *SCA-BOCG* version of Thirlwall's model, it extensively provided practicable recommendations based on policy simulation/scenario analysis in order to position the country on the path of sound growth without harming *BOP* equilibrium. This essentially provided answer to the last question raised in 1.3 Chapter 5 disaggregates the import and export functions to further elucidate the implication of intermediate imports on growth. Here, the research largely follows *BOPCG* model forwarded by Blecker & Ibarra (2013) and extended by Araujo et al. (2016) to estimate the Non-oil and Oil export sectors as well as the intermediate and final import sectors in order to answer the third question raised in section 1.3.

Chapter 6 moves on to further disaggregate the tradable sectors based on technological classification (Lall 2000) which was not done in the preceding chapter. This is mainly to identify critical technological sectors that could aid faster in easing constraints on growth; hence answering the fourth question in the same section (1.3). It should be noted that Chapters 5 and 6 were estimated using variants of multi-sectoral *BOPCG* models. The last empirical essay is Chapter 7. It clearly demonstrates how technology gap and the role of national innovation system could be useful in shaping export quality and the explanation of the Nigeria's long-run growth. It sufficiently provided answer to the fifth question by empirically blending more strongly the Schumpeterian idea on the relevance of innovation with the demand-led perspective on the relevance of effective demand and balance of payments as major restrictions on growth.

CHAPTER 2

AN OVERVIEW AND PERFORMANCE OF THE NIGERIAN ECONOMY

2.1 Introduction

The majority of the literatures on the economic growth in Nigeria largely take on the suply-side oriented approach with a few exceptions. However, this view is not so persuasive, since they pay little attention to the roles that the demand-side variables have played in the Nigerian context (Anoka, 2013). In order to have a complete understanding of the Nigerian economy; this research first analytically examined the behaviour of major macroeconomic indicators, evolving role and impacts of external imbalances; and how it concomitantly influences growth process.

2.2 Long-run Growth Dynamics: Stylized Facts

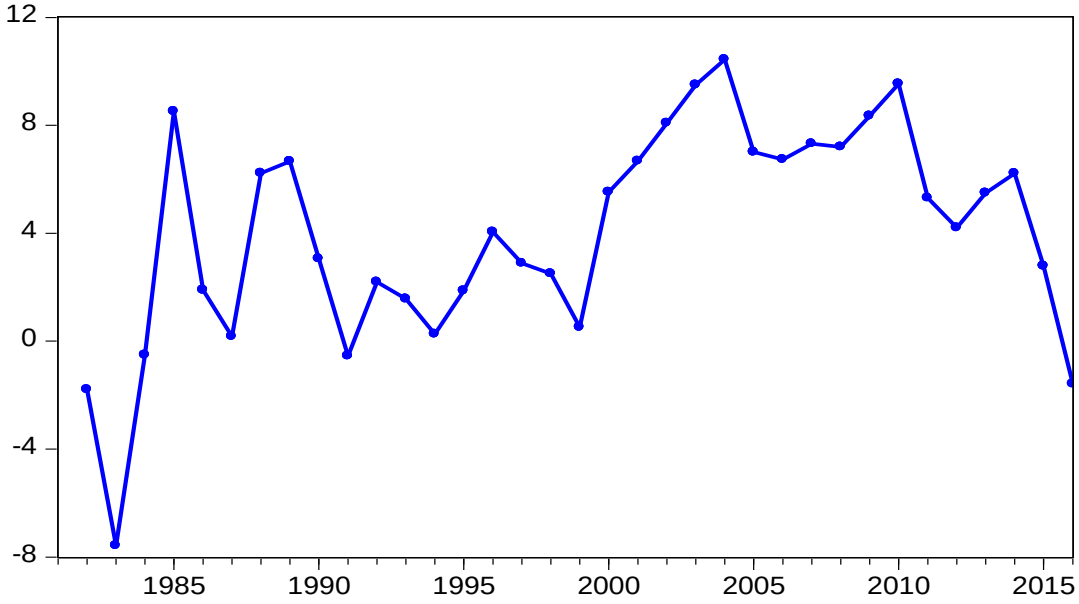
Nigeria is a West African country and it is regarded as the largest economy in the African continent based on GDP volume. It is currently the 26th largest economy in the global ranking. The country is the principal exporter of oil products on the continent. Similarly, it has the biggest natural gas reserve in the sub region. Due to its rebasing exercise in 2010, Nigeria's GDP approximately doubled from US$270 billion in 2013 to US$510 billion in 2014, and its economy has become more services driven (about 61% of GDP in 2016). This GDP increases 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).

Achieving stable and impressive long-run growth has always being an important policy objective of the Nigerian government. Before the

introduction of Structural Adjustment Programme (SAP) in 1986, Nigeriahad launched several development Plans. The initial attempt to comprehensively plan and chart a development path appeared in the outline of the First National Development Plan (1962–1968). From 1960 to 1965, real GDP stood at 4.88%. Subsequently, this impressive growth reverted to an average of – 7.08% between 1966 and 1968 as a result of military coups that led to Nigeria's civil war in 1967. Moving further, Nigeria implemented the Second National Development Plan (1970–1974)**.**During this period, the real GDP growth averaged 11.83% annually.In spite of the healthy growth of the economy of 11.83% in 1970-74, the good economic performance of country declined to about 2.50% between 1975 and 1980 as a result of the 1975-1976 political crises. In addition, the high inflation of about 34% in 1975 and 24% in 1976 which emanated from the excess money supply through deficit financing during the preceding plan periods) further compounded the problem affecting the implementation of the Third National Development Plan (1975 -1980).The political instability became a stern hurdle to the execution of many meaningful project to the level that government programmes on which huge amount of financial resources were already exhausted got dumped, and in some instances, were absolutely scrapped all along with the stoppage of administration that formulated them. A typical example is the Ajakuta steel rolling company.

The first reaction to the economic slowdown was to fix some stabilization policy controls, as captured by the Economic Stabilization Act of 1982. However, the policy actions were unsuccessful and counterproductive to the degree that the real GDP growth drifted deeper into the negative region -7.8% as could be seen in Figure 2.1.

Figure 2.1: Real GDP Growth, 1981 to 2016



(Source: Central Bank of Nigeria Statistical Bulletin, 2017)

In the non-oil sector, particularly the agricultural sector, gross export performance was severely inhibited by the overvalued exchange rate and production almost nose-dived. The decline in productivity was most evident in the manufacturing sector, leading to significant job losses. Total manufacturing index decreased by 26% from 1982 to 1983 (Forrest 1993). Similarly, average capacity utilization in industry fell from 73.3% in 1981 to 38.2% in 1986 (Chete, Adeoti, Adeyinka &Ogundale, 2016).

By 1985, additional strict fiscal, monetary and exchange rate as well as incomes policy measures were formulated to ameliorate the dwindling economic condition. Even though the new-fangled strategy aided in the re-establishment of some control policy actions over the economy, the dilemma of macroeconomic imbalance nevertheless remained unsettled. The need for a fundamental economic restructuring was consequently adjudged as the solitary and workable alternative capable of averting the imminent collapse of the entire economy. This reflection prompted the IMF/World Bank motivated Trade Liberalization policy of 1986 commonly called Structural Adjustment Programme (SAP).The implementation of the trade policy has contributed in no small amount in over-turning the unfavourable growth performance of theeconomy.

Considering the post trade liberalization period starting with 1987 up to 1998, the average growth of domestic income increases to 2.42%. And at the wake of modern democracy in 1999 up to 2007, average growth of domestic income climax to 7.61%. This figure more than triples the annual growth rate of income for the world in same time period (1.84%). Within the period (1999-2007), the growth rates of real GDP in 2003/04 were most massive. This unprecedented growth is arguably attributed to debt relief, substantial increase in global oil prices as well as banking sector reforms of recapitalization. Having achieved tremendous growth rate of about 7% annually over ten years (2004 -2014), the Nigerian economy drastically slowed downwards in 2015 with a growth rate of 2.65%. This unimpressive growth later plunged the country into recession, with negative growth rates over the first three consecutive quarters with an average of -1.61% in 2016. This negative development affected virtually every economic activity in the country, most especially exchange rate.

In an attempt tosave the local currency and the economy at large, 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. By 2016 proper, Nigeria abandoned the pegged/fixed exchange rate for floating exchange system to see if it could achieve stability in the foreign exchange market. The policy of CBN helped the economy to exit recession with an average growth rate of about 0.81% in 2017.

2.3 External and Internal Deficits

Small open economies with lop-sided productive structures are frequently restricted by BoP instability. This is anchored on the fact that when these economies start to mature, larger economic functions or necessities often lead to higher demand for foreign exchange owing to substantial import requirements to support the domestic production. Given that inflow of foreign exchange in the Nigerian context principallyarises from primary and natural

resource –based sector in which their supply is relatively inelastic—a rising current account deficit emerges (Médici &Panigo, 2015).

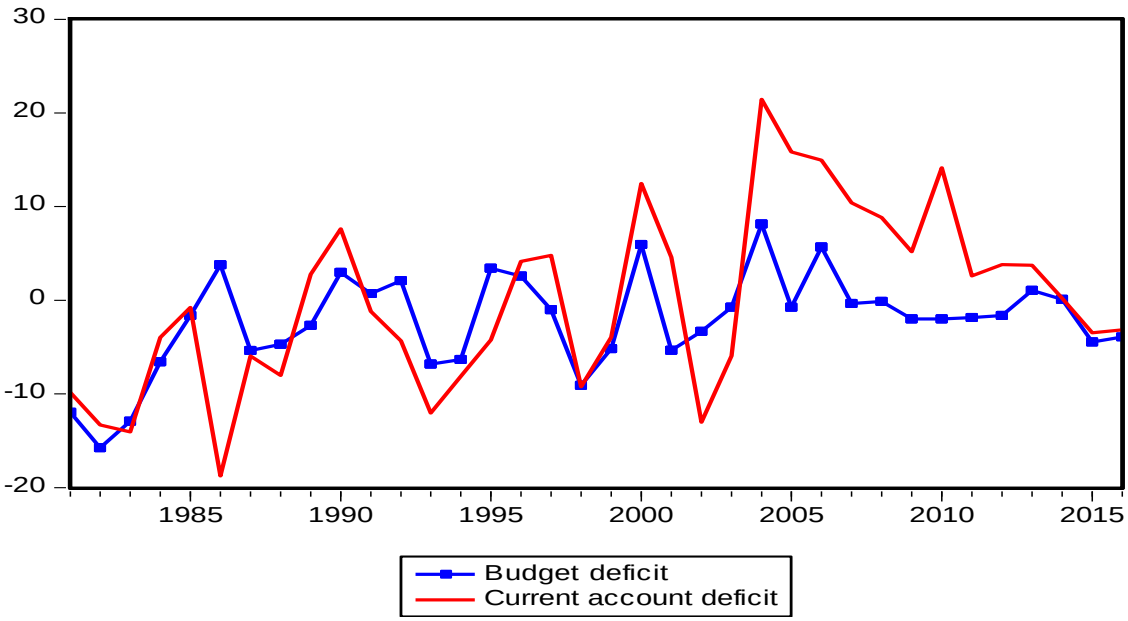
Mounting budget deficits were a remarkable characteristic of the economy since the 1980s. The increasing requirements for greater public expenditure on basic and critical infrastructure are among the most important issues of the Nigerian economy. These needs are perceived as the remote causes of persistent fiscal and current account deficits. This fact is based on the understanding that huge budget deficits have the propensity of crowding-out domestic private investment through increase in the domestic level of the rate of interest. In the same way, large current account deficit have the propensity of decreasing a county's competitiveness, shifting of wealth to foreigners, waning of gains from international trade, and possibly initiating currency instability.

In historical perspective, the first major fiscal deficit financing program introduced in Nigeria was the contraction of the $1b jumbo loan after the civil war of 1967-70 for the reconstruction, reconciliation and rehabilitation of the war-torn country. Moreover, the significant pressure from the general public manifestly added to increased public spending. This was essentially caused by the increased understanding that public spending could increase growth and development. Another reason for the surging budget deficits has to do with high level of inflationsignificantly caused by loose public funds. Given high price levels, labour often bargain for wage increases adding to the burden of the government. Since the substantial amount of the workforce is under government employment, the government response to labour demands further compounds the situation.

In the same vein, Mbanefoh (1993) observed that the fragile balance of payments position of the country was partly due to the financing of budget deficits through money creation and rising interest repayments on loans. In a nutshell, factors accounting for the upsurge in deficits in Nigeria are attributable to issues, such as decreased government revenue (especially fall in commodity prices, shallow tax base) and increased government spending, especially on the rising need for social infrastructure; large public sector, political instability; the systemic failure of institutional values; and to the ever increasing expenditure on national defense and security.

Figure 2.2 shows that Nigeria's budget was largely in deficit during the whole period of analysis[4]. The only periods that Nigeria experiences budget surplus were in 1986, 1990 to1992; 1995 to 1996; 2000; 2004; 2006; 2013 to 2014 only.These fluctuations have significant implications on the country's current account balances and government spending ability.

Figure 2.2: External and internal imbalances, 1981 to 2016



(*Source: Obtained using data from African Development Bank, 2017)*

For the past 40 years now that Nigeria has implemented several policies to deal with among other things, these two deficits still remain largely in unresolved.

[4]The scope of the thesis substantially captures the period that Nigeria experience major policy regime changes. Since the country's independence in 1960, the most notable economic crisis the economy experienced started in the early 1980s that led to introduction of structural adjustment programme of 1986. Since then, Nigeria has implemented several policies to deal with among other things, these two deficits but the internal and external accounts of the balance of payment still remain largely in crisis. The global financial crisis of 2007/08 as well as the recent economic recession of 2015/16 also falls with the scope of the analysis. Debt relief programme of 2003/04 given surging external debt service obligations, rebasing of GDP, change from pegged exchange rate system to floating system in 2016. On the political side, the coups and counter coups (1984, 1985, 1993), shift from military administration to modern democracy (1999 to date) all falls within the scope. Therefore, the scope captures important periods that major economic events occur (Akalpler & Panshak, 2019).

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The country recorded the highest budget deficit of about 15% of GDPin 1982 in the wake of economic recession. The highest positive fiscal balance was in 2004 following the debt cancellation/relief for highly indebted countries. From 2005 to 2014, public deficit stood at only -0.18%. However, this dramatically changes in 2015 where budget deficits increased to 4.45% with further signs of increasing beyond the universally accepted threshold of 3% of GDP (Panshak, et al. 2019b).

Similarly, intermittent imbalances have characterized the current account position of the country. The only periods that the current account experiences positive growth include: 1989 -1990, 1996-1997, 2000-2001 and 2004-2014 only. Huge deficits have been recorded in this account since 2015 (Akalpler &Panshak, 2019). An interesting pattern of the external and internal positions of the country clearly reveals that the variables move in the same direction and they largely rest in the negative territory which reflects the dilemma of the economy.

2.4 The Structure of the Nigeria's External Sector, 1981-2016

It is well documented that exports of primary and natural resource-based products contribute for about 80 to 90 per cent of the overall exports of numerous developing countries. It is also known that the long term deterioration in the terms of trade and the volatility of commodity markets are major constraints to the long-run growth of these economies. Table 2.1 shows the performance of Nigeria's external sector classified according to the most generally used taxonomy: the Standard International Trade Classification (SITC). It is very clear that the export share of mineral fuels constitutes the largest export product for the country[5] and there has been no decline in its export share before and after Trade liberalization policy of 1986 until the recent global financial crisis of 2007/08. Other commodity based products: beverages and tobacco as well as crude materials inedible excluding fuel

[5]It is worthy to state that the dominance of the mineral fuel sector reflects the effect of Dutch disease. Bresser-Pereira & Oreiro (2008; 2012) described the Dutch disease as a market failure ensuing from the subsistence of inexpensive and rich natural resources employed for the production of export goods which are well-suited with a more appreciated exchange rate than the one that would be essential to make competitive the other tradable sectors like the manufacturing.

show some upward movements. Interestingly, the share of manufactured exports (machinery and equipment, manufactured basic articles, chemicals and miscellaneous exports) showed some little improvements especially after 2007. This could be taken as a gradual structural transformation process. This improvement is also reflected in the increase of the contribution of the manufacturing sector to *GDP* and a gradual reduction of crude petroleum & natural gas to *GDP*. However, the pitiable electricity supply, poor transport network, water and other complementary public goods continue to inhibit the manufacturing sector performance and domestic income growth (WTO, 2017). These among others largely explain why the sector performs dismally. As a result, most firms are frequently compelled to create supplementary payments to guarantee a stable supply of public services. These factors essentially raise the cost of doing business to the level that even the small quantity that is manufactured is exorbitant; hence, cannot compete favourably in the international marketplace. Therefore, serious attention and investment in infrastructure is needed to encourage diversification to the export of non oil sectors especially by increasing the share of manufactured export sectors in total exports. This is to assist the economy to respond and take advantage of international trade opportunities largely emanating from variations in foreign demand.

Table 2.1: Structural Evolution of Nigeria's Exports Sector (Percentages)

Year	Bev&Tob	Crud mat	Minerals_	Animals	Chemicals	Manuf.	Mach & Equi	Other Manuf	Not SITC	Total
1981-1986	0.238	0.306	98.42	0.044	0.017	0.131	0.001	0.001	1.048	100
1987-1993	0.021	0.766	97.83	0.164	0.233	0.338	0.052	0.048	0.543	100
1994-1999	0.024	0.839	97.36	0.069	0.203	0.312	0.963	0.115	0.105	100
2000-2007	0.011	0.299	97.67	0.001	0.107	0.396	1.101	0.239	0.165	100
2008-2016	0.119	3.06	91.89	0.007	0.472	1.871	1.597	0.751	0.121	100
1981-2016	0.222	1.17	96.33	0.053	0.224	0.695	0.815	0.270	0.365	100

(Source: Computed using trade data from COMTRADE, 2018).

*Note.*Bev &Tob=beveragesandtobacco; Crud mat=crudematerialsinedibleexcludingfuel;Minerals=mineralfuels;Animimals= animalandvegetableproducts;Chemicals=organicandinorganicmaterials;Manuf.=manufacturedproductschiefly materials;Mach&Equi=machinery and equipment; Other Manuf. = miscellaneous manufactures; Not SITC= commodities not classified elsewhere in Standard International TradeClassification.

Table 2.2: Structural Evolution of Nigeria's Imports Sector (Percentages)

Year	Bev&Tob	Crud mat	Minerals_	Animals	Chemicals	Manuf.	Mach &Equi	OtherManuf	Not SITC	Total
1981-1986	0.229	3.710	1.134	1.497	15.68	25.17	46.01	6.034	0.522	100
1987-1993	0.176	2.888	0.585	0.400	16.35	21.77	37.68	4.08	1.60	100
1994-1999	0.271	2.910	1.753	0.570	21.61	22.55	40.56	5.892	3.826	100
2000-2007	0.889	1.874	6.291	0.544	19.26	21.82	43.69	4.37	1.248	100
2008-2016	1.152	2.516	12.448	0.758	13.74	18.77	45.75	4.50	0.350	100
1981-2016	0.603	2.710	5.105	0.733	17.11	21.73	42.90	4.880	4.211	100

(Source: Computed using trade data from COMTRADE, 2018)

Note as in Table 2.1.

. An analogous explanation regarding import sectors is tenable when the import sector is restructured to reflect stages/level of production as seen in Table 2.3. While the imports of raw material and intermediate goods show some signs of reduction over the sample period, the import of capital good continue to rise. This increase becomes somehow substantial after the 2007 to 2015 as final goods imports declined. Note that various parts and components for which data is available are subtracted from the total of *SITC* 7 and added to raw material and intermediate imports. This is essentially not to over state the share of capital goods imports; hence the difference between capital goods imports in Table 2.3 and machinery and equipment-*SITC 7* in Table 2.2

Table 2.3: Classification of Imports based on the Stages of Production

Year	Raw and Intermediate $(\theta_i^m)^1$	Capital goods $(\theta_k^m)^2$	Final goods $(\theta_k^m)^3$	Total %
1982-86	25.165%	33.904%	40.929%	100%
1987-93	19.442%	32.229%	48.259%	100%
1994-99	20.668%	38.949%	40.381%	100%
2000-07	11.614%	39.984%	48.400%	100%
2008-15	11.168%	45.350%	43.4801%	100%
1982-2016	17.612%	38.097%	44.290%	100%

(Source: Computed from data from COMTRADE, 2018)

(1) Calculated by considering chemicals and Chemicals products (SITC. REV1: 512, 513, 514, 515 & 561); Raw/crude materials (SITC. as reported: all items in 2); components and parts of machinery and equipment, (SITC REV1: 71492, 7199, 7317, 7328, 7333, 73312, 7349 & 73281); Beverages and others (SITC. REV1: 0015, 0460 & 0488).

(2)Calculated by considering machinery and equipment (SITC. as reported 7 less parts and components identified above

(3) Calculated by considering (SITC 1, 3, 4, 5 & 9).For description of SITC codes, see Appendix A2.1.

2.5 Foreign Exchange Rate Management in Nigeria, 1981-2016

It should be noted that traditional *BOPCG* theory ignores the role ofexchange rate in growth process. However, recent studies found significant relationship between growth and relative prices especially for developing countries (Razmi, 2011; 2016). As in many countries, the most important objectives of exchange rate policy in Nigeria are to safeguard the value of the Naira-local

currency, preserve a sound external reserves position and guarantee current account balance devoid of constraining the internal balance requirements and the ultimate objective of achieving stability at the macro level.

Nigeria has passed through different foreign exchange rate policy regimes. Figure 2.3 evidently reveals real effective exchange rate dynamics over the period 1982 to 2015. 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 prices, an upward tendency is observable.However, the policy shifted to market determined from 1986. The main purpose of exchange rate policy was the maintenance of balance of payment viability and exchange rate stability. Consequently, the local currency was allowed to float under the second-tier foreign exchange market (SFEM) 1986-1994. Nigeria witnessed a sharp fluctuation in its real exchange rate following fall in commodity prices and the trade liberalization policy that ushered in Structural Adjustment Programme (SAP). Within this period (1986-1994), a unified exchange rate system was adopted where the first and second-tier markets were merged into foreign exchange market (FEM) in which deposit money banks were permitted to trade official exchange between them. In addition, an autonomous market for privately sourced foreign exchange emerged with its own rate. Between 1995 and 1999, the autonomous foreign exchange market (AFEM) was adopted. This was aimed at correcting the distortions occasioned by the implementation of fixed exchange regime underthe military dictatorship administration at that time. *AFEM* experienced low demand pressures due to numerous bureaucratic processes-hence, exchange rate was relatively stable. However, the local currency was generally unstable in the parallel market during this period causing movements in the real exchange rate.

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 mild appreciation of the exchange rate compared with the initial period.

The instability in commodity markets in the international market really caused enormous difficulties for effective exchange rate management in Nigeria. It is on record that it costs 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.

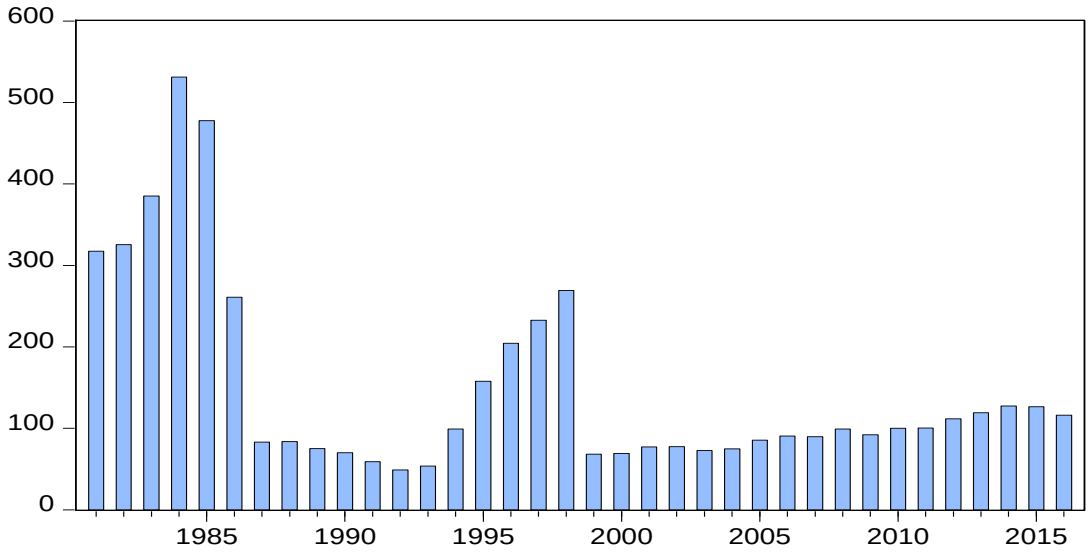

Figure 2.3: Real effective exchange rate dynamics, 1981 – 2016

(Source: World Bank development indicators)

This led to about 25% reduction in foreign reserves to roughly US$33billion. However, the intervention could not prevent the local currency from plummeting in the face of 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.

Notwithstanding the *CBN's* controls, the dollar currency continue to move out of the economy as the officially and unofficially determined local currency to dollar deviated. Around 2016, the unofficially determined rate of exchange rose beyond 300 *NGN* to one dollar. Similarly, external reserves could not even sufficiently finance gross imports for five months.

By June 2016, the *CBN* immediately switched to a floating system. One instant impact of this change was the collapse of the local currency from one dollar to approximately 282. Accordingly, the *CBN* soft-pegged the exchange

band between 282 and 285 for the succeeding month. Despite this height, the external reserve withdrawal to preserve this was confirmed to be unrealistic and cannot be sustained. In July, the *CBN* decided to stop holding the local currency and dollar exchange rate further collapsed by 14.2 percent in a single month and 61.8 percent on yearly basis. It is a fact that rapid currency depreciation can be excruciating especially for a country that relies on foreign imports of intermediate and capital goods. In the same July 2016, soaring price level coerced the *CBN* to increase interest rates to an exceptional 14 percent. Given this high rate especially for an economy already under recessionary pressures, implies a bitter remedy for the economy.

2.6 Recent Macroeconomic Developments

Moving further, it is quite clear that the unbalanced external sector has enormous implication for the overall stability and performance of the Nigerian economy as evidently given in Table 2.4. It is interesting to observe some logical tendencies as the variables change overtime. A discernable feature is that the performance of the Nigerian economy is positively associated with oil prices. This literally indicates the unhealthy dependence of the economy on oil sector. In the last 10 years, Nigeria experienced a tremendous growth approximately 7% annually on the account of impressive or high world prices of oil and natural gas. Nevertheless, the quick turn down in oil prices ever since the third quarter of 2014 has created enormous difficulties to the economy, which considerably led to a sluggish growth of about 2.7% in 2015 and consequently moved into recession in 2016 with an annual growth rate of approximately -1.5%. The rising unemployement rate from 5.1% in 2010 to 13.1 in 2016 is largely as the result poor performance of the economy.

Again, a positive relationship could also be observed between real GDP growth rate and government revenue. This elucidates the claim that real GDP and government revenue moved in the same direction.

During this period, total export decreased by 42% which sharply plunged government revenue arising from oil and gas exports from 17.5% of GDP in 2011 to 6.75% in 2015. The stumpy export revenues (principally from oil and natural gas) consequently led to lower home demand that has affected the performance of the non-oil sector. Weaknesses in the macroeconomic

atmosphere (e.g. unpredictable and costly power supply, and poor governance, as well as in the oil sector) have also contributed to the dismalperformance in the most recent years. It is also reasonable to emphasize that fall in public revenue tends to exerts increasing pressure on public authorities to match up decreasing revenue by progressively scaling down public spending[6]. In the same vein, reduction in real *GDP* growth rate tends to be associated with rise in interest repayments. Given the scenario, the huge level of uncertainty in the international market especially the systematic rise in US interest rate or appreciation of the US dollar inherently implies a substantial repayment burden for Nigeria**.** Accordingly, while debt-*GDP* ratio may not be increasing, interest repayment as percentage of revenue has ever been rising. Debt servicing has become more exigent given deteriorating government receipts. Interest payment obligations by now take up over 30% of federal government revenue. This elevates anxiety regarding financial sustainability of the economy over the medium and long term periods. This is a perennial problem in the Nigerian debt history and has been seen as one of the major factors causing abandonments of otherwise good projects.

[6]Owing to the principal importance of oil and gas sector to Nigeria's economy, and in spite of the country's enormous oil resources, the sector continuously experience several problems. These challenges includeirregularpower supply disruptions; oil thefts causing serious pipeline destructions, production losses, pollution, and disruption of production; mundane infrastructural facilities; and inefficient maintenance and the ensuing oil spillage. The net generation of electricity power in Nigeria is adjudged as one of the smallest per capita in the whole globe. Even though, Nigeria is termed as Africa's largest oil reserves, it still imports virtually all of its refined petroleum products. This paradox is largely attributed to the low rate of capacity utilization and insecurity at the country'soil refineries. The fall in world crude oil prices recently permitted Nigeria to slowly phase out its most discussed fuel subsidy regime that it started reforming in the early parts of 2012. In 2016, the subsidy was almost completely removed. Compounding the problem, is the array of taxes, charges that Investors in the oil and gas sector are subjected to a well as and local content conditions or requirements set for the investors

Table 2.4: Recent macroeconomic developments, 2010 to 2016

	2010	2011	2012	2013	2014	2015	2016
Real GDP	7.80%	5.31%	4.21%	5.49%	6.22%	2.70%	1.58%
Oil Rev as % GDP	15.4%	17.5%	15.8%	12.9%	10.8%	6.45%	6.75%
Govt. Rev as %GDP	20.0%	29.9%	14.3%	11.0%	10.5%	7.8%	8.01%*
Expenditure as % GDP	26.9%	29.4%	14.7%	13.4%	12.3%	11.5%	11.0%*
Interest repayment as % Rev.	13.4%	14.8%	18.7%	20.5%	24.3%	28.1%	40%
Budget deficit as % GDP	-1.99%	-1.8%	-1.63%	1.08%	0.06%	-4.46%	-3.48%
Crude oil price (US$/barrel)	92.8	111.5	114.5	112.8	63.3	37.8	40.68
Export (BOP based)	41.8%	23.4%	-3.8%	0.9%	-15.6%	-42.0%	-23.7%
Imports (BOP based)	34.4%	179.%	-10.9%	-5.2%	11.9%	-16%	57.52%
External reserves US$ b)	32.3	32.3	32.6	43.8	34.2	28.3	31.2*
FDI flows (% GDP)	1.7%	2.2%	1.5%	1.1%	0.8%	0.6%	1.10%
Manufacturing as %GDP	6.6%	7.2%	7.8%	9.0%	9.8%	9.5%	8.7%
Unemployment rate	5.1%	6.0%	10.6 %	10.0%	7.8%	9.0%	13.1%

(Source: Compiled from the WDI and AFDB, 2017)

Note:*= average value

Rieffel (2005) observed in a cross examination of 63 projects executed in the 1980s for which the government had contracted $2.6 billion reveals that only one project was working and had fully settled its debts. A typical example is the long-awaited Ajoakuta steel company which started in 1971 but still remains merely an abandoned project. The cost of installed capacity per unit of the company rose from US$1,700 in 1980 to 6000 US$ as at 1986; and has been on the rise with severe ever increasing contractual cost and attendant repayment obligations on the loan (Oyeyinka & Adeloye, 1988). This trajectory follows the much discussed Jumbo foreign loan of USD1billion in 1978 where no satisfactory consideration was given to economic viability of the project to be executed. In addition, government at all levels engaged in colossal external borrowing from the international capital market to finance all types of programmes largely to settle trade arrears.

Ogunlana (2005) clearly pointed out that foreign loan increased swiftly from $9.0 billion in 1980 to $17.8 billion, $25.6 billion in 1983 to 1986 respectively merely to pay for insured and uninsured trade credits incurred. These problems are further compounded by mismatch of loan terms and project profiles. Therefore, deficit financing ought to be approached cautiously and with greater regards to the feasibility of the loans in order to lessen the

intensity of capital flight. Notwithstanding its increasing drift since 2012, the budget deficit as percentage of *GDP* has been controlled by the cutback on government spending from 29.4% of *GDP* in 2011 to 11.5% of *GDP* in 2015.

Another logical drift could also be seen between oil prices and *FDI* inflows. When oil prices fall, external reserves and *FDI* inflows as percentage of GDP also fall. This has enormous implication on the realization of objective of faster growth and being among the top 20 performing countries by year 2020. This is because the required foreign exchange earnings needed to execute major critical infrastructure is continually and substantially eroded following any dramatic fall in its major foreign exchange earner in the foreign market and excessive importation of factor inputs to advance exports and domestic investment.

When manufacturing sector contribution to *GDP* is considered, one could assert that there is some improvement. This positive performance could be attributed to government effort towards diversifications well as the establishment of Bank of Industry (BoI). The bank was formed in 2000 to advance long-term credit, equity finances, and technical support to the manufacturing firms. Nigerian Agricultural, Cooperative and Rural Development Bank (NACRDB) was equally established to enhance the accessibility of most important manufacturing inputs through the supply of medium to long term loans for agriculture and agro-allied processing firms. Consequently, the sector relatively improved to 8.76% in 2016.

Indeed, Nigeria is making concerted efforts towards ensuring that it achieves considerable diversification away from the dominant oil sector by constructing a cut-throat manufacturing sector, particularly in automotive assembly, cement, as well as textiles/clothing. Regardless of its present reserved contribution to *GDP*, oil sector still contributes to about 90% of export receipts and 70% of government income. For this reason, in consonance with the country's Vision 20:2020 as well as Economic Recovery and Growth Plan (ERGP) 2017-2020 which seeks to position Nigeria among the top 20 high impact world economies by 2020, the country singled out four critical sectors towards achieving sound economic diversification and structural change. These sectors include manufacturing, agriculture, solid mineral mining and construction materials.

CHAPTER 3
GENERAL REVIEW OF THEORETICAL AND EMPIRICAL LITERATURE

3.1 Introduction

This chapter presents the theoretical underpinning of the thesis. It starts by examining the original model and then it proceeded to review the extended versions of the model.

3.2 The Approach of Balance of Constrained Growth Theory to Long-run Growth: Thirlwall (1979)

Generally, economists adhering to diverse theoretical points of views agree that in the long-run, growth is exogenously constrained by variablesemanating from either the demand side or the supply side of the economy. Solow (1956) argued that the amount of capital, labour and productivity factors explains potential domestic income growth in the long-term. In a similar perspective, Romer (1986) and other mainstream scholars of the so-called new endogenous growth theory maintained that capital accumulation and technical progress are the major drivers of domestic income growth. In essence, the mainstream economic theory suggests that differences in growth rates of countries are explained by the disparities in the growth rates of supply factors as well as productivity levels. Accordingly, 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 side. 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 behindtheir growth potentials and performance.

Unfortunately, the supply-side position may not be fully exploited as a result of slow growth caused by effective aggregate demand; hence *BOP* matters for growth. This is the very foundation of the balance payment constrained growth model. Therefore, whenever supply adjusts to demand, in line with the standard Keynesian framework, these disparities ought to be attributed to disparities in the rates of growth of aggregate demand, these in turn are originated by the existence of long-run restrictions on growth of demand, imposed by the condition that external account ought to be in equilibrium in the longterm (Bagnai, 2010).

Before the development of the *BOPCG* model, Dixon & 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 balance of payments constraint as imports were utterly excluded. However, supposes that a proxy of imports is generated such that it exceeds the growth of exports, which cannot be permanently sustained. Thirlwall (1979; 2012) categorically stated that something has to play the adjustment role. Using relative prices as an adjustment variablemay not realize the required objective; especially in a regional framework. This is because of the usage of universal currency within the region. Hence, the necessity to implement policy toward safeguarding relative prices is worthless. In the context of nations, on the contrary, two underlying types of modifications are required: relative price depreciation or adjustment in output (income).

Accordingly, Thirlwall (1979) forwarded a simple demand-led model which can be used to determine the long-run growth path of any country compatible with balance of payment equilibrium by an underpinning and overriding conjecture that the degree to which an economy grows depends on the level of export growth to the income elasticity of demand for import. Essentially, the law maintains that it is impracticable for any nation to experience faster and rapid growth than that guaranteed by its *BOP* equilibrium. However, a country can grow more than that permitted by balance of payment condition if it is

privileged to embark on incessant deficit financing from external sources. Unfortunately, this is unrealistic and unsustainable means of stimulating growth especially when viewed in long-run terms. Given a scenario that foreign exchange earnings fail to address balance of payment distortions on the external account unremittingly, faster and higher rate of growth is inevitably truncated.

Following Kaldorian tradition and as a Keynesian, Thirlwall (1979) started by specifying two equations and an identity as follows:

$$X = a\left(\frac{P}{P^*E}\right)^{\varepsilon_{xp}} Y^{*\varepsilon_{xy^*}} \qquad \varepsilon_{xp} < 0, \qquad \varepsilon_{xy^*} > 0 \qquad (3.1)$$

$$M = b\left(\frac{P^*E}{P}\right)^{\varepsilon_{mp}} Y^{\varepsilon_{my}} \qquad \varepsilon_{mp} < 0, \qquad \varepsilon_{my} > 0 \qquad (3.2)$$

$$PX = P^*ME \qquad (3.3)$$

Where,$\boldsymbol{\varepsilon_{xp}}$ represents price sensitivity of demand for exported commodities, 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 with constant elasticities.

Specifying Equations (3.1) and (3.2) as well as trade balance identity (3.3) in dynamic terms, yields the following:

$$\dot{x} = \varepsilon_{xp}(\dot{p} - \dot{p}* - \dot{e}) + \varepsilon_{xy^*}\dot{y}^* \qquad \textit{Export equation} \qquad (3.4)$$

$$\dot{m} = \varepsilon_{mp}(\dot{p}* + \dot{e} - \dot{p}) + \varepsilon_{my}\dot{y} \qquad \textit{Import equation} \qquad (3.5)$$

$$\dot{p} + \dot{x} = p^* + \dot{e} + \dot{m} \qquad \textit{Trade balance identity} \qquad (3.6)$$

Substituting Equations (3.4) and (3.5) into (3.6) produces an all-encompassing specification as:

$$\dot{y}_A = \frac{(1+\varepsilon_{xp}+\varepsilon_{mp})(\dot{p}-\dot{p}*-\dot{e})+\varepsilon_{xy^*}(\dot{y}*)}{\varepsilon_{my}} \qquad (3.7)$$

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:

$$\dot{y}_{A1} = \frac{\dot{x}}{\varepsilon_{my}} \qquad (3.8)$$

Or,

$$\dot{y}_{A2} = \frac{\varepsilon_{xy^*}\dot{y}^*}{\varepsilon_{my}} \quad (3.9)$$

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 $\dot{y}$ and$\dot{y}^*$ accordingly, $\dot{x}$ represents real exports, and the aggregate income responsiveness of demand for import is represented byε_{my}. Accordingly, as long as relative prices play unimportant function in international trade and the *BOP* ought to be balance over the long term period; then growth is essentially *BOP* determined or constrained. Thirlwall (2012) regarded Equation (3.8 or 3.9) 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.

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 & Thirlwall, 1994, Thirlwall, 2012 for history and survey of literature).

3.3 Extensions of Balance of Payment Constrained Growth Model

It should be noted that notwithstanding empirical support for Thirlwall's model, it has come under severe criticisms especially on the inconsequence of relative prices and the deficiency of capital movements in the framework. Nevertheless, these criticisms are very critical in the developments and further

extensions of the growth model that, generally, have supplied new-fangled support to the perspective (Garcimartin, Kvedaras & Rivas, 2016).

Accordingly, several developments and modifications have emerged over the years to ascertain the robustness and legitimacy of the'Law'. The initial model has been questioned on the grounds that it fails to give adequate explanation regarding the constancy of relative prices, role of capital flows, interest repayment, sustainable debt and the experiences of developing countries. The various applications and versions of the Thirlwall's law are extraordinary in their prominence, profundity and international coverage and show the level to which Thirlwall growth model has penetrated theoretical space of economics.

3.3.1 Incorporation of Capital Inflows

The original formulation of Thirlwall law above did not incorporate the role of financial capital flows. Recognising this inadequacy, Thirlwall & Hussain(1982) modified the balance-of-payment equilibrium condition, putting as a constraint that the trade deficit (surplus) ought to be equated with capital inflow (outflow). The new equilibrium identity was changed to mirror the insertion of the new constraint as follows:

$$XP + K = P^{*}EM \qquad (3.10)$$

Where, K is the nominal value of capital flows. Continuing as before with log transformationof Equation (3.10) and substituting the component financed by exports and capital flows, the equilibrium condition in dynamic form is obtained as:

$$\dot{y}_K=\theta(\dot{p}+\dot{x})+(1-\theta)\dot{k}=\dot{p}^{*}+\dot{e}+\dot{m} \qquad (3.11)$$

Where $\theta=\left(\frac{XP}{P^{*}EM}\right)$*;* captures the export-financed fraction of imports; $(1-\theta)=\left(\frac{K}{P^{*}EM}\right)$ captures the proportion of imports financed with capital inflow. They are shares of exports and financial flows in total foreign earnings respectively. Therefore, substituting export demand equation (3.4) and import demand equation (3.5) into (3.11), the new *BOP*-constrained rate of *GDP* growth is obtained, assuming that countries are capable of financing their deficits with foreign capital:

$$\dot{y}_K = \frac{(1+\theta\varepsilon_{xp}+\varepsilon_{mp})(\dot{p}* + \dot{e}-\dot{p})+\theta\varepsilon_{xy^*}\dot{y}*+ (1-\theta)\acute{k}}{\varepsilon_{my}} \quad (3.12)$$

Where, $\dot{y}_K$is balance of payment equilibrium condition taking into account the effect of capital inflows. Given this adjustment, the new GDP growth rate compatible with the balance-of-payment equilibrium turns out to be a weighted summation of different foreign currency obtainable sources (exports as well as overseas capital) divided by the income elasticity of demand for imports[7].

If real effective exchange rates are calculated in a universal unit and remain constant for a long period of time, Equation (3.12) collapses to:

$$\dot{y}\check{k} = \frac{\theta\dot{x}+(1-\theta)(\check{k}-\dot{p})}{\varepsilon_{my}} \quad (3.13)$$

Tharnpanich &McCombie (2013)argued that if the level and growth of capital inflows are small and the rate of change of relative prices is insignificant or the Marshall-Lerner condition is only satisfied or both, Equation (3.13) further reduces either to the “weak” or the “strong”version (Perraton, 2003) of Thirlwall’s law of balance-of-payments constrained growth:

$\dot{y}_{A1} = \frac{x}{\varepsilon_{my}}$ =weak version;$\dot{y}_{A2} = \frac{\varepsilon_{xy^*}\dot{y}*}{\varepsilon_{my}}$ = strong version

3.3.2 Incorporation of Sustainable Deficits and Debt

The above extension by Thirlwall & Hussain (1982) still suffers great limitation by allowing a perpetually rising ratio of net borrowing. In reality, external financing always attract some considerable costs that must not be ignored in modelling economic growth process. Consequently, studies such as Barbosa-Filho (2001), McCombie (1997), and Moreno-Brid (1998)adjustedThirlwall & Hussain (1982) model as it does not guarantee a sustainable path of debt denominated in foreign currency (Medici & Panigo, 2015). Therefore, starting with Equation of the form:

$$PX + FP = P^*ME \quad (3.14)$$

[7]Starting from a current account deficit, (θ<1), $\dot{y}_A$will be higher than $\dot{y}$ if the capital inflow growth rate turns out to behigher than that of the export rate weighted by its income elasticity (ε_{xy^*}) (always under the assumption that $\dot{y}*$>0 and ǩ >0).

Here, *F* represents the real terms of current deficit, while *FP* represents the available financial resources at market prices to pay for any shortfall (deficit). Specifying Equation (3.14) in dynamic form as before:

$$\theta(\dot{p} + \dot{x}) + (1 - \theta)(\dot{f} + \dot{p}) = \dot{m} + \dot{p}^* + \dot{e} \qquad (3.15)$$

The notations remain unchanged. Substituting Equations (3.4) and (3.5) into (3.15) and ensuring that $\dot{f}$ becomes identical to $\dot{y}$, the model then shows a fixed amount of financial shortage or deficit from the external sector as a percentage of national income as:

$$\dot{y}_{SD} = \frac{\theta\varepsilon_{xy^*}(\dot{y}*) + (1 + \theta\varepsilon_{xp} + \varepsilon_{mp})(\dot{p}* + \dot{e} - \dot{p})}{\varepsilon_{my} - (1 - \theta)} \qquad (3.16)$$

This new version of Thirlwall's model reveals the limit at which economies constrained by *BOP* ought to grow without being trapped under excruciating impacts of external debts or promoting explosive route of foreign debts.

Assuming that the constancy assumption of relative prices is upheld, the domestic income growth becomes:

$$\dot{y}_{SD} = \frac{\theta\varepsilon_{xy^*}(\dot{y}*)}{\varepsilon_{my} - (1 - \theta)} \text{ or } \dot{y}_{SD} = \frac{\theta\dot{x}}{\varepsilon_{my} - (1 - \theta)} \qquad (3.17)$$

Assuming that there are no deficits θ = 1, we revert back to the simple *BOPCG* model in Equation (3.8 or 3.9).

3.3.3 Incorporation of the Impact of External Debt Interest Payments

All the same, the preceding extension is also limited by allowing a continually rising ratio of net borrowing. Financing current account imbalance via external borrowing leads to capital outflows in the nearby future in the form of interest payments. This is an applicable and observable fact in the Nigerian economy since the 1980s up to date. Even though , Vera (2006) and Alleyne & Francis (2008) have substantially analysed this limitation, many studies largely follow Moreno-Brid (2003) simple approach by excluding or removing repayment obligation from movement of financial asset across borders (capital flows). This permits an independent evaluation of any consequences.

Therefore, Equation (3.15) is adjusted to incorporate debt service obligations as follows:

$$\theta(\dot{p} + \dot{x}) - \theta_1(\dot{p} + \dot{r}) + (1 - \theta + \theta_1)(\dot{p} + \dot{f}) = \dot{m} + \dot{p}* + \dot{e} \qquad (3.18)$$

Here, the new terms $\dot{r}$ and θ_1 represent the growth rates of real net foreign interest payments and the financial resources earmarked for debt service, respectively. When we plug in imports, exports and ensuring that $\dot{f}$ is identical to $\dot{y}$, the following equation is obtained:

$$\dot{y}_{IRD} = \frac{\theta\varepsilon_{xy^*}(\dot{y}*) + (1+\theta\varepsilon_{xp}+\varepsilon_{mp})(\dot{p}* + \dot{e} - \dot{p}) - \theta_1\dot{r}}{\varepsilon_{my} - (1-\theta+\theta_1)} \quad (3.19)$$

Where, $\theta_1 = \left(\frac{R}{P^*EM}\right)$ = fraction of national income earmarked for the settlement of external debt obligations. The model assumes that current account deficits are addressed via the sale of long-term financial assets especially bonds in the capital markets.

When the constant relative price assumption is once more upheld; Equation (3.19) collapses to:

$$\dot{y}_{IRD} = \frac{\theta\dot{x} - \theta_1\dot{r}}{\varepsilon_{my} - (1-\theta+\theta_1)} \quad Or \quad \frac{\theta\varepsilon_{xy^*}(\dot{y}*) - \theta_1\dot{r}}{\varepsilon_{my} - (1-\theta+\theta_1)} \quad (3.20)$$

Again, assuming that debt service obligations are non-existent, specification (3.20) collapses to (3.8 or 3.9).

3.3.4 Incorporation of Sectoral Differences and Intermediate Imports

One major perspective following Thirlwall's demand-led growth theory is that changes in the sectoral composition of exports and imports affect the BoP equilibrium growth rate. This suggests that Thirlwall's aggregate model can be adapted to incorporate the sectoral product specialization of the economy that affects the non–price competitiveness of the goods produced (Soukiazis, Muchová, & Leško, 2017a). This perspective is highly rooted in Pasinetti (1981, 1993)study on structural economic dynamics. It argues that changes in the production structure systematically affect the pace of economic growth. Accordingly, moving away from the production of goods with low elasticity to foreign income to the production of goods that have high income elasticity is a viable way of boosting economic growth.

Following Pasinetti (1981 & 1993), Araujo & Lima (2007) disaggregated the original *BOPCG* to capture the structural composition of exports and imports. Here, the main argument is that shifts in the composition or sectoral shares of

imports and exports determine the long-term growth path consistent with the balance-of-payments equilibrium:

$$\dot{y}_{MBOPCG} = \frac{\sum_{i=1}^{n} w_{x_i} \varepsilon_{xy^*{}_i}}{\sum_{i=1}^{n} w_{m_i} \varepsilon_{my_i}} (\dot{y}^*) \qquad (3.21)$$

Where $\varepsilon_{xy^*{}_i}$represents a vector of income sensitivity of demand for exports of industry *i;* ε_{my_i}captures the income sensitivity of demand for imports of industry *i;* w_{x_i}represents the proportion of industry *i* in overall exports, and w_{m_i}indicates the proportion of industry *i* in overall imports, $\dot{y}^*$ is the growth of foreign income.

Therefore, an economy can substantially grow irrespective of the rate of growth of the rest of the world provided that the shares of exports and imports are satisfactorily and structurally transformed. In essence, the growth rate of domestic income largely depends on sectoral characteristics of the economy. Most importantly, countries that engage in the export of goods with high technological contents gain substantially in comparison to those that produce and export low-tech, primary and natural resource-based products(Gouvea & Lima, 2010; Missio & Gabriel, 2016; Soukiazis, et al. 2017a; Tharnpanich & McCombie, 2013).

Indeed, the role of technological content in export composition has emerged as one of the building blocks of viable external performance around the globe. However, this subject has only received little attention. This represents a substantial research gap that this chapter seeks to bridge. To the best of my knowledge, there are only a few studies that have estimated import and export functions by technological sector in *BOPCG* model (Gouvêa & Lima, 2010; Romero & McCombie, 2016; Romero, Silveira, Jayme, 2011; Araujo, et al. 2016)

Gouvea & Lima (2010) employed the Johansen cointegration procedure to estimate sectoral elasticities for six technological sectors using time series data spanning 1962 and 2006 for four Latin American countries and four Asian countries using the Lall (2000)-SITC (Rev.2) classification. The results supported Thirlwall's law for all sampled economies with the exception of South Korea, while the *MBOPCG* analogue was supported for all the countries. The authors asserted that the sectoral composition of exports and

imports is important and matters for domestic income growth. Overall, they concluded that the higher the technological composition of a sector, the higher is the income elasticity.

Romero et al. (2011) employed a vector error correction model to analyse various technological classifications of output in the Brazilian trade matrix. The authors aggregated six technological sectors into three broad sectors (primary products; resource-based and low technology and; medium and high technology manufacturing sectors). The estimates obtained were substantiated by examining impulse-response functions and the decomposition of the forecast error variance to conclude that there is a direct connection between the technological content of a tradable good and income elasticity of demand. Therefore, as in the above, products with superior technological contents possess higher income elasticities. This reinforced the idea that income elasticity depends on the level of technological concentration in a good. It suffices to assert that external balance and performance could largely and speedily be achieved when high technology is employed in export production. In line with Thirlwall (1979),raising the production and export of such products ought to accelerate the income growth of the domestic economy.

Romero & McCombie (2016) used the panel data technique to estimate the income elasticities for five technological sectors in fourteen advanced European countries. The authors conducted comparative analyses between income elasticities obtained from the VECM models and other models (Fixed effect, system GMM and Instrumentals variable models) to show that the income elasticities of both imports and exports are significantly superior for medium and high technological sectors. This essentially underpins the centrality of structural change moving away from the manufacturing of simple products to the manufacturing of more sophisticated products with substantial technological content.

A study that is closely related to Chapter 5 of the thesis is Araujo et al. (2016). The study not only demonstrated how technology contents matter, but proceeded to show that a growth strategy based on foreign content could be harmful for long-run growth when they have high elasticity with respect to exports. Blecker & Ibarra (2013) and Ibarra & Blecker (2015) showed that

massive dependence of manufacturing exports on intermediate imports could harm overall growth in the long-run.

3.3.5 Incorporation of Internal and External Imbalances

Studies on Thirlwall-Keynesian approach are on the increase to answer questions relating recent surging public debt crisis around the globe. Antunes &Soukiazis (2009); Soukiazis & Atunes(2011) and Soukiazis, et al. (2012a), pointed out one major inadequacy of the Thirlwall Law for solely concentrating on external imbalances and totally neglecting the scenario where internal distortions necessitated by mounting budget deficits or public debt serve as major hindrance to long-run growth process. The authors argue that the recent European public debt predicament and by extension, the mounting debt crises of developing countries demonstrate that when internal imbalances goes beyond a manageable magnitude, they can hamper growth and local demand in a harsh manner.

Advancing further, Soukiazis, et al. (2012b) extended the *SCA*[8] model by relaxing the neutrality assumption and overtlyspecify relative prices in the domestic income growth model.The overall outcome shows that growth could be constrained by both internal and external constraints.

Soukiazis, et al. (2013) yet again tested the model for Portugal by extending the scope to 2010. The growth rate obtained by the *SCA-BOPCG* model once more underestimates the actual growth in Portugal. The difference between growth predicted by the model and actual growth was higher than in the case of Thirlwall's law. Consequently, the authors arrived at the same conclusion that imbalances on both the accounts constrict growth for Portugal despite differences in the scope of the analysis. Applying the extended version of model on the Italian economy, Soukiazis et al. (2014) showed that he growth rate computed by the *SCA-BOPCG* model with and without neutral relative prices over predicts actual growth in Italy, thus leading to the affirmation that the economy grows slower than the rate consistent with the balance-of-payments equilibrium and this can be taken as evidence that the country has

[8]SCA represents the acronym of the names of the authors who pioneered balance of payment constrained growth (BOPCG) with internal and external imbalances, henceforth SCA-BOPCG model

enormous chance to accelerate growth than it actually did.

More recently, Soukiazis, Atunes & Kostakis (2018) revealed that the *SCA-BOPCG* version of Thirlwall's model makes a nearer forecast of the actual growth rate for Greece which is in line with the high deficit/debt and current account deficit that occurred in the country. Their overriding policy submission based on scenario analysis demonstrates that the most proficient strategy to achieve higher growth is to lessen external imbalances.Soukiazis, Atunes & Stoain (2015) obtained similar outcome for the Romanian economy and the policy measures suggested towards easing external constraints in order to achieve higher growth rates has to do with increasing the country's competitiveness.

From the foregoing *BOPCG* empirical literatures that consider both internal and external imbalances,it would be appropriate to assert that long-run growth could be incorrectly estimated if internal and external imbalances are ignored in growth computation. Again, it is quite obvious that there is a gross scarcity of studies in this area. Therefore, carrying out a *BOPCG* study that considers both internal and external deficits is worthwhile. More so, *SCA-BOPCG* model has only been tested for not more than four European economies (Portugal, Italy, Greece and Romania). However, none has been applied to a developing country, such as Nigeria. The present thesis modifies *SCA-BOPCG* model to account for structural needs of the Nigerian economy as shall be seen later (in Chapter 4).

BOPCG studies have extended Kaldor–Dixon–Thirlwall model developed by Dixon & Thirlwall (1975) to show among others that research intensity significantly generates higher productivity growth (dynamic returns to scale)(Romero & McCombie 2018;Rmero 2019;); when related with output growth (Romero & Britto, 2017) and research gap (Panshak, et al, 2019a) significantly improves income elasticities and structural change; hence robust external performance. Therefore, aside deficits, technological contents and intermediate imports, technology gap are important restrictions on growth. This addition is motivated by the fact that for a correct and comprehensive determination of long-run growth path of an economy from the Periphery-

South, the role of technological learning and upgrading in shaping exports quality is crucial.

As a synopsis, it would not be incorrect to assert that there is a gross scarcity of literatures on *BOPCG* in Nigeria. Sumra (2016); Anoka (2013); Emmanuel (2017); Panshak, et al. (2019a, b) to the best of my knowledge are among the few researches that have attempted to test the validity of the model on the economy.

CHAPTER 4
BALANCE-OF-PAYMENTS-CONSTRAINED GROWTHWITH INTERNAL AND EXTERNAL IMBALANCES, NON NEUTRAL RELATIVE PRICES AND FOREIGN CONTENTS

4.1 Introduction

As noted earlier, Several studies have sought to extend the Thirlwall's 'Law'; however, only few studies have examined a situation where simultaneous distortions on internal and external accounts of countries alongside relative prices restrict long-run growth in a *BOPCG*framework (Soukiazis, et al. 2011; 2013; 2014; 2015; 2018; Panshak, et al. 2019b).

There is a renewed interest on the relationship bewteen budget deficits and real economic activities. This attraction is even more intense in a situation where resources are not fully employed or where institutional mechanisms to efficiently manage borrowed funds are inadequate. This is anchored on the observation that increasing government borrowing or reducing taxes in order to achieve higher *GDP* and overall prosperity does not often automatically lead to the realisation of the intended objectives. 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 & Desli, 2004; Soukiazis, et al. 2014).

Similarly, lack of access to foreign intermediate and capital goods is often seen as one of the most important constraints to long-term growth for the Periphery-South. Contributing to the above issues, this thesis explained Nigeria's growth path using a modified simultaneous model (SCA-BOPCG)

developed by Soukiazis, et al. (2014). This version of the model incorporates both external and internal deficits and includes relative prices as well as foreign contents as additional determinants of long-run growth. The adoption of the model is informed by the massive importation of machinery and equipment, intermediate and raw material goods which amounts to about 56% share of total imports since 1982 in Nigeria.

The model set-up of the thesis is unique and differs from the standard occupationof existing *SCA-BOPCG* versions of Thirlwall's model on three major fronts:

i. By incorporating the role of foreign contents used in manufacturing export growth and domestic investments within the *BOPCG* framework. Intermediate and capital goods imports especially those with substantial technological content are fundamental in long growth process because they exert positive effects on performance and productivity. The modification is therefore, meant to capture the structural needs of the economy. The study therefore, contended that for a correct and comprehensive determination of long-run growth path of a small open economy, the role of intermediate goods importas important restrictions on growth ought to be included. While in the Centre-North, the principal restriction on long-run growth is foreign demand as established by traditional Thirlwall's model; this may not be the same for a country in the Periphery-South as result of severe capital shortage[9].

ii. Even if the hypothesis holds for the aggregate economy, it may differ across export sectors. Note that the *SCA-BOPCG* versionsof Thirlwall's generally focus on the aggregate export function only. Howeve, this chapter centres on the manufacturing export sector.

[9]In the Periphery-South, the creation of embodied technological knowledge necessitates advanced skills and advanced machinery which are largely unobtainable. Therefore, in the face of huge technological deficits, it is rationally satisfactory for a Periphery-South country to import the appropriate embodied technological knowledge than to produce them because of the high cost of creating them in the local environment. This would have substantial positive implications for growth especially when suitable industrial policy framework is established to direct capital investments in areas and production sectors where the economy has comparative advantage. The necessity of such industrial policy is aimed at ensuring that the correct and relevant infrastructural base is established to enhance the absorption of foreign technologies (See, Eaton & Kortum, 2001; Habiyaremye, 2013).

This adjustment is necessary to identify the most binding constraints limiting the progress of the sector which could enable efficient and accurate policy formulation.

iii. In the post-Keynesian tradition, the link between the *REER* and domestic income growth has mostly been ignored. In the conventional *BOPCG* set-up in particular, *REER* dynamics are treated as irrelevant determinants of long-run growth. This perhaps, because of the reason that some empirical studies discover either that price sensitivities of demand for exports and imports are small (implying that the effect of real devaluation on the rate of growth exports and imports is minute) or that terms of trade fail to demonstrate a logical movement of appreciation or depreciation in the long-run (Razmi, 2005, 2016).

In spite of this, recent studies especially those on the Periphery-South accentuate the significant function of competitive and stable *REER* in influencing investment decisions, exports and consequently easing the balance of payment constraint on growth. Razmi (2005, 2011, 2016) specifically contended that exporters from the Periphery-South cannot compete with producers from the Centre-North on identical level in international trade. While the Centre-North has succeeded in properly improving the composition of their export baskets; the Periphery-South economy like Nigeria still lags behind in diversifying its export structure. This makes substitution between the export goods and foreign ones increasingly difficult. Furthermore, even if these economies produce comparable goods, differences in quality as perceived by consumers are likely to make the hypothesis of similar elasticities of substitution unacceptable. Therefore, this thesis relaxes the contentious hypothesis of the neutrality of relative prices by assuming that they can perform a considerable role in the pace of growth. Therefore, it clearly introduces relative prices explicitly into the growth model as in recent researches (Soukiazis 2013; 2014; Razmi, 2011, 2016).

iv. It clearly isolated or disaggregated the import contents of the constituents of domestic income as in ex ant literatures (Soukiazis 2013; 2014).

v. Lastly, as indicated in the literature, 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. More so, only Panshak et al. (2019b) on this particular issue regarding any develop country to the best of my understanding.

The structure of this chapter is as follows: section 4.2 showsderivation of *SCA-BOPCG* model. Section 4.3 covers empirical examination andcomputation of the equilibrium growth rates. Scenario and policy simulation analysis is carried out in Section 4.4. Finally, section 4.5 gives the concluding remarks.

4.2 Modelling Balance of Payments Constrained Growth Model with Internal and External Imbalances and Intermediate imports

Building on the Thirlwall's law specified in the preceding chapter, the present chapter uses *SCA-BOPCG* model which decomposed the components of aggregate demand tocomprise four basic equations:

4.2.1 The Import Demand Function

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

$$\dot{m} = \varepsilon_{mc}\dot{c} + \varepsilon_{mg}\dot{g} + \varepsilon_{mk}\dot{k} + \varepsilon_{mx}\dot{x} + \varepsilon_{mp}(\dot{p}^* + \dot{e} - \dot{p}) \quad (4.1)$$

. A cursory look at the above function shows the growth of imports, $\dot{m}$, is a function of the growth rates of consumption $\dot{c}$, spending by the government sector, $\dot{g}$, domestic investment, $\dot{k}$, manufactured export, $\dot{x}$, foreign inflation, $\dot{p}^*$, domestic inflation, $\dot{p}$, as well as the changes in exchange rate $\dot{e}$ over time. Accordingly,ε_{mc},>,ε_{mg}, ε_{mk} and ε_{mx} >0 are the consumption, government,

investment and the manufactured exports elasticities of demand for imports respectively. Similarly, ε_{mp}< 0 is relative price sensitivity of the demand for imports

4.2.2 Export Demand Function

. Specification of export function incorporates two different kinds of exports (manufactured and other goods). Specifying the manufactured export function in dynamic form is as follows:

$$\dot{x}_m = \varepsilon_{x\dot{y}^*}\dot{y}^* + \varepsilon_{xp}(\dot{p} - \dot{p}^* - \dot{e}) \qquad (4.2)$$

In this paper, the model is extended by adding the intermediate goods import growth. This inclusion is necessary given the structural need and nature of the Nigerian economy, which is significantly reliant on the importation of intermediate goods:

$$\dot{x}_m = \varepsilon_{xy^*}\dot{y}^* + \varepsilon_{xm}\theta_i^m\dot{m} + \varepsilon_{xp}(\dot{p} - \dot{p}^* - \dot{e}) \qquad (4.3)$$

The growth rate of manufactured exports is represented by $\dot{x}_m$, foreign income is represented by *ẏ*, ṁ* is intermediate imports, $\theta_i^m$is the share of intermediate capital imports and ε_{xm} is the intermediate goods import elasticity of manufactured exports, relative prices is captured by (*ṗ —ṗ*—ė)*. ε_{xy^*}captures the income elasticity of manufactured export. This component is the aggregation of non-price features of the export goods linked with diversification, quality, packaging and trustworthiness, among others. Similarly,ε_{xp} represents the relative price sensitivity of the demand for manufactured exports. Given the positive sign of the product, a careful reduction in the value of the local currency has the potential to stimulate the demand for manufactured exports, hence making it more competitive in the foreign market. We assume that other exports (chiefly oil and agricultural products) grow at the exogenously given rate $\dot{x}_0$, and their prices change at the exogenously given rate $\dot{p}_0$, assuming that their quantities and prices are determined by supply side factors and global market conditions that are not in the scope of the present model.

4.2.3 Private Consumption and Investment Function

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

$$\dot{c} = \varepsilon_{cy}\dot{y}_d \quad (4.4)$$

The study denotes, *ċ* to represent the annual consumption growth rate, $\dot{y}_d$ is the per capita income growth and ε_{cy} captures the income sensitivity of aggregate consumption.

Similarly, the investment model firmly follows Keynes's accelerator theory. The theory postulates that actual domestic income (*ẏ)* and interest rate (*ṙ)* are the main drivers of total investment ($\dot{k}$) over a time period. The present paper further extends the model to take into account the capital goods imports used in the investment sector, specified as follows:

$$\dot{k} = \varepsilon_{ky}\dot{y} + \varepsilon_{kr}\dot{r} + \varepsilon_{km}\theta_k^m\dot{m} \quad (4.5)$$

Here,ε_{ky} captures the effect of the accelerator, while ε_{kr} measures the real cost of aggregate investment., θ_k^m is the share of capital goods imports, ε_{ky} represents income elasticity of domestic investment and$\varepsilon_{km}$is the capital goods import elasticity of domestic investment

4.2.4The Government Sector

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

$$G_n + iB_H + i^*B_Fe = tYP + D \quad (4.6)$$

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 component of government debt owned by overseas investors, real domestic income is *Y,* domestic price level is denoted by *P,* and *D* represents the difference between government revenue and expenditure. Interest rates valued at market prices given to domestic as well as overseas

holders of debt instruments are captured by *i* and *i**, respectively. The nominal exchange rate is captured by *e,* while tax rate is denoted by *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 *(ġ)* is consistent with the restriction (4.6) and can be obtained as[10]:

$$\dot{g}=\frac{t\dot{y}}{W_G} + \left(\dot{d} - \dot{p}\right)\frac{W_D}{W_G} - \left[\Delta i + i\left(\dot{b}_H - \dot{p}\right)\right]\frac{W_{BH}}{W_G} - \left[\left(e\Delta i^* + i^*\Delta e\right) + i^* e\left(\dot{b}_F - \dot{p}\right)\right]\frac{W_{BF}}{W_G} \quad (4.7)$$

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, $W_{BH} = \frac{B_H}{PY}$, and $W_{BF} = \frac{B_F}{YP}$ respectively represent, the government obligation in the hands of domestic and overseas investors(as a fraction of *GDP*). 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.

4.2.5The Balance of Payments Equilibrium Condition

The concluding part of the BOPCG specification with the below identity can be seen as: $XP + D_F e - i^* B_F e = MP * e$ (4.8)

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

$$\dot{x} + \dot{p} + (1 - \zeta)\frac{W_D}{W_X}(\dot{p} + \dot{y} - i^*) - (1 - \zeta)\frac{W_B}{W_X}\Delta i^* = \left(\frac{W_M}{W_X}\right)\left(\frac{P*e}{P}\right)(\dot{m} + \dot{p}^* + \dot{e}) \quad (4.9)$$

[10]Derivation details of the government expenditure growth equation can be found in Soukiazis et al. (2012a) and Appendix A4.3

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. $(1-\xi)$ measures the degree of public deficit (or debt) financed by foreign markets.

We further take into account manufacturing and other exports difference in the *BOP* constraint identity as:

$$\theta_m^x(\dot{x}_m + \dot{p}) + (1-\theta_m^x)(\dot{x}_0 + \dot{p}_0) + (1-\xi)\frac{W_D}{W_X}(\dot{p} + \dot{y} - i^*) - (1-\xi)\frac{W_B}{W_X}\Delta i^*$$

$$= \frac{W_M}{W_X}\frac{P^*e}{P}(\dot{m} + \dot{p}^* + \dot{e}) \qquad (4.10)$$

Where θ_m^x represent share of the manufacturing exports. After substituting all the relevant equations into (4.9) and rearranging we obtain the growth rate of domestic income with non-neutral relative prices as:

$$\dot{y}_C = {}^{A}/_{B}$$

$$
A = \left(\begin{array}{l}
\left\{ \theta_m^x \varepsilon_{xy^*} - \varepsilon_{mx} \varepsilon_{xy^*} \left(\frac{W_M}{W_X} \frac{P^* e}{P} - \varepsilon_{xm} \theta_m^x \theta_i^m \right) \left(\frac{1}{(1 - \varepsilon_{mx} \varepsilon_{xm} \theta_i^m - \varepsilon_{mk} \varepsilon_{km} \theta_k^m)} \right) \right\} \dot{y}^* \\
- \left\{ \begin{array}{l} \left(\frac{W_M}{W_X} \frac{P^* e}{P} - \varepsilon_{xm} \theta_m^x \theta_i^m \right) \left(\frac{1}{(1 - \varepsilon_{mx} \varepsilon_{xm} \theta_i^m - \varepsilon_{mk} \varepsilon_{km} \theta_k^m)} \right) \varepsilon_{mx} \varepsilon_{xp} \\ + \left(\frac{W_M}{W_X} \frac{P^* e}{P} - \varepsilon_{xm} \theta_m^x \theta_i^m \right) \left(\frac{1}{(1 - \varepsilon_{mx} \varepsilon_{xm} \theta_i^m - \varepsilon_{mk} \varepsilon_{km} \theta_k^m)} \right) \varepsilon_{mp} - \theta_m^x \varepsilon_{xp} \end{array} \right\} (\dot{p}^* + \dot{e} - \dot{p}) \\
+ \left(\dot{p} - \frac{W_M}{W_X} \frac{P^* e}{P} (\dot{p}^* + \dot{e}) \right) + (1 - \xi) \frac{W_D}{W_x} (\dot{p} - i^*) - (1 - \xi) \frac{W_B}{W_x} \Delta i^* \\
- \left(\frac{W_M}{W_X} \frac{P^* e}{P} - \varepsilon_{xm} \theta_m^x \theta_i^m \right) \left(\frac{1}{(1 - \varepsilon_{mx} \varepsilon_{xm} \theta_i^m - \varepsilon_{mk} \varepsilon_{km} \theta_k^m)} \right) \left\{ \begin{array}{l} \varepsilon_{mc} \varepsilon_{cy} \left(\frac{(\Delta i - \Delta \dot{p}) \xi w_B}{(1 - t) + \xi r w_B} \right) \\ + \varepsilon_{mg} \left(-\Delta i \frac{\xi W_B}{W_G} - e \Delta i^* \frac{(1 - \xi) W_B}{W_G} \right) \\ + \varepsilon_{mk} \varepsilon_{kr} (\Delta i - \Delta \dot{p}) \end{array} \right\} \\
+ (1 - \theta_m^x)(\dot{p}_0 + \dot{x}_0)
\end{array} \right)
$$

$$
B = \left\{ \left(\frac{W_M}{W_X} \frac{P^* e}{P} - \varepsilon_{xm} \theta_m^x \theta_i^m \right) \left(\frac{1}{(1 - \varepsilon_{mx} \varepsilon_{xm} \theta_i^m - \varepsilon_{mk} \varepsilon_{km} \theta_k^m)} \right) \left\{ \begin{array}{l} \varepsilon_{mc} \varepsilon_{cy} \\ + \varepsilon_{mg} \left(\frac{t}{W_G} + \frac{W_D}{W_G} - \frac{i \xi W_B}{W_G} - \frac{i^* e (1 - \xi) W_B}{W_G} \right) \\ + \varepsilon_{mk} \varepsilon_{ky} \end{array} \right\} - \left((1 - \xi) \frac{W_D}{W_x} \right) \right\}
$$

(4.11)

The domestic income growth model comprehensively specified above shows *inter alia* other things that the growth of real domestic income is explained by internal and external imbalances, while accounting for the role of real effective exchange rate as well as foreign contents. Precisely, the numerator, (i.e. *A* part) is disintegrated in diverse components: the first expression captures the shock of external demand on real growth of domestic income *($\dot{y}_C$);* the next expression reveals the impact of substitution via the adjustments or changes to the real effective exchange rate; the third expression identifies how trade volume affects domestic 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 disaggregated import demand contents' sensitivity to the annual growth rate of real *GDP* in the lower part of the model (denominator, *B*). Equation (4.11*)* is employed for the determination of Nigeria's growth path.

4.3 Application of the Modified SCA-BOPCG model on the Nigerian Economy

In answering questions one and two in section 1.3 Equations (4.1), (4.3), (4.4) and (4.5) are estimated concurrently. This is to obtain the elasticity coefficients essential for the calculation of the growth rate of the economy as specified in Equation (4.11).

4.3.1 Data Description and Econometric Methodology

As earlier indicated; this chapter of the thesis uses the dynamic rates to estimate the derived four system equation. It relies on the robustness of*3SLS*tecnique. 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.

Similarly, the choice of *3SLS* has to do with its superiority over *2SLS* because it utilizes the entire obtainable information at the same time period. In addition, it is more robust than *2SLS* when the time period gets larger. It equally transcends *2SLS* by not only correcting for correlation of the endogenous independent series with disturbance terms but has the capacity of providing *3SLS* estimates of a set of non-linear equations. Therefore, it could be said that *3SLS* is more efficient and its usefulness and strength increases with increase in the scope of analysis as well as of the interrelations among the error terms as in the present study. This methodology has also been shown to be more beneficial in providing efficient estimates and consistent even in the absence or failure of normality assumption (Soukiazis et al. 2013; 2014).

This chapter assumes that other variables (those not included in 4.1,4.3,4.4 and, 4.5) are exogenous including the lags of some of the constraints. The

import demand function has consumption, investment, manufactured exports and relative prices are regressors. While the export demand function uses world income, relative pricess and intermediate goods; the investment demand function makes use of domestic income, real interest rate and capital goods as regressors. Finally, the consumption demand function solely uses disposable income as explanatory variable. A substantive description, explanation and sources of the data are presented in Appendix A4.1.

4.3.2 Econometric Evidence, Interpretation and Discussion

From a cursory examination of the overall results from Table 4.1, it can be asserted that the parameter estimates are obviously in conformity with the underlying theoretical postulations both in signs and significance. Most importantly, the research produces result that particularly reflects the structural needs of a developing country. Beginning with the import growth equation[11], the estimated coefficient of the consumption growth surpasses unity (ε_{mc}= *1.738077)* and is significant at *0.05* level. This signifies that Nigeria's import demand is highly elastic with respect to the changes in the consumption growth. Likewise, the manufactured exports elasticity of demand for imports (ε_{mx}= *0.118889)* is statistically significant at *0.01* level. This implies that one percentage point increase in the manufacturing export increases imports by *0.118889* percentage points.

Moving further, import demand significantly depends on investments growth (ε_{mk}=*0.9755421*). Therefore, as investment increases, the demand for imported goods follow suit. Surprisingly, the elasticity of imports with respect to the growth of government final spending *(ε_{mg}= −0.12656*) turns out with an unexpected sign, although not significant. Note that the scope of the study includes periods of some major economic downturns, (for instance, 1983, 2015 economic recessions, 2007/08 global financial crisis).

[11]Given that shares of intermediate and capital goods imports is more than half of total imports, it is asserted that import growth in Nigeria is largely driven by demand for foreign factor inputs. Therefore, when an attempt to use the growth of intermediate and capital goods imports as the dependent variable in the imports function, all the coefficients turn out with same signs and almost same significance as does when total import growth is taken as the dependent variable. In addition, the growth prediction and interpretation of all the models are almost the same ($\dot{y}_A$ = 3.93%; $\dot{y}_B$ = 6.81% and $\dot{y}_C$ = 5.40%) with the one we obtained ($\dot{y}_A$ = 3.93%; $\dot{y}_B$ = 4.77% and $\dot{y}_C$ = 4.40%, See Table 4.2).

Table 4.1: Three Stage Least Squares Estimation of the Structural Model, Nigeria 1982–2015

	Coefficient	Std. Error	t-statistics	Probability	R^2
Import growth, $\dot{m}$					
Constant	6.288630	8.601901	0.731074	0.4663	0.15
Consumption, $\dot{c}$	(ε_{mc})1.738077	0.779116	2.230833	0.0278**	
Investment, $\dot{k}$	(ε_{mk})0.955421	0.330671	2.889342	0.0047***	
Gov. expenditure, $\dot{g}$	(ε_{mg}) -0.126562	0.083426	-1.517058	0.1322	
Manufactured exports, $\dot{x}_m$	(ε_{mx})0.118889	0.070651	1.682767	0.0953*	
Relative price, $\dot{p}^*+\dot{e} - \dot{p}$	(ε_{mp})-0.341948	0.203076	-1.683847	0.0951*	
Consumption growth, $\dot{c}$					
Constant	2.574928	1.537077	1.675210	0.0968**	0.49
Disposable income, $\dot{y}_d$	(ε_{cy})1.065298	0.209524	5.084361	0.0000***	
Investment growth, $\dot{k}$					
Constant	-7.687887	4.252595	-1.807811	0.0734*	0.35
Domestic income, $\dot{y}$	(ε_{ky})1.478858	0.511876	2.889091	0.0047***	
Real interest rate, $\dot{r}$	(ε_{kr})-0.426392	0.199210	-2.140421	0.0346**	
Capital goods imports, $\theta_k^m \dot{m}$	(ε_{km})0.284597	0.066551	4.276359	0.0000***	
Manufactured export growth, $\dot{x}_m$					
Constant	14.19247	35.72266	0.397296	0.6919	0.15
Relative price, $\dot{p}^*+\dot{e}- \dot{p}$	(ε_{xp})0.314177	0.498102	0.630748	0.5295	
World income, $\dot{y}^*$	(ε_{xy^*})1.650958	11.67963	0.141354	0.8879	
Intermediate imports, $\theta_i^m \dot{m}$	(ε_{xm})1.105926	0.358374	3.085957	0.0026***	

Notes:

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

Exogenous variables: W_{Dt}, W_{Bt}, W_G, $W_{Bt}(-1)$ $W_{Dt}(-1), W_{Gt}(-1)$, i_t, $i_t(-1), t_t(-2)$, i_t^*, $i_t^*(-1)$, $i_t^*(-2)$, $r_t(-2)$, t_t ,$\dot{g}_t(-2)\dot{g}_t$ (-3),$invt_{t,}(-3)$,$\dot{x}_{mt(-1)}$,$\dot{m}_t(-2)$,$\dot{y}_t^*(-3)$, $\dot{y}_t(-1)$,$\dot{y}_t(-2)$, $\dot{y}_t(-3)$, $\dot{y}dt(-2)$,$\dot{p}^*e/\dot{p}(-2)$,$\theta_k^m \dot{m}$ (-1), $\theta_k^m \dot{m}(-2)$, $\theta_k^m \dot{m}(3)$,

*** estimate significant at 0.01
** estimate significant at 0.0.5
* estimate significant at 0.1

Therefore, the negative sign possibly reflects recessionary pressure that tends to reduce government final expenditure.

This chapter also seeks to verify whether relative price is an important policy variable in the Nigerian economy. The result obtained (ε_{mp}= − 0.341948)[12] shows that it is negative and statistically significant at 0.1 level. Considering the dominance of the total share of capital and intermediate goods imports in production and the existence of foreign exchange constraint, an adverse change in relative prices or terms of trade could impact negatively on the ability to import critical foreign factor inputs and may thwart performance of the manufacturing sector. Therefore it could be asserted that exchange rate policy of devaluation could discourage imports of essential technological inputs and constraints productivity; hence hampering the overall growth of the economy.

The result from the investment function affirms that domestic investment is sensitive to domestic income growth and follows the accelerator principle. This is because the income elasticity (ε_{ky}*=1.478858*) is elastic and significant at 0.01 level. In other words, the sensitivity of investment growth to income is greater than unity. Again, in line with economic theory, interest rate is correctly signed and significant as expected *(ε_{kr}= −0.426392)*. Most importantly, capital goods import elasticity of investment (ε_{km}*= 0.284559)* is statistically significant at 0.01 level. Therefore, it is concluded that the novel variable in this equation (growth of imported capital goods) is fundamental to the growth of domestic investment. In general, the results point to the fact that investment decisions are anchored on income and interest rate expectations as well as on the accessibility to imported capital goods in Nigeria. Finally, in the consumption equation, disposable income elasticity of consumption (ε_{cy}*= 1.065298)* is elastic and statistically significant at 0.01 level in line with our apriori expectation.

[12]Similarly, when it is assumed in line with Habiyaremye (2013) that all imports are intermediate and capital; hence no final consumption component, the estimated coefficients turn out with expected signs and significance in all the structural models. The only exception in this scenario is in the magnitudes of the coefficients. This confirms the argument on the dominance of the shares of capital and intermediate in driving imports demands in Nigeria over the sample period.

The outcome of the manufacturing export demand equation shows that the most binding constraint on manufactured exports is the growth of intermediate goods imports. The variable is statistically significant at *0.01* level (ε_{xm} = *1.105592*). This outcome supports our finding on the significance of the growth of imported capital goods in the domestic investment function. On the contrary, the study did not find any statistical significance regarding relative prices *(*ε_{xp} *= 0.314177*) in the export equation.

Likewise, the response of the manufactured exports to the growth of world real income (measured by the growth rate of real GDP of five major trading partners-India, US, Netherlands, France and Spain) is positive as expected but not significant (ε_{xy^*}*=1.650958)*[13]*.* The insignificance of these variables could be because of the small share of manufactured exports in total exports, low technological contents of the export products, less competitiveness of the products, low market access or perhaps, the effect of Dutch disease. This result agrees with Razmi (2016) that most countries particularly small open economies are principally restricted by domestic aggregate supply rather than by world demand. The author buttresses this argument by showing the experience and success story of the Chinese economy where it grew slowly in the mid 1950s and 60s when the world is growing more rapidly. The author also shows that China experienced impressive growth when world income growth was sluggish in the 1980s, 90s, and even into the 2000s. This

[13]Note that this outcome is only related to the manufactured exports. However, when we estimated the entire export function where oil constitutes over 90% exports, the result was statistically significant (ε_{xy^*}*= 2.44).* Though primary based products do not enjoy considerable elasticity in the world market, the increasing oil demand by oil-hungry nations like China, India, Turkey etc possibly explains its significance (Romero & McCombie, 2016). Therefore, it could be said that the role of foreign demand in growth process at the individual or disaggregated level differs from the aggregate level.

Given the lacklustre growth and contribution of the manufacturing sector to *GDP*, it is logical to assert that the it does not really seems it would be able to activate or spark any considerable diversification except an unusual impulse and encouragement is directed towards the sector in the form of massive investments in spurring industrial infrastructural base and moulding of suitable manpower. Therefore, as a short-term transformation plan, more oil exports gains should be exploited and channel towards driving stable growth of domestic income in the long run, where the manufacturing sector is the main driver of the process.

apparently suggests that there could be some fundamental explanations to this phenomenon than the growth of foreign demand.

The study also estimates *2SLS* regression based on the same instruments to determine the validity of the coefficients. The results are given in Appendix A4.2. The estimation starts with Sargan-*J test*, which gives information on whether the model is over-identified or not. The test reveals that the instruments used are valid and uncorrelated with error terms. The second is the test for heteroskedasticity. The results show that the errors are homoskedastic except for manufactured export growth equation. The Langragian multiplier (LM) test of autocorrelation also shows that there is no problem of serial correlation in the system equation residuals. Finally, the Jarque-Bera test for normality also confirms that the residuals are distributed normally, given that their Jarque-Bera values are superior to all the probability statistics, except for import growth function. The R^2 on the average indicate that the models are well fit.

4.3.3 Computation of Balance of Payment Equilibrium Growth Rates, 1982 to 2015

The estimates from *3SLS* in Table 4.1 well as the actual averages of some of the variables are used for the estimation of the growth rates in Table 4.2.The paper estimates three main equilibrium rates of growth. The first one is the original model ($\dot{y}_A$). The second one is the *SCA-BOPCG* model that purely considers internal and external imbalances where the real exchange rate are neutral in the growth process ($\dot{y}_B$).The third growth specification is the modified *SCA-BOPCG* model as defined in Equation (4.11), which is ($\dot{y}_C$). Here, the model does not only accounted for the role of relative prices but equally extended the model to account for the structural need of the economy by including intermediate and capital goods imports in the export and investment equations, respectively.

Note that Thirlwall's initial model requires the computation of the aggregate income responsiveness of demand for imports. Here, we use cointegration: technique-fully modified ordinary least squares (FMOLS) for the estimation:

$$\dot{m} = \varepsilon_{mp}(\dot{p}* - \dot{e} - \dot{p}) + \varepsilon_{my}\dot{y} \quad (4.12)$$

Growth of gross imports ($\dot{m}$) depends on the growth of domestic income ($\dot{y}$) and growth of relative prices $(\dot{p}* - \dot{e} - \dot{p})$. Lags of (relative prices, manufactured exports, investment and a dummy variable corresponding to 2007) are used as fixed determinants. The long-run gross domestic income and relative price elasticities are obtained as ($\varepsilon_{my} = 1.34$) and (ε_{mp}=-0.45) and are statistically significant at 0.1 and 0.01 levels, respectively. Therefore, at the aggregate level, these variables matter for growth.

It is possible to calculate the growth rate compatible with the *BOP* equilibrium and put side by side with the actual growth rate over the period 1982 to 2015. The reduced form of the model indicates that Nigeria's growth experience could be explained using three different ways: by the aggregate model (Thirlwall's Law); by purely accounting for internal and external deficits; and finally by accounting for internal and external deficits with the effect of relative prices as well as foreign contents in domestic investment and export growth.When a comparative analysis regarding actual growth of domestic income ($\dot{y}$ = *4.26*%) and *BOP* equilibrium growth rates are conducted, the below bold statements could be advanced:

(i) From the weak and strong versions of Thirlwall's model: Equation (3.8) and Equation (3.9), the *BOP* equilibrium growth rates are obtained as $\dot{y}_A$ =3.95% and $\dot{y}_A$ =3.32% respectively. The models underestimate the actual growth rate ($\dot{y}$=*4.26*) for the time frame examined. Therefore, without considering capital flows and other factors, one may claim that Nigeria respectively grows at a rate that is 0.31% and 0.94% relatively higher per annum than is permitted by the balance of payment equilibrium condition *per se*.

Thecloseness of the results confirms that the models are largely identical and one can use either of them in growth determination.

(ii) When *SCA-BOPCG*model where internal and external imbalances is purely considered; superior growth rate is obtained comparative to the original Thirlwall's model ($\dot{y}_A$).

Table 4.2: Computation of the growth rates of domestic income, 1982 to 2015

ε_{xy^*} 1.650958	ε_{mx} 0.118889	ε_{cy} 1.065298	ε_{mc} 1.738077	ε_{ky} 1.478858	ε_{mk} 0.975542	ε_{mg} −0.12656	ε_{kr} −0.4263	ε_{mp} −0.3419
ε_{xp} 0.314177	t 0.179518	r 0.20141	$\dot{p}$ 0.225628	$\dot{y}^*$ 0.027091	W_D 0.018671	W_G 0.198182	W_B 0.63	ξ_D 0.51
ξ_B 0.49	W_M 0.207383	W_X 0.304706	i 0.12815	i^* 0.060724	Δi 0.002697	Δi^* -0.0032	e 0.74	$\dot{e}$ 0.06
$\left(\frac{P*e}{P}\right)$ 1.20	$(\dot{p}*+\dot{e}-\dot{p})$ -0.025224	$\Delta i\text{-}\Delta\dot{p}$ 0.003293	$\dot{p}^*$ 0.054823	$\dot{p}_{-i}$ 0.097478	$\Delta\dot{p}$ -0.00058	ε_{xm} 1.105592	ε_{km} 0.284559	ε_{my} 1.34
θ_i^m 0.18	θ_k^m 0.38	θ_f^m 0.44	θ_m^x 0.05	$\dot{x}_0$ 0.0240	$\dot{p}_0$ 0.008	$\dot{x}$ 0.0530		
ẏ=4.26 Actual growth	$\dot{y}_A$= 3.95% Thirlwall model	$\dot{y}_B$ = 4.77% SCA-BOPCG Model	$\dot{y}_C$= 4.40% Modified SCA-BOPCG model					

(Source: Authors' computation)

Note: ε_{xy^*}, $\varepsilon_{mx}, \varepsilon_{cy}, \varepsilon_{mc}, \varepsilon_{ky}, \varepsilon_{mk}, \varepsilon_{mg}, \varepsilon_{kr}, \varepsilon_{mp}, \varepsilon_{xp}, \varepsilon_{xm}$ and ε_{km} are obtained from Table 4.1.

$W_M, W_X, W_D, W_G, W_B, t, c, r, i, i^*, e, \dot{p}, \dot{p}^*, \dot{y},^*$ are annual growth rates expressed in percentage points from 1982 to 2015.

$\left(\frac{P*e}{P}\right)$= average REER two years after the rebasing exercise (i.e. from 2012- 2015); θ_i^m, θ_k^m, are fixed average shares[14] from1982 to 2015 obtained from Table 2.3.

θ_m^x = average share of manufactured exports (SITC, 5, 6, 7 & 8) corresponding to columns 5, 6, 7 & 8 from 2008 to 2015 in Table 2.1.This period is the most recent period that the manufactured exports experience some impressive performance.

$\xi_B = \xi_D$ = 0.51 are assumed fixed over time[15]

The model returned $\dot{y}_B$= 4.77% as an estimate of growth which is higher than the actual growth rate of the economy ($\dot{y}$= 4.26). This exaggeration of the growth rate as revealed in the present study is largely attributed to the non-inclusion of relative prices as well as the effects of intermediate and capital goods imports in domestic growth determination

(iii) Therefore, when the effects of these variables (relative prices and intermediate and capital goods imports) are incorporated in the model, the predicted growth of domestic income is obtained as ($\dot{y}_C$) = 4.40% per annum. The overstatement of the *BOP* equilibrium

[14]The shares of intermediate, capital goods imports as well as the manufactured exports are varying each year but in the growth calculation as the other variables we took all the period averages

[15]) ξ_B & ξ_D are assumed fixed in the long-run given the assumption that the absolute change in public debt is due to public deficit

growth rate ($\dot{y}_B$) is essentially reduced or adjusted to reflect real value added in domestic income growth, as given by the modified *SCA-BOPCG* model ($\dot{y}_C$) in Equation 4.11. This *BOP* equilibrium growth rate ($\dot{y}_C$ =4.40%) is comparatively closer to the actual growth of the Nigerian economy ($\dot{y}$= 4.26) than ($\dot{y}_B$= 4.77%).

In sum, the empirical analysis shows that Nigeria's growth experience could be explained on the demand side in line with Thirlwall's law. Relying on the estimate of Equation 4.11, we affirm that Nigeria grows slower than the rate permitted by BoP equilibrium. In line with the intuitive prediction of BoP constrained growth model, Nigeria has enormous capacity to accelerate growth than it actually experienced despite controlling for the effects of intermediate imports in the determination of long-run growth path of the economy. Therefore, in order to grow at balanced rate, Nigeria ought to grow at $\dot{y}_C$= 4.40% to avoid balance of payment crisis and to fully maximise the gain from international trade.

4.4 Scenario Analysis and Policy Recommendations

In general, manufacturing sector is adjudged to have superior value added relative to primary-based sector and aids faster in alleviating constraints on long-run growth emanating from the *BOP* (Tregenna, 2008). Despite this recognition, the contribution of the sector to export and overall *GDP* in Nigeria has remained dismal over the years. In light of the outcomes of the present investigation, genuine recommendations to realize stable rate of growth without upsetting *BOP* equilibrium position has to do with developing policy measures that improve: external performance, internal stability as well as overcoming supply related constraints affecting production (particularly, critical industrial factor inputs-capital and intermediates goods).

Here, the study carefully crafted some possible and executable policy scenarios that enable the identification of 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* model given in Equation 4.11.

i. Assuming that manufactured export share in total exports is raised from 5% to 10%, 20% and 50%; domestic income growth improves from $\dot{y}_C$ =4.40% to 4.50*%, 4.88%* and *5.88%* respectively. Concerted towards raising manufacturing export share and income elasticity is required. It has been identified that Nigeria's manufacturing sector since 1980s is largely constrained by low level of technology and small size of skilled human capital. This makes full-blown industrialization concerning the manufacturing of high quality and sophisticated products difficult. For this reason, the manufacturing sector largely comprises mainly of assemblage plants with diminutive or no backward connections/linkages in the economy. In an attempt to change the above, successive administrations have embarked on several policies to solve this menace.

Before 1986, Nigeria embarked on import substitution industrialization strategy to protect domestic manufacturing firms and strengthen industrial productive capacity. This ought to have led to the internal manufacture of intermediate and capital goods to substitute the imported ones. The policy could not yield the needed results not necessarily because it was inherently defective *per se* but it was not executed to the conclusion. Similarly, it was a misguided import-substitution policy which instead of advancing industrialization, it led to the emergence of less competitive manufacturing firms. The uncompetitive character of the manufacturing firms arises because of the failure to take into consideration the comparative advantage of the firms in trade and industrial policy formulation. A pragmatic measure towards addressing this entails Nigeria taking advantage of the high-tech imports not only towards improving export share and performance but by domesticating, assimilating and adapting the foreign technologies which would encourage the process of technological upgrading through technological diffusion[16]. However, intrinsic in this

[16]This is in line with Agosin (2007) that a country below the technological frontier could expand its comparative advantage by properly imitating and adapting subsisting products. This could be facilitated when the country takes advantage of its demographic strength to develop requisite skills in the population to copy and adapt foreign technology. This could also be enhanced when educational

process is learning-by-doing. Therefore, public authorities has a function to perform in massively raising *R&D* expenditure from the present *0.27%* as percentage of GDP in order to meet *UNESCO* standard of at least 1% of *GDP*[17]. This is achievable when a substantial fraction of enormous oil rents is set aside for scientific and industrial research and investment in human capital towards upgrading the technical competencies. The reason why this investment is important is because a technologically deficient country like Nigeria is not likely to profit from the technologically advanced countries' knowledge without adequate levels of local technological skills. It is pathetic that in 2015, only less than 9% of annual budget was allocated to the education sector. This is far below the UN minimum requirement of 26% of annual budget. Therefore, it would be appropriate to meet the minimum requirement or to set a feasible target of at least 20% of the federal budget in order to develop quality human capital relevant in today's dynamic manufacturing to produce goods with substantial technological content and high demand in the international market. Accordingly, as technological content of the export goods increases, world real income elasticity and demand for the products may possibly improve to address any constraints arising from balance of payments.

ii. Assuming that the state increases public expenditure from W_G =19% to 30% and reduce debts from ξ_B = 49% to 30%; domestic income improves from $\dot{y}_C$ = 4.40 % to *=4.45%.* The role of state in driving industrialization is enormous as in '*Asian Tigers'* countries (including South Korea, Singapore). State's effort in tackling infrastructural deficits would be helpful in manufacturing export growth, raising sector share and improving competitiveness. It is worrisome that even where high

curriculum is modified to encourage vocational and technical training (to even award diplomas, degrees in say meat processing, parts and components etc than focusing on the award of usual theoretical diplomas).

[17]Note that most countries in the Centre-North have even surpassed the *UNESCO* threshold. For instance, U.S earmarks about 2.7% of *GDP* to *R&D*. It should be noted Nigeria's R& D is also behind most countries in Africa. At present, about 14 countries dedicate over 1% of GDP to R &D: Botswana, Burundi, Comoros, Ghana, Kenya, Lesotho, Malawi, Mali, Namibia, Senegal, Seychelles, Swaziland, Tanzania and Togo. It is also behind the ratio of entire Sub-Saharan Africa (SSA) 1.4% of *GDP*

technology is deployed for production; shortage of regular power supply and other infrastructural requirements often frustrate efficient production process. Note that Nigeria generates approximately 4,000MW of electricity for a population of about 200 million people and firms in 2015. This is far below countries such as South Africa (50,000 MW for about 57.59 million people) and Swaziland (60,000MW for just 1.39 million people). This study contends that faithful implementation of 'clustering' as an industrial policy particularly driven by public-private partnership may be a more pragmatic objective than attempting to enlarge the supply of infrastructure in the country in total, as a short term approach. In the same manner, the state should make financial resources handy for reparation of any harmful externalities for the manufacturing firms.

iii. In addition to the above, the active participation of the state to make available the guarantees as well as provide fiscal and tariff inducements to subcontractors and other private economic agents is essential. This strategy has the capacity of launching a low-income country such as Nigeria into a global industrial country given its youthful demographic advantage (more than half of population is below 30 years). For instance, encouraging retirees and using Nigerian university graduates during their mandatory national youth service to engage in acquiring knowledge and actual production of parts and components would be relevant.

iv. An expansionary monetary policy of the central bank by reducing interest rate from 12% to 6%, domestic income growth increases from $\dot{y}_C$ =4.40 % to *=4.42%.* Making financial markets and institutions stronger to support domestic investment is important. An industrial policy action from a developing economy that intends to expand a flourishing manufacturing export sector ought to focus on a sustained acquirement and proficient use of more technologically superior factor inputs. In this regard, ensuring that financial marketplace is broadened and deepened is not an option. Financial institutions especially those that encourage manufacturing export growth (e.g. Nigeria–Export and Import bank (NEXIM) ought to be fortified to protect manufacturers and

provide easy access to the foreign exchange necessary for the importation of only critical intermediate and capital inputs. Recently, the Nigerian government launched the Manufacture-in-Bond Scheme[18] in 2010 to support manufacturing sector to easily and cheaply import critical factor inputs for which it can't produce duty-free towards the production of final goods for export. Similarly, Bank of Industry (BOI) was formed in 2000 to advance long-term credit, equity finances, and technical support to the manufacturing firms. Nigerian Agricultural, Cooperative and Rural Development Bank (NACRDB) was equally established to enhance the accessibility of most important manufacturing inputs through the supply of medium to long term loans for agriculture and agro-allied processing firms. Yet, the export share of the manufacturing sector remains infinitesimal. One of the major explanations to this is still inadequacy of the funds. Therefore, preferential loans and guarantees should be given to export oriented firms to access credit at a subsidized rate. This can attract new entrants, hence increasing productivity and contribution of the sector to overall export and *GDP*.

v. In addition to the above, sound trade policy is crucial. One of the major hypotheses of the paper is to determine whether relative prices are important adjustment policy variables. If $\dot{p} - \dot{p}* + \dot{e} = 0$, $p^*e/\dot{p}=1$ $e = 1$, $\dot{e} = 0$,this equally suggests that $\dot{p}* = \dot{p}$ 0.054, the obtained growth ($\dot{y}_C$=4.40%) dramatically reduced to 0.94% suggesting a 3.46% 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 ($\dot{y}_C$) 3.10% suggesting a reduction of 1.31%. 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

[18]The sheme is managed by Federal Ministry of Finance and it is backed by a bond issued by any recognized banking firm which is executed following a proof of exportation and repatriation of foreign exchange.

growth as forwarded by conventional *BOPCG* models. Therefore, there is the vital need to align industrial policies with trade policies. Note that Nigeria is just recovering from 2015/16 recession and still experiences sluggish employment and growth in the face of escalating public debt. Hence, policy makers need to be conscious of trade in capital and intermediates goods at the back of their minds when fashioning trade policy. While protectionism imposes high costs, a considerably opened economy comparatively supplies extensive gains. Stern barriers can limit manufacturing firms access to critical factor inputs required for efficient international competition. Therefore, instead of saving domestic jobs, trade restriction can cause plant shutdown and job losses. For many decades, consecutive administrations have opted for protectionist policy measures, import prohibitions and exchange restriction to handle quandary of high import and over reliance on oil.[19]The policy has by no means helped the country achieve the objective of industrialization[20].

vi. Similarly, with an improved exchange value of the domestic currency consistent with *BOP* equilibrium from p^*e/p*=1.20 to 0.95,* domestic income growth increases from $\dot{y}_C$*= 4.40* % to *=6.43%.* This is primarily because with improved exchange value of the domestic currency-Naira, more technologically superior shares of capital goods could be accessed. Therefore, a blend of stable price level, rising productivity as well asstable macroeconomic and political environment could assist in improving the Naira in line with the policy thrust of the government at a particular point in time.

[19]In 1983 as a result of the fall in commodity prices; 1993 to control general imports; 1999 to 2007 discriminatory controls and 2015/2016 complete restrictions on over 40 items.

[20]Generally speaking, imports, 'outsourcing' as well as 'offshoring' often have negative impression in the mind of people. This is primarily because they are linked with plant closures and unemployment creation which often justifies trade protection as a measure of lessening import competition and safeguarding jobs. But that is not the complete reality, especially when the structural need of the economy is considered. Imports, particularly, capital related components can enhance manufacturing productivity as a result of cheaper and sophisticated factor import and; hence improving export competitiveness *per se*.

vii. Fiscal operation of the state relating to tax adjustment is important. The state could still do better by reducing the tax burden on firms. At the moment, manufacturing firms with annual turnover of less than 1 million in local currency are taxed at 20% for the first five years of operation and companies with pioneer status are entitled to a tax holiday of 3 years (WTO, 2017). Given the high cost of doing business[21], if an expansionary income tax policy adjustment in which tax is reduced from 17.9% to 5% ceteris-paribus and the modified *SCA-BOPCG* model turns out to be $\dot{y}_C$ =4.41% from the initial value of 4.40%. The tax ought to be reduced to less than 10% for the former and six years extension with possible clause of extension for the later to enable them to operate at a larger scale. Similarly, reducing taxes on firms to benefit from lesser tax rates on profits earned via patents, research, innovation, or other ingenious enterprises would accelerate the growth of the sector and overall *GDP.*

viii. Similarly, an attempt towards curbing fiscal indiscipline by reducing $W_D$from -1.89% to -1.50% and reducing public debt-W_B= 63% to 40% of GDP below the target of the Stability and Growth Pact in the Eurozone, domestic income growth increased from the initial value of $\dot{y}_C = 4.40\%$ to 4.42%. Though the improvement is minimal, it is partic ularly 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. With regards to public deficits, 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 and the continued decline in government revenue in the most recent years need to be contained

[21]Nigeria is ranked 170 among 190 economies in ease of doing business in 2015.

within the acceptable region of 3% of GDP; thus matching the universal standard analogous to the Stability and Growth Pact. There is the need to enhance fiscal discipline and embark on a very truthful sustainability re-examination regarding local and external public debts. If loans must be obtained, the economic viability always needs to be the guiding principle.

ix. It is exciting to observe the responsiveness of the various components import demand. A reduction in import sensitivity of manufactured exports (ε_{mx}) and investments from (ε_{mk}) 0.118889and 0.955421 to 0.05 each; the predicted growth of the domestic economy substantially increased to$\dot{y}_C$ = 4.55% and 8.55%. Similarly, when final private consumption (ε_{mc}) reduces from 1.73 to 1.50; 1.00% and 0.5; predicted growth of the domestic economy substantially increased to$\dot{y}_C$ = 4.79%, 5.88% and 7.61% respectively. 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. Therefore, to soundly grow without harming balance of payment position requires making local manufactured products more desirable and attractive in the domestic market (this would be achieved by enhancing the supply characteristics of the products-quality, packaging, designs and product differentiation) and placing painstaking tariffs on luxurious imports. This also entails Standard Organization of Nigeria (SON) to ensure that manufactured products meet the international quality benchmark to satisfy both local and international consumers.

x. A reduction in the share of gross import(W_M) from 20.8% to 15%, growth performance of the economy increases from $\dot{y}_C$ 4.40% to 7.35%. If total export share(W_X) is raised from 30.2% to 35%, the predicted growth rose from $\dot{y}_C$ 4.40% to 4.53%. Therefore, Nigeria's growth can be substantially improved by restructuring the external sector.

xi. Assuming that the growth rate of rest of the world proxied by growth rate of five major trading partners increased from $\dot{y}^*$ = 2.70% to 3.0% per annum and the shareofmanufactured export component increased

to 20% of total exports, the growth of the Nigerian increases from $\dot{y}_C$ 4.40% to 5.52%.

4.4.1 Other Policy Recommendations

i. Export diversification and change in productive structure is essential for manufacturing productivity and overall income growth. The dependence of the Nigerian economy on oil is not sustainable. Instability in oil prices as frequently experienced, often leads to disruption of public projects as well as widening of foreign exchange gap. A gap subsists whenever the ability to create foreign exchange falls short of foreign content requirements. From our results, foreign income only contributes to exports at the aggregate level. Given that domestic production substantially relies on imported intermediate and capital goods, addressing foreign exchange constraints for critical factor importation may require Periphery-South economy such as Nigeria to productively use its increasing oil export revenues to invest in the development of sectors that can generate stable foreign exchange such as manufacturing in order to avoid *BOP* crisis.

ii. Very decisive to the above is the important role of regional integration. The study recommends an expanded trade in non-oil commodity, particularly manufactured products within African Union (AU), ECOWAS etc. Nigeria has a dynamic population and other material resources to manufacture for most of the countries in Africa if the right art of technology is deployed into production. Despite the launching of Nigeria Industrial Revolution Plan (NIRP)[22] with the objective of ensuring that manufactured goods have substantial market share in the global market, Nigeria's reluctance in signing into African Continental Free Trade Area (ACFTA)[23] is worrisome. This trade agreement if

[22]NIRP marked definite targets to achieve by the year 2020. These include raising manufacturing of automotives by 50% as well as boosting the manufacturing of metals-related products, petro chemicals and processed palm oils. It also seeks to enhance investments in manufacturing industries including agribusiness and solid minerals.

[23]ACFTA has the objective of doubling intra-African trade by removing tariff barriers on large scale products. It also seeks to guarantee mutual acknowledgement of standards, licensing and trade

signed into could facilitate regional production, processing (e.g. oranges, cashew nuts etc.), trade and consumption of Made in Nigeria goods in the African region thereby increasing the scale and breadth of manufacturing firms' involvement in export markets.

iii. Moving further, given the current structure of production, keeping reasonable buffers from oil wealth to stabilize the economy and counter any vagaries in the international markets is critical. This would essentially lessen the risk premiums investing agents may attach to investment decisions, prevents interruption of key manufacturing ventures and projects (government and private) and fortify the country's position in trading or negotiating with the global community. One major dilemma for economic and industrial policies in Nigeria especially in times of high oil prices is the issue surrounding the utilization of enormous oil rents to position the country on the right path of industrial and structural change. In 2004, Excess Crude Account (ECA) was established to save the country's excess oil rents in order to insulate the country from any fluctuations. However, with the recent collapse in commodity prices in 2014/2015 eventual recession, the weakness of *ECA* was exposed. One possible explanation to this is that little oil rent was saved or much was siphoned into private treasury. This study contends that any failure to save against declines in commodity prices, would definitely affect all sectors, including industrial investments.

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

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disagreement measures for key manufacturing firms, making it simpler for industries in the to take advantage scale economies in new marketplaces.

4.5 Conclusion

In this chapter, Nigeria's economic growth path is explained from demand side. We specifically use *SCA-BOPCG* version of Thirlwall's model for the analysis. The study uses system estimator to essentially take into consideration the endogeneity of the variables. This is to enable us get efficient and consistent elasticity estimates. The coefficients of the variables are largely in conformity with apriori expectation in terms of signs, magnitude and significance. An important revelation of the study is that even though world real income exerts significant effect on gross exports, similar arguments could not be established when manufactured export sector is considered in isolation. Therefore, the relevance of world demand in domestic income growth may differ across export sectors. Although, the empirical investigation indicates that the original and the modified versions of the *BOPCG* theory are appropriate for determining actual growth of domestic income for Nigeria; a plausible proposition however, one that need not only be true principally because of demand-side factors. Supply-side constraints including deficiency of intermediate and capital goods imports and other supporting factors important for domestic production are also essential. This finding is highly instructive, especially when proper disaggregation of the economy is carried out.

Interestingly, the study clearly reveals that when relative prices and foreign contents (shares of intermediate and capital imports) are not included in the estimation; domestic income growth rate may be biased upwards. Therefore, the understanding of the channels of causation between the variables in which it values and respects the balance of payments constraint is very pertinent. From the conventional *BOPCG* theory, the channel of causation basically moves from foreign income to exports and from there to domestic income growth. An alternative causality path as contend in the present study is that it is very possible for the causation to run from intermediate and capital goods imports to accelerate domestic output and to the ability to export/import, thus evading running into balance of payments difficulties.

It is worthy to mention here that the empirical validity of "Thirlwall's law" as another approach to the explanation of growth differences has significant policy suggestions. These implications are not only for 'positive economics'

where it contested the mainstream idea on determinants of long-run but also for ‘normative economics’. This is because it implies among other issues that a stable and appropriate economic policy as a matter of necessity ought to incorporate the income elasticities of demand for exports and imports.

In conclusion, aside ensuring that budget deficit is kept within acceptable threshold, the study recommends among other things, several structural changes that have the capacity of increasing the growth rate of domestic income without hampering the balance of payments position of the economy. (i) Raising the export share of manufactured exports (ii) A more liberal and friendlier trade policy (iii) A cautious reduction of final components of imports (iv) Cautious use of intermediate imports (v) Leveraging on regional integration (vi) Proper use of oil rents and exploiting her demographic dividend, (vii) Decisive role of state in directing industrial policy towards adapting and domesticating foreign technology. (viii) Investment in human capital and domestic infrastructure. These policies would assist in the production of medium and high tech manufactured exports and to optimise the gains derivable from international trade in the long-run.

Having found that the relevance of world demand in domestic income growth may differ across tradable sectors, the research proceeds to examine various sectorsof the economy using a modified multi-sectoral balance of payment growth model in the succeeding chapters (5 and 6) with particular consideration of the implication of growth strategy based on imports of intermediate factor inputs.

CHAPTER 5
THE IMPLICATION OF INTERMEDIATE IMPORTS GROWTH PROCESS: A MULTI-SECTORAL BALANCE OF PAYMENT CONSTRAINED GROWTH APPROACH

5.1 Introduction

Motivated by the outcome of the preceding empirical essay; this chapter employs a multi-sectoral version of *MBOPCG* to examine the implication of growth strategy based on foreign contents. It should be noted that theoriginal *BOPCG*model was fashioned based on trade in final goods; hence the role of intermediate imports in long-run growth was not taken into consideration.

Accordingly, Araujo &Lima (2007) follow Pasinetti (1981 & 1993) to disaggregate the original *BOPCG* model to capture the structural composition of exports and imports. They contended that shifts in the composition or sectoral shares of imports and exports determine the long-term growth path consistent with the balance-of-payments equilibrium. Therefore, an economy can grow substantially, irrespective of the rate of growth of the rest of the world, provided that the shares of exports and imports are satisfactorily and structurally transformed.

Most importantly within the context of the multi-sectoral approach detailed above, Blecker &Ibarra (2013) and Araujo, et al. (2016) revealed that actual growth could be influenced by the degree to which intermediate imports are used to advance exports. This implies that exports maybe stimulated in the short run but in the long-run, overall growth maybe stunted by the substantial reliance of export growth on foreign factor inputs. .

In line with the aforementioned conditions, Nigeria represents an exciting subject of enquiry given the massive importation of foreign contents, representing about 56% of total imports. Given this huge level of foreign factor inputs, failure to account for possible differences in the imports patterns in the present context, conventional Thirlwall's or Araujo & Lima's growth models may be incorrectly specified and could possibly leadto the exaggeration of income elasticities of demand for imports.

This present chapter seeks to:

(i) Explain the economic growth process for Nigeria using *MBOPCG* model.

(ii) Incorporate the role of intermediate factor inputs in growth process. In achieving the research objectives, the chapter examines the Nigerian economy based on the oil and non-oil sectors (peculiar structure of the economy) as well as intermediate and final goods import sectors.

(iii) It is worth mentioning that previous *MBOPCG* studies have only been conducted on the Mexican economy. Therefore, another contribution of the present chapter is that it provides more realism, universal adaptability and acceptability of the effect of intermediate imports in the economic growth literature.

(iv) Accordingly, the study leverages on the robustness of the *ARDL,* hence avoiding some econometric issues often associated with trade data with different orders of integration. In line with Blecker & Ibarra (2013), the study provides more insights on the effects of trade liberalization or *SAP* in the Nigerian context.

(v) More importantly, the chapter examines whether the incorporation of *REER* could improve the predictive power of the disaggregated *BOPCG* model as identified in Blecker & Ibarra (2013). Even though this was attempted in Ibarra & Blecker (2015), the present thesis is the second to provide more evidence on the subject matter to the best of my knowledge. This improvement would be essential in fashioning industrial and trade policies for Periphery-South economies, which rely greatly

on foreign contents to produce final exports. Accordingly, the study does not only estimate the import functions as in Blecker & Ibarra (2013), but proceeds to estimate the non-oil export function, particularly the manufactured export function. The oil export function is taken as given.

The structure of this chapter is as follows: Section 5.2 focuses on the specification of the extended version of *MBOPCG* model with intermediate imports. Section 5.3 covers the econometric model and the description of data. The empirical estimation of the study is given in 5.4. Lastly, Section 5.5 gives the conclusion.

5.2 Modelling Multi-sectoral Balance of Payment Constrained Growth Model with Intermediate Imports

This chapter makes use of the model advanced by Blecker &Ibarra (2013) which explicitly considers the imports of intermediate inputs.

Here, the modelling process startswith the specification of the manufactured export demand function (x_n)as follows:

$$x_n = \varepsilon_n(e + \ p^* - p) + \eta_n y^* \quad (5.1)$$

Where, $x_n, e, y^*, p$and p^*represent the growth rate of demand for exports, exchange rate and world real income, domestic inflation and foreign inflation, respectively. While, ε_n and η_n represent price and world real income elasticities of demand for exports, respectively. In order not to complicate our analysis, oil exports are taken as given and grow at the exogenously given rate, x_o and its price changes at the exogenously given rate p^*_o denominated in foreign currency (i.e., US dollars). This is instructive and appropriate given that the supply of oil is determined by *OPEC* and its price is determined externally in the international market.

Moving further, the growth rate of demand for the intermediate import function is specified as follows:

$$m_i = -\varepsilon_i(e + p^* - p) + \eta_i y + \alpha x_n \quad (5.2)$$

Here, m_i and y represent the growth rate of demand for intermediate imports and domestic real income, respectively, while ε_i, η_i and α represent price, domestic real income and manufactured export elasticity of demand for

imports, respectively. Here, I equally follow the assumption of Blecker &Ibarra (2013) that the value of α depends ontwo fundamental determinants, which are not overtly expressed in the present study. Firstly, it depends on the fundamental elasticity of demand for intermediate factor inputs for the production of non-oil exports. Secondly, it depends on the share of intermediate goods imports that are committed to manufactured exports. Theoretically, modelling these underlying factors would clearly require the specification of the supply side of the model for the production of exported non-oil goods.

Nevertheless, the available data do not differentiate intermediate goods imports according to whether they are used in the production of exported or domestic goods. Thus, the model as specified here is in harmony with the existing data for econometric calculation in the Nigerian context.

The demand function for final goods expressed in terms of growth rate is given as:

$$m_c = -\varepsilon_c(e + p^* - p) + \eta_c y \qquad (5.3)$$

Where,m_c, ε_c and η_c represent the import demand for final goods, price elasticity of demand for final imports and income elasticity of demand for final imports, respectively. It is also assumed, admittedly somewhat artificially, that all imports have the same prices and all import-competing domestic goods have the same prices, regardless of whether they are intermediate or final goods.

Assuming that there are no capital flows and transfers[24], the balance of payment equilibrium condition is given as:

$$\mu(p - e + x_n) + (1 - \mu)(p^*_o + x_o) = \theta(p^* + m_i) + (1 - \theta)(p^* + m_c) \qquad (5.4)$$

Where θ represents the share of intermediate imports in gross imports and μ captures the share of manufactured exports in gross exports. x_o and p^*_orepresent the growth rate of demand for oil exports and the price of oil in the international market, respectively.

[24] Significant rise in capital flows especially after trade liberalization may influence the equilibrium growth rate; therefore, I did not account for it in growth estimation.

Substituting (5.1), (5.2), and (5.3) into (5.4) and solving for the domestic income growth rate *y*, we obtain (after rearranging)

$$Y_{MBPCG} = \frac{\{(\mu-\alpha\theta)\eta_n y^*+(1-\mu)(p_o{}^*+x_o-p^*)+[(\mu-\alpha\theta)\varepsilon_n+\theta\varepsilon_i+(1-\theta)\varepsilon_c-\mu](e+p^*-p)\}}{[\theta\eta_i+(1-\theta)\eta_c]} \quad (5.5)$$

In the light of the above assumption, Equation 5.5 represents an all-encompassing expression for the *BOP* equilibrium growth rate. Here, it is argued that for a successful policy of currency devaluation, the Extended Marshal-Lerner (EML) condition must be achieved for a quicker rate of real depreciation to boost the balance of payment equilibrium growth rate. The *EML* condition (the terms in parenthesis multiplying the rate of *REER* ($e + p^* - p$) ought to carry a positive sign, i.e.,$(\mu - \alpha\theta)\varepsilon_n + \theta\varepsilon_i + (1 - \theta)\varepsilon_c - \mu$>0 , and is comparatively more difficult to achieve (Blecker & Ibarra, 2013). As in Araujo et al. (2016), both the numerator and denominator of Equation (5.5) capture the existence of intermediate goods. In order to obtain equilibrium growth in Equation (5.5), the manufactured export demand function (5.1), intermediate import demand function (5.2) and final goods import demand function (5.3) need to be estimated to obtain the related elasticities.

When the assumption of constant relative price is upheld (meaning that$e + p^* - p$ =0), the *MBOPCG* is obtained as:

$$\text{MBOPCG} = \frac{(\mu-\alpha\theta)x_n+(1-\mu)(p_o{}^*+x_o-p^*)}{\theta\eta_i+(1-\theta)\eta_c} \quad (5.6)$$

Accordingly, $x_n = \eta_n y^*$ if long-run relative purchasing power parity (PPP) assumption holds ($e + p^* - p$ =0).

In order to estimate the equilibrium growth rate from Equation (5.6);the respective elasticity coefficients from Equations (5.2) and (5.3) for the imports of intermediate and final goods are required. These estimations would enable us to obtain parameter estimates for ,$\eta_i$andη_c. The additional message that arises from Equation (5.6) is that the growth rate compatible with intertemporal equilibrium in the balance-of-payments is lesser due to the dampening effects of intermediate goods being imported for the production of final goods for exports.

5.3 Data Description and Econometric Methodology

The trade data used to estimate the imports and exports equations were all obtained from COMTRADE. The study uses manufactured exports as a proxy of non-oil exports. The World Bank defines that manufactured exports comprise commodities in *SITC* sections *5* (Chemicals), *6* (basic manufactures, chiefly by materials), *7*(machinery and transport equipment), and *8* (miscellaneous manufactured goods), but not including group 68 (non-ferrous metals). Similarly, oil exports are taken from *SITC 3*. Imports of intermediate goods are calculated by summing raw materials and intermediate goods for which data are available.

Final import is taken as the residual. The trade data, initially expressed in current dollars, were transformed using the US producer price index (PPI) to corresponding real quantities. Relative prices or *REER* is taken from *WDI.* While domestic real income (Real GDP at constant 2010 prices corresponds to Nigeria's output in constant Naira) is obtained from the central bank of Nigeria's statistical bulletin, world real income is obtained from the *AFDB*. The present chapter makes use of ECOWAS *GDP* as a proxy of world real income given that the sub region is among Nigeria's major export destinations for non-oil products.

In line with earlier studies, the chapter estimates the model using the log level of the variables, even though the theoretical derivations are in growth rates. This essentially permits the interpretation of coefficients obtained as elasticities as well as the preservation of the long-run properties of the variables. The econometric method employed is expressed in the ensuing sub-section.

The long-run estimates used in the computation of domestic income growth rate were obtained using *ARDL* approach. The justification behind using *ARDL* approach is that it performs better than conventional techniques such OLS and other cointegration techniques when the sample size is small. Similarly, it gives unbiased parameter estimates of the long-run estimates irrespective of endogeneity of some of the regressors. It can be used with a mixture of *I(0)* and *I(1*) data.

Another advantage of the method is that it is a straightforward model which comprised of a single equation and can be easily carried out and results

interpreted with ease. Another crucial advantage has to do with the privilege of using lags in the calculation. Conceptually speaking, as largely observed in the real world, the effect of a regressor on a regressand may or may not be instantaneous. This implies that a change in an economic series may not necessarily lead to an immediate change in another variable. Therefore, using a method that uses the historical values of the dependent variable to determine its present value is appropriate.

For the cointegration investigation, ΔY_t is modelled as a conditional error correction model (ECM):

$$\Delta Y_t = \sum_{j=1}^{n} a_j \Delta \mathrm{Y_{t\text{-}j}} + \sum_{j=1}^{k} \sum_{j=0}^{n} b_{i,j} \Delta \mathrm{Z_{i,t\text{-}j}} + \lambda \mathrm{Y_{t\text{-}1}} + \sum_{i-1}^{k} d_i Z_{i,t\text{-}1} + dum \qquad (5.7)$$

Where Δ represents the first difference of the series, and λcaptures the speed of adjustment of the variable toward the long-run equilibrium. *Y* represents the dependent variable. *Z* is a set of potential determinants of the dependent variable: Log of domestic real income*(y),* log of world real incomey^*log of real effective exchange rate ($e + p^* - p$), log of manufactured exports (x_n).

The study determines the appropriate lag structure of the equations based on the *AIC* criteria. The diagnostic tests including the tests for serial correlation, heteroskedasticity, and the Autoregressive Conditional Heteroskedasticity (*ARCH* test) are conducted. The bounds test proposed by Pesaran, Shin and Smith (2001) is used to determine whether there is long-run relationship among the variables.

After establishing the adequacy of the models, the *F*-bounds test is employed to determine the existence or otherwise of a long-run relationship between the variables. The criteria for ascertaining this is that the *F*-statistics must exceed the (asymptotic) upper critical value (or upper bound) calculated by Pesaran et al. (2001). The conclusion of *F-stat* is supported by the absolute value of *t-stat* when it equally falls outside the upper critical bounds. Furthermore, the study tests for the speed of adjustment towards the long-run. At this stage, the study basically expects the error correction coefficient to be negative and significant to for a cointegrated relationship to be established.

5.4 Empirical Examination

5.4.1 Unit Root Tests

Prior to the estimation of the model, the unit root test should be conducted ascertain the order of integration of the variables. The result of the standard unit root test in Table 5.1 shows that the variables are integrated of a different order, which justifies the rationale for the use of the econometric methodology: *ARDL.*

Table 5.1: Standard Unit Root Test

	Augmented-Dickey Fuller			Phillips-Peron			Kwiatsowski, Philips, Scmidt, and Shinn, (KPSS)		
	Null: unit root *I(1)*[a]						Null: stationary *I(0)*[b]		
Variable	Const.	Const& T	First Diff	Const.	Const& T	First Diff	Const.	C & T	First Diff
Domestic real income, (y)	0.09	3.73**	-3.22**	1.15	-2.51	-3.04**	0.93	0.22	0.13†††
World real income,(y*)	0.98	-2.76	-5.36***	2.06	-2.80	-3.53**	0.67	0.20	0.08†††
REER,($e + p^* - p$)	-2.10	-1.91	-4.43***	-2.28	-2.17	-4.35***	0.25†††	0.10†††	-0.09†††
Intermediate imports (m_i)	-1.33	-1.44	-4.00***	-1.94	-3.43**	-3.88***	0.45	0.19	-0.16†
Final goods imports, (m_c)	-1.67	-3.39**	-6.70***	-1.27	-3.43**	-6.71***	0.53	0.19	0.10†††
Manufactured exports, (x_n)	-1.64	-3.19	-6.12***	-1.15	-3.10	-6.13***	0.83	0.08†††	0.12††

(Source, author's computation)

All the variables are considered in log levels. The estimation started by testing the model with constant, constant and trend and then first difference.

[a],*,**, *** implies rejection of the **null** hypothesis of a unit root at 0.10, 0.05 and 0.01 level of significance.

[b] †, ††, ††† implies acceptance of the null hypothesis of stationarity at 0.10, 0.05 and 0.01 level of significance.

The critical values from Kwiatsowski, Philips, Scmidt, and Shinn, (KPSS) at constant or integrated of order *1* are: 0.10= 0.34; 0.05= 0.46; 0.01=0.73.

For intercept and trend or integrated of order 1: 0.10=0.11; 0.05=0.14; 0.01= 0.21.

Nevertheless, for a scope of study as in the present one, it is extremely probable that there could be structural breaks in the variables. Accordingly, the standard Augmented Dickey-Fuller (ADF) and Philips-Peron (PP) may not be sufficient as they are liable to accept the null hypothesis of non-stationarity as well as rejecting the null hypothesis of stationarity under the Kwiatkowski–Phillips–Schmidt–Shin (KPSS). The structural break stationarity test was initially suggested by Perron (1989). However, Zivot & Andrews (1992), among others, considered conventional unit root test (namely *ADF* and *PP*) to be inadequate because it considers structural break points ex ante. It is suggested that a suitable evaluation process ought to be one in which the break dates are endogenously selected by the data.

Consequently, the study carries out the unit root test in the presence of structural break to ascertain the stationarity of the variables.

Generally, the test is always conducted based on three models:

$$\Delta y_t = \alpha_0 + B_t + \delta DU_t + \rho y_{t-1} + \sum_{i=1}^{i=k} \Delta y_{t-j} + e_t \quad (5.8)$$

$$\Delta y_t = \alpha_0 + B_t + \gamma DT_t + \rho y_{t-1} + \sum_{i=1}^{i=k} \Delta y_{t-j} + e_t \quad (5.9)$$

$$\Delta y_t = \alpha_0 + B_t + \delta DU_t + \gamma DT_t + \rho y_{t-1} + \sum_{i=1}^{i=k} \Delta y_{t-j} + e_t \quad (5.10)$$

Where, DU_t is a shift dummy variable, DT_t is a time dummy variable, and e is the disturbanceterm. The shift occurs at each possible break point at $T_B (1 < T_B <$ T). DU_t = 1 if $t > T_B$ and zero if $t < T_B$; and $DT_t = t - T_B$, if $t > T_B$ and zero if not. δ and γ are the degree of a change in the level and trend slope, respectively, which occur at $t = T_B$. δ and γ are the degree of change in the level and trend slope, respectively, which occurs at $t = T_B$. Equation (5.8) allows for a one-period change in the level of the variable, Equation (5.9) permits for a one-period change in the slope of the trend equation, and Equation (5.10) allows for a combination of one-period change in the level and the slope of the trend equation. Therefore, it is possible to test the null hypothesis for all the equations, $\rho = 0$, which suggests that the variable (y_t) follows a random walk process with a drift parameter without any structural break, while the

alternative hypothesis ρ< 0 suggests that the variable follows a stationary pattern with a one-period break taking place at an unidentified point in time. Consequently, Equations(5.8), (5.9) and (5.10) are consecutively estimated and $T_B$is selected so as to minimize the one sided t-statistics for testing $\hat{\rho}$= 0.

Table 5.2: Unit Root test with structural Break

	Const.	Const.& Trend	First Diff.	Break date
Domestic real income, (y)	2.36	-4.80*	-4.36*	2009
World real income,(y^*)	2.71	-1.16	-4.53***	2000
REER,($e + p^* - p$)	-5.27***	-5.21**	-5.55***	1998
Intermediate imports (m_i)	-5.11***	-4.92**	-5.84***	2010
Final goods imports(m_c)	-2.03	-4.43	-8.32***	1985
Manufactured exports (x_n)	3.67	-7.17***	-11.64***	2015

Source: Authors own computation

Note:

All the variables are considered in log levels. The estimation started by testing the model with constant, constant and trend and then first difference.

[a],*,**, *** implies rejection of the null hypothesis of non-stationarity at 0.10, 0.05 and 0.01 level of significance.
The critical values with constant and/or integrated of order 1 are: 0.10 =4.19; 0.05= 4.44; 0.01=4.94
For intercept and trend and/or integrated of order 1 are: 0.10=4.60; 0.05=4.85; 0.01= 5.34

The result of the breakpoint unit root test confirms our conclusion that the variables are essentially a blend of *I*(0) and *I(1)*series. Besides the break points identified in Table 5.2, Bi-Perron test as well as recursive coefficients were examined to correctly identify periods with significant outliers and structural breaks in the data. Therefore, I estimated the various sectors with the significant break points. The manufactured export demand function specified in Equation (5.1) is used to estimatesthree models/columns by sparingly selecting some dummies among Dum2012, Dum2007, Dum2010, Dum1986, Dum1995 and D_1985[25]. Similarly, the four models/columns of intermediate import demand function as given in Equation (5.2), incorporate some dummies among: Dum2012, Dum1986, Dum1987, Dum2003,

[25]While Dum_period is an intercept dummy with 0 before and 1 after the period, D_period is a dummy variable with 1 corresponding to the exact period and 0 otherwise.

Dum1998, and D_2007, D_1984. Finally, the three final goods import demand functions specified in Equation (5.3), is estimated by also selecting some dummies within: Dum2012, Dum2002, Dum2008, Dum1987, D_2007 and D_1986. These dummy variables are useful in satisfying the diagnostic requirements of the models. It should be noted that I relaxed some of the dummies according to the requirement of each column.

5.4.2 Estimation of Demand Functions

In this sub-section, we carry out empirical estimation and interpretations of the estimated elasticities starting from the intermediate import, final import and to the export demand function.

5.4.2.1 Imports of Intermediate Goods

We first specify the intermediate import function with only real domestic income and the real effective exchange rate as regressors in log form. At this stage, a shift in elasticities after the implementation of *SAP* (Trade liberalization policy) is not allowed and no structural break dummies are included. In terms of the signs, the output in Table 5.3 column 1 shows that the estimated elasticities are in line with research expectations. An increase in real *GDP* tends to stimulate the demand for intermediate imports. On the other hand, a real depreciation of the naira (rise in *REER*)[26] tends to cause a reduction in the demand for intermediate imports.

The speed of adjustment is low (-0.19), which means that deviations from the long-run growth path are adjusted for with the speed of 19% annually. In addition, *F-* stat confirms the existence of a long-run relationship among the variables. However, heteroskedasticity problem seems to be present in this model. As a result, the study proceeds to incorporate the relevant breaks in the data in the succeeding columns.

[26]In the conventional *BOPCG* setup, relative price dynamics are treated as insignificant determinants of long-run growth. This is attributed to the substantial empirical evidence (Thirlwall, 2012) that price elasticities of demand for exports and imports are small or that terms of trade fail to demonstrate a logical movement of appreciation or depreciation in the long-run (Razmi, 2005, 2016). In this this thesis, even though REER remains largely above 100 index points; I interpreted increase in REER as depreciation of domestic currency given that the variable generally trends dowmwards. For instance, REER was over 300 index points in 1981 and had reduced to about 116 index in the last period of analysis.

The most important aspect of this sub-section is the consideration of the responsiveness of intermediate imports to manufactured exports. Therefore, when manufactured exports are included into the model (Table 5.3 column 2), all variables maintain their expected signs. Accordingly, the speed of adjustment significantly improves to about 82% and the bounds tests (*F and t-stat*) reject the null hypothesis of no long-run relationship at 0.01 significant level. In addition, the heteroskedasticity problem identified in Table 5.3 column 1 is addressed; hence, the model does not suffer from any econometric weaknesses. Given that the other variables are constant, a one per cent increase in manufactured exports increases intermediate goods imports by 0.31 per cent. Hence, manufactured exports will lead to a high growth of imports with negative implications on growth performance.

We examine the effect of Trade Liberalization or the *SAP*in the Nigerian context. Therefore, we include shift dummies to represent Post *SAP* corresponding to 1987 in Table 5.3 column 3. The variables *GDP*dum1987*, *REER*dum1987* and *MANExports_Dum1987* are interactive variables corresponding to real *GDP*, relative prices and manufactured export, respectively. I interact the dummy with both level and the first difference of the intermediate import determinants. This allows for shifts in the long-run and short-run coefficients of the model. The outcome reveals that the variables achieved significance with good accuracy. It should be noted that when manufactured exports are incorporated into the intermediate import model, real *GDP* and *REER* elasticities moved in an unexpected way after the implementation of SAP: instead of moving upwards, they declined (*REER* coefficient interpreted in absolute terms). Therefore, the coefficient on real *GDP* and *REER* falls with the inclusion of shift dummies 1.19 = (2.60-1.41) and -0.38=(-2.29+1.91) respectively, when compared to column 1.Similarly, the coefficient on the manufactured exports marginally declines from 0.31 in column 2 to 0.27 in column 3.

Therefore, given that imports are withdrawals, the rising value of manufactured export elasticity (α) in Equation 5.2 implies a diversion of foreign exchange for the purchase of foreign factor inputs to be used in the manufacturing sector. The *F* and *t-tests* all confirm the existence of a long-run relationship among the variables. In addition, the speed of adjustment further

increases to about 77% per annum and no econometric problems are detected in the model. In general, when the direct consequence of manufactured exports is accounted for, there is no confirmation of an increase in the income elasticity of intermediate imports following *SAP*. This agrees with Blecker & Ibarra (2013) in the case of Mexico.

The result of the last column (Table 5.3 column 4) once more shows that the variables and the speed of adjustment remain significant with the expected signs especially after accounting for the effect of SAP. The bounds tests reveal the existence of a long-run relationship between the variables. The coefficient of the interactive dummy variable of manufactured exports after *SAP* (*MANExport*Dum1987*) increases to 0.40 = (2.03 – 1.63). Hence, we conclude that there is evidence of a shift in manufactured exports following the introduction of SAP in Nigeria.

Table 5.3: Estimated intermediate goods imports demand function

	(1)	(2)	(3)	(4)
Long-run coefficients	*1981 to 2016*		*Post SAP (1987 to 2016)*	
Speed of adjustment,	(λ) -0.19(0.00)	-0.82(0.00)	-0.77(0.00)	-0.73(0.00)
Domestic real income,y	(η_i)1.30(0.06)	0.57(0.04)	2.60(0.00)	0.86(0.00)
REER, $(e + p^* - p)$	(ε_i) -0.71(0.25)	-0.46(0.00)	-2.29(0.00)	1.43(0.04)
Manufactured export,x_n	(α)	0.31(0.00)	0.27(0.01)	2.03(0.00)
GDP*Dum1987			-1.41(0.00)	-0.49(0.00)
REER*Dum1987			-1.91(0.00)	-1.73(0.02)
MANExport*Dum1987				-1.63(0.00)
Diagnostics[(a)]				
Adjusted R-Squared	0.433712	0.827772	0.700661	0.817714
Jarque-Bera	0.07(0.96)	0.19(0.90)	1.59(0.45)	1.86(0.39)
Breusch-Godfrey-autocorrelation	0.59(0.54)	0.22(0.07)	0.28(0.12)	0.23(0.10)
Breusch-Godfrey-Heteroskedasticity	0.08(0.01)	0.25(0.24)	0.30(0.28)	0.44(0.38)
ARCH	0.49(0.48)	0.46(0.44)	0.62(0.60)	0.73(0.72)
Ramsey RESET test	0.65(0.42)	1.57(0.22)	2.44(0.13)	0.17(0.67)
Bounds testing[(b)]				
F-stat	8.46***	14.36***	7.36***	9.7***
t-stat	-2.39	-7.85***	-5.24***	-4.84***

(Source: Authors' computation)

Notes:

The ARDL equations were largely estimated with constant using lags one based on the *AIC* information criteria. Elasticities are given in parentheses after the variable and notation.

[a]. We accept the null hypotheses that (i)there is no autocorrelation in the residuals (Breusch-Godfrey) (ii) no Heteroskedasticity(Breusch-Pagan-Godfrey-test), (iii) that there are no *ARCH* errors and, (iv) no specification errors in the model (RAMSEY RESET test) when the p. values in parentheses are greater than 0.05. Again, when the values corresponding to Jarque-Bera χ^2statistics are greater than 0.05, we conclude that the model is normally distributed.

[b]. The decision as to whether there is a long-run relationship between the variables, *, **,*** indicates the rejection of the null hypothesis of the absence of a long-run relationship at 0.10, 0.05 and 0.01 significant levels when the *F*-stat or the absolute value of t-stat falls outside the upper critical bounds of Pesaran et al. (2001).

The upper critical bounds of *F-stat* at 0.10, 0.05 and 0.01 are 3.89, 4.63 and 6.67, respectively and -3.66, -3.99 and 4.60 for t-stat. The output is obtained by estimating Equation 5.2.

5.4.2.2 Final Imports Demand Function

The final import demand function specified in Equation (5.3) contains only two variables: log of real *GDP* and log of*REER.* Once again, the estimation starts with the simplest model and moves to the more complex one. The result in Table 5.4 column 1 shows that the variables are significant and correctly signed. In addition, the speed of adjustment shows that errors are rapidly corrected with speed of 72% annually. As in the intermediate import function, I interact the dummy with both level and the first difference of the (final) import determinants. This allows for shifts in the long-run and short-run coefficients of the model.

When a permanent shift in the estimated coefficients on real *GDP* and *REER* in Post *SAP* era is introduced, the elasticity coefficients of the variables considerably increase (See Table 5.4 columns 2 and 3). In these models, the *REER* coefficient seems to have marginally increased more in the post SAP era. Considering Table 5.4 column 3 precisely, the income-elasticity of final imports seems to be smaller (0.77) for the entire period-1981 to 2016 and higher 1.54 = (2.68 – 1.14) in 1987–2016. Similarly, *REER* seems to be lower –0.48 for the entire period but higher – 0.53 (–2.23 + 1.70) for the Post *SAP* era. This is insightful if we assume that the composition of final demand may become more responsive to changes in the relative price of final imports in the post *SAP* era.

Table 5.4: Estimated final goods imports demand functions

	(1)	(2)	(3)
Long-run estimates	*1981 to 2016*		*Post SAP*
Speed of adjustment,	(λ) -0.72(0.00)	-0.77(0.00)	-0.84(0.00)
Domestic real income,y	(η_c)0.77(0.00)	1.20(0.00)	2.68(0.00)
REER, $(e + p^* - p)$	(ε_c)-0.48(0.00)	-0.55(0.02)	-2.23(0.00)
GDP*Dum1987		-0.16(0.00)	-1.140(0.00)
REER*Dum1987			1.70(0.00)
Diagnostics[(a)]			
Adjusted R-Squared	0.622410	0.596077	0.648549
Jarque-Bera	5.85(0.05)	2.52(0.28)	3.10(0.21)
Breusch-Godfrey-autocorrelation	0.79(0.70)	0.43(0.34)	0.73(0.63)
Breusch-Godfrey-Heteroskedasticity	0.96(0.43)	0.93(0.89)	0.84(0.78)
ARCH	0.59(0.57)	0.90(0.90)	0.52(0.51)
Ramsey RESET Test	1.61(021)	1.00(0.32)	0.51(0.48)
F-stat	10.91***	10.69***	9.44***
t-stat	-6.04***	-5.75***	-6.28***

(Source: Authors' computation)

The ARDL equations were largely estimated with ntercept at lag one based on the *AIC* information criteria.
Elasticities are given in parentheses after the variable and notation.
[a]. Note as in Table 5.3
[b]. Note as in Table 5.3
The output is obtained by estimating Equation 5.3.

5.4.2.3 Manufactured Export Demand Function

For the non-oil export or manufacturing export Equation[27] (5.1), the log of world real income and the log of real effective exchange rate are used as explanatory variables. Here, any increase in the log of world real *GDP* causes a positive change in manufactured exports. Again, an increase in *REER*

[27]SITC 5, 6 7& 8

represents a depreciation of the domestic currency; hence, the expected sign is positive.

Looking at the coefficients of the variables in Table 5.5 column 1, we assert that any increase in foreign income as well as *REER* tends to increase the demand for manufactured exports. The speed of adjustment λ is negative and significant, as expected. The *F and t* bounds tests similarlyfall above the upper critical bounds only at 0.05 levels. Therefore, the null hypothesis of no long-run relationship is rejected. The Jarque-Bera test shows that the model is normally distributed; the Breusch-Godfrey-autocorrelation, heteroskedasticity, ARCH test as well as the Ramsey RESET test all suggests that the estimated coefficients are unbiased and the model does not suffer from any specification problems.

As in the import functions, we interact the dummy with both level and the first difference of the manufactured export determinants during the post *SAP* era. This allows for shifts in the long-run and short-run coefficients of the model (Table 5.5 column 2 and 3). While the world real income expectedly shifted in the right direction in the post SAP era 2.39 = (2.27+0.12), the shift in *REER* was negative 0.90= (0.91-0.01). Once more, there are no econometric problems with the models.

It should be noted that the manufactured export sector is a combination of manufactured products with different technology contents. Therefore, the relatively high elasticity of manufactured exports in respect to world real income means that increasing the export share of this sector will invariably improve the gains from international trade. Given the level of export sophistication and technological development of Nigeria, where the share of the manufactured export sector is minimal relative to total exports, it is likely that a comparatively small increase in manufactured exports, especially those with high technological content, will manifest in high income sensitivity of demand (Gouvêa & Lima, 2010; Romero & McCombie, 2016).

Table 5.5: Estimated manufactured exports demand function

	(1)	(2)	(3)
Long-run estimates	*1981 to 2016*	*Post SAP*	
Speed of adjustment,	(λ) -0.83(0.00)	-0.82(0.00)	-0.80(0.00)
World real income,y^*	(η_n)2.22(0.00)	2.34(0.03)	2.27(0.00)
REER, $(e + p^* - p)$	(ε_n)0.42(0.06)	1.04(0.01)	0.91(0.04)
GDP*Dum1987		0.12(0.00)	0.12(0.00)
REER*Dum1987			-0.01(0.04)
Diagnostics[(a)]			
Adjusted R-Squared	0.467564	0.689256	0.680583
Jarque-Bera	1.09(0.36)	0.50(0.77)	3.32(0.18)
Breusch-Godfrey-autocorrelation	0.67(0.57)	0.67(0.54)	0.85(0.77)
Breusch-Godfrey-Heteroskedasticity	0.07(0.09)	0.15(0.15)	0.71(0.63)
ARCH	0.45(0.43)	0.35(0.35)	0.35(0.33)
Ramsey RESET test	2.69(0.11)	1.10(0.30)	0.71(0.40)
Bounds testing[(b)]			
F-stat	7.27***	11.89***	11.75***
t-stat	-4.47***	-5.29***	-5.35***

(Source: Authors' computation)

The ARDL equations were largely estimated with constant based on *AIC*.

Elasticities are given in parentheses after the variable and notation.

[a]. note as in Table 5. 4

[b].note as in Table 5. 4

The output is obtained by estimating Equation5.1

5.5 Computation of Multi-Sectoral Balance of Payment Constrained Growth Rate, 1981 to 2016

Descriptive statistics of the appropriate variables, sector shares and elasticities that are used in the estimation of Equation (5.5) are accessible in Table 5.6.It should be noted that the elasticity coefficients presented in Table 5.6 are obtained from Table 5.3 column 3 for intermediate imports, Table 5.4 column 3 for final goods imports, and Table 5.5 column 2 for non-oil or manufactured exports. We first presented the outcome for the whole sample period 1981–2016 and then *SAP* era 1987–2016.

We begin the interpretation of the equilibrium growth rates for the entire period (1981-2016). The result supplied by Equation (5.5) in (Table 5.6 column 1),

shows that the Nigerian economy seems to have outperformed its *BOP* equilibrium growth rate (3.93% > 3.07 annually) *per se*. It is obvious that this growth rate is not too far from the actual growth rate (3.93%) per year over the entire period. Hence, we conclude in line with earlier literatures that the BOPCG model often mimics the actual average growth of an economy in the long-run (Blecker, 2013, Razmi, 2005, Gouvêa & Lima, 2010, Araujo, et al. 2016).

Moving further, the study examines the performance of the economy following the introduction of the trade policy (SAP) in 1986. In the light of the results obtained using Equations (5.5) (Table 5.6 column 2), it could be asserted that Nigeria experienced more sluggish growth than the rate permitted by the balance of payment equilibrium condition (4.69% < 4.85%). A reasonable explanation for this scenario could be attributed to a constellation of contradictory forces that have a tendency to raise the *MBOPCG* rate above the actual growth. Firstly, reductions in the manufactured export elasticity of intermediate goods imports tend to raise the numerator and invariably raise the *MBOPCG* rate. Secondly, a marginal increase in the share of non-oil exports and world income tends to increase the equilibrium growth rate over the actual growth rate. Note that$-\alpha\theta$ represents a leakage, therefore, therelative reduction in $-\alpha\theta$ in the post *SAP* period possibly positioned the actual growth of the economy below its equilibrium growth rate, *per se.*

Table 5.6: Multi Sectoral Balance of Payments Constrained Growth Rate, 1981 to 2016

Period	**1981-2016**	**1987-2016**
Domestic real income growth rate (y)	3.93%	4.69%
Balance of Payment growth rate,*MBOPCG*=Equation 5.5	3.07%	4.85%
Income elasticities		
Domestic income elasticity of intermediate imports,(η_i)	0.57	1.19
Domestic income elasticity of final goods imports, (η_c)	0.77	1.53
World real income elasticity of manufactured export,(η_n)	2.22	2.39
Relative price elasticities		
Relative price elasticity of manufactured exports,(ε_n)	0.42	0.90
Relative price elasticity of intermediate imports,(ε_i)	-0.46	-0.38
Relative price elasticity of final imports,(ε_c)	-0.48	-0.53
Manufactured export elasticity of intermediate imports,(α)	0.31	0.27
Sector shares		
Final goods imports in gross imports,($1-\theta$)	45%	46%
Intermediate imports in gross imports,(θ)	55%	54%
Non-oil or manufactured exports in gross exports, (μ)	2%	5%
Oil exports in gross imports, ($1-\mu$)	98%	95%
Average growth rate		
Real oil exports,($p_o{}^* + x_o - p^*$)	4.74	9.60
REER, ($e + p^* - p$)	2.34	2.61
World income growth, (y*)	3.78	4.49

(*Source:* Authors' computation)

Notes: The *MBOPCG* growth rate is computed using Equations 5.5

As earlier noted, the estimation of Equation (5.5) is essentially aimed at shedding more light on whether incorporating *REER* would improve the predictive power of the *BOPCG* model. Accordingly, the *EML* condition is not satisfied given that the values for the entire sample period as well as the post *SAP* era are negative with-1.30 and -1.53, respectively. The study attributes the inability to satisfy the *EML* condition to the small share of manufactured exports and large variations in *REER*. Blecker &Ibarra (2013) clearly noted

that *EML* is more difficult to satisfy because of the weight $(\mu - \alpha\theta)$on price elasticity. In the presence of higher domestic inflation compared to its trading partners, this scenario is not unlikely. The high cost of production tends to limit the ability of domestic manufacturers to actually benefit from the Naira's depreciation, hence lessening the net impact of changes in the *REER* on external performance.

In summary, it is important to note that the *MBOPCG* advanced by Blecker & Ibarra (2013) and extended by Araujo et al. (2016) largely produces congruent implications in the *BOPCG* model. The study conclusively asserts that Nigeria had an enormous opportunity to accelerate growth more than it actually did.

5.6 Conclusion

This chapter basically estimates four sectors of the Nigerian economy: non-oil (manufactured) and oil exports sectors as well as intermediate and final goods imports sectors. The econometric procedure adopted is the *ARDL* approach. Accordingly, the elasticity coefficients are in line with earlier studies on this subject.

In the light of the research outcome, the estimated equilibrium growth rates obtained generally predicts the actual growth of the economy over the sampled period, which is supportive of Thirlwall's hypothesis. More importantly, the research found that, even though intermediate imports positively improve manufacturing exports, massive dependence on this type of import negatively affects the long-run growth of the economy.

For the period of analysis (1981-2016), the *MBOPCG* growth rate was lower than the actual growth of the economy. In other words, Nigeria seemed to have outperformed its *BOP* equilibrium growth rate *per se*. On the other hand, the outcome of the Post *SAP* era (1987-2016) showed that the economy rather underperformed relative to its *BOP* equilibrium growth rate. There are numerous factors that could possibly explain this poor performance, including

the effects of relative prices, domestic constraints as well as the conflicts or mismatch in macroeconomic policies.

REER is the first visible factor that may explain why actual growth is below its equilibrium growth. The variation in *REER* after *SAP* is substantially high (2.61% annually).It is very clear that *REER* has not been stable over time. Even though Nigeria witnessed a sharp decline in its real exchange rate following a fall in commodity prices and the trade liberalization policy that ushered in SAP, the *REER* remains largely over 100 index points.

In particular, it was recorded that at the inception of the *IFEM* between 2000 and 2015, the real exchange rate index oscillated approximately on a constant drift with an indication of mild appreciation of the exchange rate. For instance, the local currency depreciated against the US dollar by 9% in 2015 and a snowballing 19% since October 2014; however, given that the US dollar is relatively stronger against other trading currencies, the depreciation has merely been approximately 10% in nominal effective terms. Accordingly, *REER* only depreciated by 3% for the same period, leaving the local currency approximately 26% stronger in real effective terms than the first year following the rebasing of the Nigerian economy in 2010.

This largely limits the capacity of Nigerian manufactuers to actually benefit from the naira's depreciation, which impacts negatively on the external performance and external reserves of the country (WTO, 2017). Accordingly, the net appreciation of the domestic currency harms export performance and stimulates import demand.

Another factor that may have led to a state in which the Nigeria's actual growth was beneath its equilibrium growth rate was the sustained constricted focus of macroeconomic policy on inflation targeting and real exchange stability in the post SAP era. Agu &Evoh (2011) have pointed out that SAP-induced Inflation Targeting (IT) in most Periphery-South economies has shown to be one of the most contentious monetary policies since the end of the traditional structural adjustment policies. Given that achieving a low price level is related to higher interest rates, it negatively affects long-run growth due to the instantaneous implication on investment demand. Hence, the

apparent trade-off between in macroeconomic policies adopted in Nigeria in the past decades could also explain why actual growth falls short of the equilibrium growth rate. In addition, other factors such as the underdeveloped financial sector, high cost of doing business, sluggish human capital formation, weak institutions, corruption, hostile investment climate (discouraging domestic investment as well foreign direct investment), and the rise of militants and *Boko Haram* fighters in the country may also have contributed to the underperformance of the economy.

In line with Araujo et al. (2016), this paper is not in opposition to growth policy driven by foreign contents given that it enables a country to increase its income elasticity of exported products. The major concern being advanced is that sound growth could be accelerated by substantially lessening the foreign contents used in final export production, principally if they present a sizeable elasticity with regard to exports. The study thus contends that Nigeria ought to increase the usage of available local contents in export production to reduce leakage occasioned by the extensive importation of intermediate goods. There is a need to constrain domestic prices to singledigit in order to benefit from devaluation of the local currency. Similarly, there isan urgent requirement to match macroeconomic policies with measurable objectives to raise *R&D* funding. Given that non-oil exports are highly responsive to world real income (growth of the *ECOWAS*), leveraging on the strengths and benefits of regional integration and a focus on high-tech manufacturing could be decisive in improving the growth of the economy.

CHAPTER 6

TECHNOLOGICAL SECTORS AND INCOME ELASTICITIES IN GROWTH

6.1 Introduction

The role of technological content in export performance has emerged as one of the building blocks of iable growth around the globe. Recent studies have shown that the structural composition of trade affects the equilibrium growth rate as a result of differences in income sensitivities of demand for products from different sectors.

Gabriel, et al. (2016) noted that more developed productive structures with substantial technological content across export has emerged as one of the determinants of viable external performance and growth; and help to ease external disequilibrium. In the preceding chapter, the thesis only examines only two main classification of the economy: Oil and Non-oil export sectors as well as intermediate and final import sectors.

While this broad classification simply captures the apparent structure of the economy, it may not be efficient in answering the fifth question in section 1.3, which seeks identify important sectors with high income elasticities in order to direct policies towards achieving sustained external performance and stable growth.

This is anchored on the perspective that changes in the sectoral composition of exports and imports affect the growth in the long-run. Highly rooted in Pasinetti (1981, 1993) study on structural economic dynamics, Thirlwall's aggregate model could be adapted to incorporate the sectoral product specialization of the economy that affects the non–price competitiveness of

the goods produced (Soukiazis, et al. 2017). The chapter argues that structural change systematically affects the pace of economic growth. Accordingly, moving away from the production of goods with low elasticity to foreign income to the production of goods which have high income elasticity is a viable way of boosting economic growth.

Following Pasinetti (1981 & 1993), Araujo & Lima (2007) disaggregated the original *BOPCG* to capture the structural composition of exports and imports. Here, the main argument is that shifts in the composition or sectoral shares of imports and exports determine the long-term growth path consistent with the balance-of-payments equilibrium. Therefore, an economy can substantially grow irrespective of the rate of growth of the rest of the world provided that the shares of exports and imports are satisfactorily and structurally transformed. In essence, the growth rate of domestic income largely depends on sectoral characteristics of the economy. Most importantly, countries that engage in the export of goods with high technological contents gain substantially in comparison to those that produce and export low-tech, primary and natural resource-based products (Gouvea & Lima, 2010; Missio & Gabriel, 2016; Soukiazis et al., 2017; Tharnpanich & McCombie, 2013).

The contributions of this chapter are on two major issues pertinent to the Periphery-South economy:

i. Recent studies on this subject have indicated that income elasticities of demand for export products vary across sectors (Gouvêa & Lima, 2010; Romero et al., 2011; Romero & McCombie, 2016). This reinforces the rationale and importance of further disaggregation of the Oil and Non oil sectors in the preceding chapter to appreciate the degrees of both the Verdoorn coefficient (Verdoorn-Kaldorian idea that faster growth of demand/return to scale causes a faster growth of productivity) as well as the income elasticities of demand (Soukiazis et al. 2017b).

   In this sense, the study seeks to identify technological sectors with high income elasticity in order to aid in directing factors of production to

achieve external sustainability[28]. The UNcomtrade classifications as given by Lall (2000) in which various export and imports sector are categorised according to the technological content is used. To the Nigerian economy, this is particularly relevant and timely given the global shift from primary and natural resource-based products toward technologically inclined sources of energy. Therefore, a comprehensive search for alternative means of generating foreign exchange such as this is crucial.

ii. The chapter modifies Romero & McCombie (2016) to examine the implications of a growth strategy based on intermediate imports. Accordingly, the import functions of technological sectors are adjusted to include manufactured exports as an additional constraint. This is anchored on the idea that massive reliance on intermediate imports (leakages) to create final manufactured exports could harm long-term growth. This study is the first after Araujo, Paiva & Santos (2016) to demonstrate the role of intermediate inputs in various technological sectors within a *MBOPCG* model. Therefore, the research outcomes would provide more realism and universal acceptability regarding the effect of intermediate imports on the growth process. This adjustment would be essential in fashioning industrial and trade policies for Periphery-South economies, which rely greatly on foreign contents to produce final exports.

The structure of the chapter is as follows: following the introduction section 6.2 covers Thirlwall (1979) and the modified *MBOPCG* model. Section 6.3 is on data description and econometric methodology. Section 6.4 covers empirical estimation and discussion of results. Section 6.5 offers the general conclusion.

[28]This may not necessarily be a novelty but represents the dire need of the economy to resourcefully move away from the exports of primary based products to those with high income elasticity in the international market.

6.2 Modelling Multi-Sectoral Balance of Payment Constraint Growth (MBOPCG) based on Technological Sectors

In order to show how calibration of the original model (i.e. Thirlwall's, 1979) is done, it is necessary to begin the model formulation from the initial model. Here, a typical *BOPCG* model is presented showing how variations in exports and imports clearly determine the long-run equilibrium growth rate of an economy. The model specification is comprised of two sets of equations and an identity:

$X_t = A(\frac{P_t^* E_t}{P_t})^{\eta_x} Y_t^{*\lambda_x}$ $\eta_x > 0, \lambda_x > 0$ Export demand function (6.1)

$M_t = B(\frac{P_t^* E_t}{P_t})^{\eta_m} Y^{\lambda_m}$ $\eta_m < 0$, $\lambda_m > 0$ Import demand function (6.2)

$P_t X_t = P_t^* E_t M_t$ Balance of payment identity (6.3)

Where, $X_t, M_t, P_t^*, P_t, E_t, Y_t^*$ and Y_t represent exports, imports, foreign prices, domestic prices, exchange rate, foreign income and domestic income respectively. η_x *and* η_m represent price sensitivity of demand for export and imports respectively, while λ_x and λ_m represent income sensitivity of demand for exports and import. A and B are constants. Specifying the above in dynamic terms yields the following:

$$x_t = \eta_x(p_t^* + e_t - p_t) + \lambda_x y_t^* \quad (6.4)$$

$$m_t = -\eta_m(p_t^* + e_t - p_t) + \lambda_m y_t \quad (6.5)$$

$$p_t + x_t = p_t^* + e_t + m_t \quad (6.6)$$

Substituting Equations (6.4) and (6.5) into (6.6) produces an all-encompassing specification as:

$$y_{Bt} = \frac{(1+\eta_m+\eta_x)(p_t^*+e_t-p_t)+\lambda_x y_t^*}{\lambda_m} \quad (6.7)$$

Equation (6.7) is valid only when the role of relative prices is significant. Theoretically, until $|\eta_m + \eta_x|$ >1, the domestic exchange rate devaluation policy will be ineffective. This is the Marshall-Lerner condition for a successful devaluation. Note, however, that a once-for-all depreciation (or devaluation)

will not put a country on a permanently higher growth path. For this to happen, the depreciation has to be continuous which is not sustainable. Another implication of the Equation (6.7) is that growth of the rest of the world would generate an upward rise in domestic incomey_t. Furthermore, a small income sensitivity of demand for imports would generate a high growth rate of *y* attuned with the balance-of-payment equilibrium condition. However, suppose that real exchange rate plays no role in the growth process; the model reduces to:

$$y_{B1} = \frac{\lambda_x}{\lambda_m} \tag{6.8}$$

Or,

$$y_{B2} = \frac{\lambda_x}{\lambda_m} y_t^* \tag{6.9}$$

As earlier obtained, Equations (6.8) and (6.9) are the balance of payment constrained growth rates; they respectively referred to as weak and strong versions (Perraton, 2003).

The study proceeds to specify *MBOPCG* model of a typical economy which is composed of i sectors, each one subject to different price and income elasticities of demand, we can re-specify the Thirlwall aggregate export function (Equation 6.1) and import function (Equation 6.2) as in Equations (6.10) and (6.11):

$$X_{it} = A\left(\frac{P_t^* E_t}{P_t}\right)^{\eta_{xi}} Y_t^{*\lambda_{xi}} \quad \eta_{xi} > 0, \lambda_{xi} > 0 \tag{6.10}$$

$$M_{it} = B\left(\frac{P_t^* E_t}{P_t}\right)^{\eta_{mi}} Y^{\lambda_{mi}} \quad \eta_{mi} < 0, \lambda_{mi} > 0 \tag{6.11}$$

Taking log and differentiating with respect to time, the growth rate of export and imports of sector i are obtained as

$$x_{it} = \eta_{xi}(p_t^* + e_t - p_t) + \lambda_{xi} y_t^* \tag{6.12}$$

$$m_{it} = \eta_{mi}(p_t^* + e_t - p_t) + \lambda_{mi} y_t + \alpha_{mi} x_{mi} \tag{6.13}$$

Here we modified the import function (6.13) to incorporate the manufactured exports whose production largely relies on foreign contents as in Araujo et al. (2016).

In Equations (6.12) and (6.13),$x_{it}, m_{it}, x_{mi}, e_t, y_t^*, y_t, p_t$and p_t^*represent the growth rate of export, imports, manufactured export in the sector i, exchange rate, foreign income, domestic income, domestic inflation and foreign inflation, respectively. $\eta_{xi}$and λ_{xi}represent the price and world income elasticity of demand for the *i*th export sector, respectively(increase in the real exchange rate indicates real depreciation of domestic currency). While η_{mi}, λ_{mi} and α_{mi} represent the price, domestic real income and manufactured exports elasticity of demand for imports for the *i*th sector. The value of α_{mi}depends on two fundamental determinants, which are not openly expressed in the present study. First, it depends on the sensitivity of demand for intermediate factor inputs for the production of non-oil exports. Second, it depends on the share of intermediate goods imports that are committed to manufactured exports.

Note that aggregate imports and exports in dynamic form are respectively identical to:

$$x_t = \sum_{i=1}^{k} \omega_{xi} x_{it} \quad (6.14)$$

$$m_t = \sum_{i=1}^{k} \omega_{mi}\, m_{it} \quad (6.15)$$

Where, ω_{xi} and ω_{mi} represent the share of the *i*thsectors in gross exports and imports, respectively. When we Substitute Equations (6.12) and (6.13) into Equations (6.14) and (6.15) we obtain following equations:

$$x_t = \sum_{i=1}^{k} [\omega_{xi}\eta_{xi}(p_t^* + e_t - p_t) + \omega_{xi}\lambda_{xi} y_t^*] \quad (6.16)$$

$$m_t = \sum_{i=1}^{k} [\omega_{mi}\eta_{mi}(p_t^* + e_t - p_t) + \omega_{mi}\lambda_{mi} y_t + \omega_{mi}\alpha_{mi} x_{mi}] \quad (6.17)$$

In this study oil export is taken as given and grow at the exogenously given rate, x_o, and its price changes at the exogenously given rate p_0^* denominated in foreign currency (i.e., US dollars). This is instructive and appropriate given that the supply of oil is determined by *OPEC* and its price is determined externally in the international market. Furthermore, we assume that there are

no capital flows and transfers as in the preceding chapter; the balance of payment equilibrium condition in growth rate is obtained as:

$$(p_t + x_t) + (p_{ot}^* + x_{ot} - e_t) = p_t^* + e_t + m_t \qquad (6.18)$$

Where,$x_o$andp_{ot}^* represent the growth rate of demand for oil exports and the corresponding price in the international market, respectively. Therefore, when we Substituted (6.16) and (6.17) into (6.18) and solve for the domestic income growth rate $y_t$we obtained the long-run growth rate of the economy compatible with balance of payments equilibrium (after some rearrangements)

$$y_{MBOPCG} = \frac{\sum_{i=1}^{k}[(\omega_{xi}\lambda_{xi}y_i^*) - (\omega_{mi}\alpha_{mi}x_{mi}) + (\omega_{xi}\eta_{xi} + \omega_{mi}\eta_{mi} + 1)(p_t^* + e_t - p_t) + \omega_{xi}(p_{0t}^* + x_{ot} - p_t^*)]}{\sum_{j=1}^{k}\omega_{mi}\lambda_{mi}} \qquad (6.19)$$

Here,$(p_{0t}^* + x_{ot} - p_t^*)$ represents the real growth rate of oil-mineral fuel sector.

Note that $\sum_{i=1}^{k}\omega_{mi} = 1$ and $\sum_{i=1}^{k}\omega_{xi} = 1$. Based on Equations (6.16) and (6.17), $\eta_x = \sum_{i=1}^{k}\omega_{xi}\eta_{xi}$; $\lambda_x = \sum_{i=1}^{k}\omega_{xi}\lambda_{xi}$; $\eta_m = \sum_{i=1}^{k}\omega_{mi}\eta_{mi}$;$\lambda_m = \sum_{i=1}^{k}\omega_{mi}\lambda_{mi}$ and$\alpha_m = \sum_{i=1}^{k}\omega_{mi}\alpha_{mi}$ hence the composition of the various tradable sectors of the economy are generally altered by sectoral elasticities.

Therefore, the growth of domestic income consistent balance of payment equilibrium depends on the growth of world real income (y_i^*); income elasticity of demand for exports of the *i*th sector (λ_{xi}); the respective shares of the ith export and imports sectorsω_{xi}andω_{mi}; export and import price elasticities of the *i*th sectors, η_{xi} and η_{mi} respectively.The new or Extended Marshall Lerner condition is that*:* $\omega_{xi}\eta_{xi} + \omega_{mi}\eta_{mi} > 1$ for devaluation to have faster effect on growth.

One of the key factors in the *MBOPCG* model is that, even if the world income growth remains unchanged, it is still possible for an economy to experience some growth by shifting resources from low income elasticity sectors to the ones with superior elasticities in the international market.

6.3 Data Description and Econometric Methodology

The link between technological contents and global competitiveness is widely established in international trade. The product classification according to the most generally used taxonomy-Standard International Trade Classification (SITC) obtained from the COMTRADE initially constructed by Lall (2000) is employed to investigate this link.

The Lall (2000) classification is more appropriate and fitting for analysis because it groups commodity trade flows based on their phases of production. In addition, it supplies a wealth of information that can be used in policy making. In other words, it supplies policy makers with the required knowledge for proper identification of key, strategic and growth-enhancing tradable goods sectors of the economy. The study obtained the real *GDP* (at constant 2010 prices corresponds to Nigeria's output in constant Naira) from the central bank of Nigeria's statistical bulletin to measure the growth of the economy. The study used the *GDP* of the *ECOWAS* as a proxy of world real income given that the sub region is among Nigeria's major export destinations.

Real effective exchange rate obtained from *WDI* was used as a measure of relative prices. In line with earlier studies, the present study estimated the models using the log level of the variables, even though the theoretical derivations are in growth rates. This fundamentally allowed us to interpret the coefficients obtained as elasticities as well as to to maintain the long-run properties of the variables. The econometric method employed is expressed in the ensuing sub-section.

As in the previous chapter, Chapter 6 relies on the elasticities obtained from *ARDL* econometric method.

ΔY_t is modelled as a conditional *ECM*:

$$\Delta Y_t = \sum_{j=1}^{n} a_j \Delta \mathrm{Y}_{\mathrm{t-j}} + \sum_{j=1}^{k} \sum_{j=0}^{n} b_{i,j} \Delta \mathrm{Z}_{\mathrm{i,t-j}} + \lambda \mathrm{Y}_{\mathrm{t-1}} + \sum_{i-1}^{k} d_i Z_{i,t-1} + dum \qquad (6.20)$$

Where Δ represents the first difference of the series, and λ captures the speed of adjustment of the variables toward the long-run equilibrium. *Y* represents the dependent variable. The set of independent variables *Z*

comprises four potential determinants: Log of domestic income, log of foreign income, log of manufactured exportsand log of real effective exchange rate.

Similarly, appropriate lag structure of the equations are based on the *AIC* criteria. The diagnostic tests including the Breusch-Godfrey test for serial correlation, the Breusch-Pagan-Godfrey test for heteroskedasticity, and the *ARCH* test are conducted. The bounds test (*F* and *t-tests*) were carried out.

6.4 Empirical Examination

6.4.1 Unit Root Test

As in the previous chapter, it is important to determine the underlying statistical properties of the variables included in the estimation. Following Perron & Vogelsang (1992a, 1992b), and Vogelsang & Perron (1998), the study applied break point unit root test to the variables.

The result in Table 6.1 indicates that the variables comprise of a mixture of *I(0)* and *I(1)* which justifies the adoption of the econometric model. Multiple structural break tests as well recursive analysis were carried to account for any significant outlier regarding each sector. The analysis is conducted on basis of the three models (Equations 5.8 to 5.10) specified in the preceding chapter.

Table 6.1: Unit root test with Breakpoints

Variables	*Const.*	*Const&Trend*	*Fists Differences*	*Break date*
Exports				
Animal	-4.48**	-5.12***	-8.01***	2008
Chemicals	-3.31	-4.63*	-8.49***	2008
Manuf.	-3.76	-3.87	-7.36***	1986
Other_Manuf	-3.31	-3.49	-8.12***	2015
Mach & Equi	-420*	-4.41*	-9.41***	2015
Imports				
Minerals	-3.70	-5.62***	-9.43***	2011
Animal	-3.87	-12.44***	-10.54***	1987
Chemicals	-5.49***	-5.30**	-6.88***	1999
Manuf.	-4.49**	-4.41*	-5.37***	1988
Other_Manuf	-5.30***	-5.17**	-4.41*	1985
Mach&Equi	-5.75***	-5.72***	-4.87**	2010
Regressors				
Real GDP	2.36	-4.80*	-4.36*	2009
World real GDP	2.71	-1.16	4.53***	2000
REER	-5.27***	-5.21***	- 5.55***	1998
Manufactured exports	-3.67	-7.17***	-11.64***	2015

(*Source:* Authors' computation)

All the variables are considered in log levels. The estimation started by testing the model with constant, constant and trend and then first difference.
*,**, *** implies rejection of the null hypothesis of non-stationarity at 0.10, 0.05 and 0.01 level of significance. The critical values with constant and/or integrated of order 1 are: 0.10 =4.19; 0.05= 4.44; 0.01=4.94 For intercept and trend and/or integrated of order 1 are: 0.10=4.60; 0.05=4.85; 0.01= 5.34

In addition to the above, the estimation is supported with significant breakpoints (including Dum1984, Dum1991, 2005, Dum2012) detected by Bi-Perron.

6.4.2 Econemetric Evidence, Interpretation and Discussion

At this stage, the study presents and interprets the empirical results as mostly done in the *MBOPCG* research community. For the export function, Equation (6.12), the world real income and the log of *REER* are used as explanatory variables. As in the preceding chapter, any increase in the log of world real GDP causes a positive change in exports. Similarly, an increase in *REER* represents a depreciation of the domestic currency; hence, we expect a negative on the coefficient. From Table 6.2, it is shown that the income elasticity estimates across the sectors are correctly signed and significant at 0.01 level. We assert that any increase in foreign income tended to increase the demand for exports across all the sectors. Note that the relatively large sizes of the estimated coefficients of the export sectors are mostly identical to those found by Gouvea & Lima (2010) and Romero & McCombie (2016), albeit in different countries. Given the level of export sophistication and technological development of Nigeria, where the share of chemicals, machinery and equipment, manufactured exports and other manufactured exports sectors is relatively small in total exports, it is likely that a comparatively small increase in exports of these industrial sectors will manifest itself in high income sensitivity of demand. Similarly, the estimated coefficients of relative price largely turn out withpositivesigns.This imply that real depreciation of the domestic currency tends to increase exports as a result of price competitiveness.

Moving further, it is apparent that the error correction terms λ across the export sectors are negative and significant as expected. The speed of adjustment in chemicals, machinery and equipment, manufactured exports and other manufactured exports sectors are shown to be the fastest. Therefore, any movement into disequilibrium is corrected with the speed of 77%, 83%, 87% and 92% each year for the respective sectors. However, for the Animals sector (Table 6.2 column 1); errors are corrected with the speed of 57%. Since all the values of the *F- stat* tests fall to the right of the upper critical value of Pesaran et al. (2001), we conclude that there is a long-run

relationship between the variables in all the export sectors. We further confirm the validity of the long-run relationship using the absolute values of *t-stat*where the relationship obtained is not nonsensical but appropriate as the *t-stats* exceeds the upper critical values

Table 6.2: Estimated exports demand functions

Variables	**Animals**	**Chemicals**	**Manuf.**	**Other Manuf.**	**Mach &Equi**
Long-run coefficients					
Speed of adjustment,λ	-0.57(0.00)	-0.77(0.00)	-0.83(0.00)	-0.87(0.00)	-0.92(0.00)
World real income, (y_i^*)	1.33(0.31)	4.96(0.00)	1.75(0.00)	3.37(0.00)	4.90(0.00)
Relative price,$(e + p^* - p)$	2.71(0.04)	0.90(0.00)	0.77(0.00)	2.66(0.00)	-1.36(0.00)
Diagnostics[(a)]					
Adjusted R-Squared	0.439663	0.566186	0.423228	0.598005	0.595060
Jarque-Bera	5.73(0.05)	2.44(0.29)	2.46(0.29)	1.69(0.42)	5.52(0.07)
LM test	0.31(0.08)	0.79(0.71)	0.12(0.06)	0.82(0.70)	0.94(0.92)
Heteroskedasticity test	0.69(0.57)	0.72(0.65)	0.58(0.28)	0.16(0.18)	0.36(0.33)
ARCH	0.30(0.29)		0.91(0.91)	0.56(0.54)	0.81(0.81)
RAMSEY RESET	1.90(0.18)	2.90(0.10)	0.39(0.53)	0.00(0.92)	1.02(0.32)
F-stat	6.86**	6.85**	5.79**	7.92***	13.24***
t-stat	-3.69**	-4.15***	3.29*	-4.62***	-6.01***

(Source: Authors' computation)

Notes:
The ARDL equations were largely estimated with intercept at lag one based on the AIC information criteria. Elasticities are given in parentheses after the variable and notation.
[a]. We accept the null hypotheses that (i) there is no autocorrelation in the residuals (Breusch-Godfrey) (ii) no Heteroskedasticity(Breusch-Pagan-Godfrey-test), (iii) that there are no ARCH errors and, (iv) no specification errors in the model (RAMSEY RESET test) when the p. values in parentheses are greater than 0.05. Again, when the values corresponding to the Jarque-Bera χ^2statistics are greater than 0.05, we conclude that the model is normally distributed.
[b]. The decision as to whether there is a long-run relationship between the variables. *, **,*** indicates the rejection of the null hypothesis of the absence of a long-run relationship at 0.10, 0.05 and 0.01 significant levels when the *F*-stat or the absolute value of t-stat falls outside the upper critical bounds of Pesaran et al. (2001)
The upper critical bounds of *F-stat* at 0.10, 0.05 and 0.01 are 4.41, 5.33 and 7.60,respectively and -3.21, -3.35 and 4.10 for t-stat

The Jarque-Bera test shows that the model is normally distributed; the Breusch-Godfrey-autocorrelation, heteroskedasticity, ARCH test as well as the Ramsey RESET test all suggest that the estimated coefficients are unbiased and the model does not suffer from any specification problems.

In summary, the study upholds the position in most analyses in MBOPCG that export elasticities of medium- and high-tech manufacturing (chemicals, machinery and equipment, manufactured exports and other manufactured

exports sectors) have higher income elasticity and real gains from international trade than low tech, primary and resource-based manufactures. This essentially indicates the importance of moving away from the production of simple goods to goods with high technological content.

Considering the estimation results of the import demand functions (Equation 6.17) in Table 6.3, income elasticity estimates across all the sectors turn out with the expected positive signs and are significant at 0.01 levels. Therefore, an increase in real GDP tended to induce import demand over the period of analysis. The coefficients of relative price on the other hand are generally mix interns of signs and significance. The significant and negative values inTable 6.3 (columns 1, 2 and 5) from the domestic economy standpoint mean that depreciation of the domestic currency reduces import demands. This study contends that the existence of a substantial share of imports of intermediate goods in gross imports, which are strongly related to exports, the unexpected signs of relative price is conceivably unsurprising; they are prone to react in the contrary direction. Thus, the combination of some imports that respond positively to relative price with others that respond negatively lessens the elasticities in absolute terms and lowers the significance (Blecker& Ibarra, 2013).

In this study, we extended the standard import function by including manufactured export. The estimated coefficient, α_{mi} in the four medium and high technology sectors (chemicals, machinery and equipment, manufactured exports and other manufactured exports sectors) are as expected. The positive elasticity of manufactured exports, α_{mi} shows the diversion of foreign exchange for the purchase of intermediate imports to produce final exports, which has negative implications for growth.

As in the export sectors, the speed of adjustments,λ are negative and significant at 0.01 level, which indicates that the errors are quickly adjusted in each period. Similarly, the two bounds tests (*F and t-test*s) uphold the existence of a long-run relationship at 0.01 to 0.10 levels. Based on the diagnostic test results, we conclude on the whole that there are no

econometrics issues with the estimated coefficient at 0.01 to 0.1 levels of significance.

Table 6.3: Estimated import demand functions

	Animals	Chemicals[(b)]	Manuf.	Other Manuf.	Mach &Equi[(b)]
Long-run coefficients					
Speed of adjustment,λ	-0.57(0.00)	-0.90(0.00)	-0.52(0.00)	-0.64(0.00)	-0.56(0.00)
Domestic real income,(y_t)	1.01(0.00)	1.33(0.00)	1.04(0.05)	0.71(0.08)	1.67(0.00)
Relative price, $(e + p^* - p)$	-0.56(0.03)	-0.15(0.00)	0.29(0.11)	0.17(0.31)	-0.18(0.02)
Manufactured export,(x_{mi})		0.07(0.01)	0.22(0.02)	0.24(0.04)	0.26(0.00)
Diagnostics [(a)]					
Adjusted R-Squared	0.875823	0.671345	0.6413324	0.651547	0.807991
Jarque-Bera	0.87(0.64)	1.99(0.36)	2.95(0.22)	5.56(0.06)	0.76(0.68)
LM test	0.15(0.08)	0.14(0.08)	0.40(0.23)	0.36(0.17)	0.81(0.72)
Het	0.13(0.14)	0.22(0.21)	0.99(0.98)	0.45(0.39)	0.32(0.29)
ARCH	0.87(0.86)	0.11(0.11)	0.40(0.39)	0.84(0.84)	0.65(0.64)
RAMSEY RESET	1.03(0.31)	1.09(0.30)	0.06(0.80)	0.79(0.38)	0.21(0.64)
F-stat	17.66***	10.39***	4.87**	5.60**	11.49***
t-stat	-7.14***	-5.84***	-3.97*	-4.31*	-6.17***

(*Source*: Authors' computation)

[(b)] Estimated with constant and trend: The upper critical bounds of *F-stat* at 0.10, 0.05 and 0.01 are 4.51, 5.30 and 7.17, respectively and -4.04, -4.36 and 4.96 for *t-stat*

Other notes as in Table 6.2

6.4.3 Computation of Multi-Sectoral Balance of Payment Contrained Growth Rate, 1981 to 2016

Descriptive statistics of the appropriate variables, sector shares and elasticities that are used in the estimationof Equation (6.19) are available in Table 6.4.The elasticity coefficients presented in Table 5.4 are obtained from Table 6.2 and Table 6.3 for export and import sectors respectively.

In the light of the results in Table 6.4, it could be asserted that Nigeria underperformed relative to its balance of payment equilibrium growth rate (3.93% < 4.46%).This situation could be attributed to a number of contradictory forces that have a propensity to position the *MBOPCG* rate above the actual growth. First, the loss of competitiveness of exports tended to lower the external performance of the economy. Second, the dominance of

the mineral fuel sector tended to position the equilibrium growth rate over the actual growth rate. Note that$-\omega_{mi}\alpha_{mi}x_{mi}$represents a leakage, and an increase in α_{mi}possibly positioned the actual growth of the economy below its equilibrium growth rate, *per se.* This is in line with Pacheco-López & Thirlwall (2004), who reported that balance of payments difficulties could be triggered when export growth fails to adequately compensate for foreign contents used in export production. In general, it is revealed that Nigeria grew at a slower rate than was allowed by the *MBOPCG* rate, but it was not significantly different from the actual growth rate (3.93% < 4.46%). Hence, we conclude in line with earlier studies that the *BOPCG* model often mimics the actual average growth of an economy in the long-run (Blecker, 2013; Razmi, 2005, 2016; Gouvêa & Lima, 2010, 2013; Araujo, et al. 2016; Soukiazis et al. 2017a).

In addition, we took half of the period of the analysis, which corresponds to the end of military dictatorship through to the era of modern democracy (1998-2016) to examine the performance of the economy. The period also captures major economic events that occurred: firstly, debt cancellation/relief from the Wold Bank in 2003; secondly, banking sector reform of 2004; and thirdly, rebasing of the Nigerian economy in 2010. Using the same elasticities and the growth of oil mineral fuel exports, the *BOP* constraints seems to have fallen below the actual growth of the economy (5.85 >5.18) in the second half of the period*per se*.

To give more validity to our result as to whether Nigeria has underperformed or outperformed relative to its equilibrium growth rate, we excluded the period of severe economic crisis in the early1980sand the global financial crisis of 2007(and estimated only 1987-2006) to ascertain whether there was any significant variation in the growth rates. This period could be regarded as post trade liberalization of 1986. Even though the economy lagged behind the equilibrium growth rate, the predictive capacity of the *MBOPCG* model is superior. Therefore, we assert that the exclusion periods of major economic crises improve the prediction of Nigeria's growth experience (4.27< 4.30). The study conclusively asserts that Nigeria had significant opportunities to accelerate growth more than it really did.

Next, we consider whether the exchange rate devaluation could lead to faster growth of the Nigerian economy. Theoretically, the extended Marshal-Lerner (EML) condition ($\omega_{xi}|\eta_i| + \omega_{mi}|\eta_{mi}| > 1$) ought to be satisfied for growth to be rapidly enhanced. Given that the value of *EML* is negative (-0.11), we affirm that the net effect of real depreciation may not be fast enough to induce the desired domestic income growth. This paper attributes the failure to satisfy the *EML* condition to the small share of manufactured exports and large variations in relative price. In the presence of higher domestic inflation compared to its trading partners, this scenario is not unlikely as in the Nigerian context. Even though relative price remains relatively high above 100 percentage points, it is however lower than its index at the beginning of the period. Similarly, the high cost of production tends to limit the capability of local manufacturers to really profit from the naira's depreciation, hence lessening the net impact of changes in the relative prices on external performance.

Table 6.4: Computation of Multi-Sectoral Balance of Payment Constrained Growth Rate, 1981 to 2016

	Minerals	**Animals**	**Chemicals**	**Manuf.**	**Other Manuf.**	
Exports						
World real income,(y_i^*)	-	1.33	4.96	1.75	3.37	4.90
Relative price, ($e + p^* - p$)	-	2.71	0.90	0.77	2.66	-1.36
Imports						
Domestic real income,(y_t)	-	1.01	1.33	1.04	0.71	1.67
Relative price, ($e + p^* - p$)		-0.56	-0.15	0	0	-0.18
Manufactured export,(x_{mi})	-	-	0.07	0.22	0.24	0.26
Sector share						
Exports, (ω_{xi})	97.93%	0.05%	0.23%	0.70%	0.26%	0.80%
Imports,(ω_{mi})	5.47%	0.79%	18.60%	23.73%	5.23%	46.15%

	1981-2016	**1998-2016**	**1987-2006**
Averages			
World real GDP,(y^*)	3.61	4.17	5.53
Relative price, ($e + p^* - p$)	2.34	2.55	0.34
Manufactured export growth,(x_{mi})	5.56	7.71	-7.18
Real growth of Minerals exports, ($p_{0t}^* + x_{ot} - p_t^*$)	4.74	4.74	4.74
Domestic real income,(y_t)	3.93	5.85	4.27
y_{MBPCG}	**4.46**	**5.18**	**4.30**

(Source: Authors' computation)

6.4.4 Scenario and Policy Simulations Analysis

The chapteralso attempted to measure the implications of the equilibrium growth model given in Equation (6.19) by carrying out a scenario analysis. Long-run growth could be enhanced by first raising the export shares of the products with substantial demand in the international market (chemicals, machinery and equipment, manufactured exports and other manufactured exports sectors) and/or by lessening the reliance of manufactured exports on foreign contents in production. The simulation analysis is conducted on the basis of the entire sample period.

Therefore, using the parameters estimates and averages presented in Table 6.4 given a purposeful structural change policy effort that tends to reduce the dominance of mineral fuel exports to Minerals = 70% and raising the share of medium and high technological sectors to Chemicals=9%; Mach &Equi=9%; Manuf. =7%; Other_Manuf=7%, the *MBOPCG* rate increased from 4.46% to 7.25% without harming the *BOP* equilibrium position. This massive performance suggests that manufactured exports should be raised to about 30% and other sectors (chiefly mineral fuels) lessened to 70%. The policy scenario shows that variations in the performance of a particular sector could influence the performance of the other sectors via inter-sectoral demand externalities by lessening the balance-of-payment constraint. However, *MBOPCG* growth rate reduced from 4.46% to 4.23% when the share of low technology manufacturing (Animals) was increased to 9%. This once more reinforces the necessity to move away from low-tech to hi-tech manufacturing.

Policy efforts towards enhancing non price competitiveness (including quality, diversification) of hi-tech manufacturing are necessary. Recently, BPCG studies have extended the Kaldor–Dixon–Thirlwall model developed by Dixon &Thirlwall (1975) to show among others that research intensity significantly generates higher productivity growth (Romero & McCombie 2018; Romero 2019); when related with output growth (Romero &Britto, 2017) and research gap (Panshak, Civcir & Ozdeser, 2019a) significantly improve income elasticities and robust growth performance. Therefore, in the light of the empirical outcome and in line with recent studies, positioning the Nigerian

economy towards the production and export of superior technological products would improve long-term growth performance because the income elasticities of these products are intrinsically higher than those of low technological products. Raising the paltry *R&D* funding from 0.27 to at least meet the 1% UNESCO threshold would be decisive in facilitating the productivity of the export sectors. Another meaningful implication of the model (Equation 6.19) is that long-run growth could also be achieved by strategically and cautiously reducing the dependence of domestic production on intermediate component of imports. This outcome is line with Araujo et al. 2016 and Blecker& Ibarra (2013).

As in the above, using the same shares and averages, when the manufactured exports elasticity of imports was reduced to 5% across the imports sectors (Chemicals, Mach &Equi, Manuf. and Other_Manuf), the *MBOPCG* rate rose from 4.46% to 5.12% without impacting the *BOP* equilibrium condition. This outcome once more reveals that Nigeria has a significant opportunity to accelerate growth more than it actually did. The study asserts that the exploitation of available local content could be beneficial for growth. However, exploring how the country realizes substantial local sufficiency in intermediate and raw materials sourcing is largely a product of intense research. Therefore, Nigeria's Raw Materials Research and Development Council (RMRDC) ought to intensify efforts aimed at harnessing, utilization and shaping the vast domestic factor inputs required across the technological sectors. *RMRDC* was established in 1988 with the central objective of expanding and exploiting the country's massive industrial intermediate and raw materials resources in order to facilitate the institutionalization of innovative industries, which in turn makes new job opportunities available and contributes to the overall growth of the economy. This policy calls for significant intervention, not only by the federal government, but also the private sector to make significant investment in research and development for sustainable economic growth.

Continuing with the simulation exercise, still keeping Minerals = 70%; Chemicals=9%; Mach &Equi=9%; Manuf. =7%; Other_Manuf=7%, and reducing the elasticity of manufactured exports of imports (α_{mi}) by 5% each,

the predicted growth rate rapidly increased from 4.46% to 7.91%. Thus, a sound policy mix that tends to reduce the reliance of manufactured exports on foreign content and one that tends to increase the shares of chemicals; machinery & equipment, manufacturing; and other manufacturing sectors leads to faster growth of the Nigerian economy. It should be noted that the average share of total foreign contents in Nigeria has risen to about 60% of total imports between 1981 and 2016. In conformity with Araujo et al. **(**2016**)**, this study is not in opposition to growth policy driven by foreign contents given that it enables a country to increase its income elasticity of exported products. The major concern being advanced is that sound growth could be accelerated by substantially lessening the foreign contents used in final export production, principally if they present a sizeable elasticity with regard to exports. The study thus contends that Nigeria ought to increase the usage of available local contents in export production to reduce leakage occasioned by the extensive importation of intermediate goods.

6.5 Conclusion

Thischapter of the thesis determines long-run growth path for the Nigerian economy from 1981 to 2016 using *MBOPCG* model. Accordingly, the study uses *COMTRADE* product classification constructed by Lall (2000) to achieve the research objective. We modified the model advanced by Romero & McCombie (2016) to account for the effect of intermediate imports used the production of final imports. The econometric procedure adopted is the *ARDL* approach

In the light of the estimated coefficients, we assert that the elasticities are largely in line with research expectations. Medium and high-technology manufacturing sectors (chemicals, machinery & equipment; manufacturing; and other manufacturing) are highly elastic to variations in world real income and are comparatively higher than low technology sectors. This indicates the necessity of implementing structural transformation programmes that could assist toward achieving a sustainable external sector. This outcome is substantially instructive for the Nigerian economy as well other primary

product-based economies to structurally move away from the export of products with low demand elasticity (such as animals and fats, beverages and tobacco, mineral fuels) to the production and export of products with high income elasticity in the international market.

The empirical investigation showed that the multi-sectoral balance of payments constrained growth model is suitable to explain the actual growth experience for Nigeria. Another point to note is the more than unitary elasticity of real income in both demand equations. This fundamentally confirms the broad spectrum of findings in this area that trade depends on income more than relative prices as the coefficient of the relative price is comparatively smaller and largely insignificant in the import demand functions. We assert that the actual growth rate of Nigeria was more sluggish than that the rate permitted by the *BOP* equilibrium. This study contends that this situation is caused by several factors, which may include fluctuation in relative prices, high imports of intermediate imports, conflicts in macroeconomic policies and other domestic constraints.

Relative prices tended to fluctuate rapidly over the different time periods. Despite a sharp decline in its real effective exchange rate following a fall in commodity prices and the trade liberalization policy, relative prices largely remained over 100 index points. In 2015, for instance, the local currency depreciated against the US dollar by 9% and snowballed by 19% after October 2014; however, given that the dollar is somewhat stronger against other trading currencies, the depreciation was simply around 10% in nominal effective terms. In view of that, relative price only depreciated by 3% for the same period, leaving the local currency about 26% stronger in real effective terms than the first year following the rebasing of the Nigerian economy in 2010.This largely restricted the ability of local manufacturers to profit from the naira's net depreciation for the period, which negatively impacted on the external performance and external reserves of the country (WTO, 2017; Panshak et al., 2019b).

Additionally, the underperformance of the economy could be explained in terms of the sustained and unwavering concentration of macroeconomic

policy on inflation targeting and real exchange stability from 1987. It has been identified that Inflation Targeting (IT) policy in most developing economies is one of the most contentious monetary policies (Agu &Evoh, 2011)ever since the last phase of traditional structural adjustment policies. For the reason that realizing a low price level is related to higher interest rates, *IT* negatively affects long-run growth due to its immediate repercussions for investment activities. Therefore, the obvious conflicts in macroeconomic policy objectives in the past decade could also explain why actual growth is below the equilibrium growth rate. Similarly, other constraints such as the underdeveloped financial sector, high cost of doing business, weak institutions, corruption, hostile investment climate (discouraging domestic investment as well foreign direct investment) and sluggish human capital formation may also have contributed to the poor performance of the economy.

In conclusion, this chapter stresses the significance of inter-sector demand gains in a *MBOPCG* set up. In a typical Araujo & Lima (2007) multi-sector model, superior equilibrium growth rate is achievable via shifts in the sectoral composition of trade. In the *MBOPCG* model examined in this thesis, higher equilibrium growth rates could be realized either through change in productive structure in line with Araujo & Lima (2007) and Romero & McCombie (2016), or via a decrease in the reliance on foreign contents to create final exports. More decisively, equilibrium growth rates rapidly increase with structural change and the reduction of foreign contents in export growth.

CHAPTER 7

The Role of Technology Gap and National Innovation System in Growth

7.1 Introduction

As earlier noted, *BOPCG* essentially contends that growth is demand led and, in particular, export-led in line with export-led cumulative causation (ELCC) models. This post-Keynesian perspective specifically recognizes the role of external demand and structural change in explaining the long-run growth path of an economy.In this approach to economic growth, income elasticities of exports and imports are the crucial parameters determining the longterm growth rate.

As contended by McCombie &Tirlwall (1994), income elasticities reflect the non-price competitiveness of each country's production. Romero & McCombie (2018) however, observedthat regardless of the significance of the income elasticities of demand, their determinants are still not completely understood.From the the literature review section, whereas substantial empirical evidence exists regarding Thirlwall (1979), only few studies have examined how technological gap improves quality and income elasticity of exports within*BOPCG* framework (Cimoli & Porcile, 2014; Porcile et al., 2007). Most importantly, the above studies only considered theoretical aspects of the subject (Romero & McCombie, 2018).

In the post-Keynesian tradition as observed in the preceeding chapters, the link between the*REER* and domestic income growth has mostly been ignored. In the conventional *BOPCG* setup in particular, *REER* dynamics are treated as irrelevant determinants of long-run growth. This is either because of the

substantial empirical evidence that price sensitivities of demand for exports andimports are small or that terms of trade fail to demonstrate a logical movement of appreciation or depreciation in the long-run (Razmi, 2005, 2016). In spite of this, recent studies, especially those on the Periphery-South, accentuate the significant function of competitive and stable *REER* in influencing investment decisions, exports, and consequently easing the *BOP* constraint on growth. Razmi (2005, 2011, 2016) specifically contends that exporters from the Periphery-South cannot compete with producers from the center-North on identical level in international trade. Whereas the center-North has succeeded in properly improving the composition of its export baskets, the Periphery- South economy like Nigeria still lags behind in diversifying its export structure. This makes substitution between the export goods and foreign ones increasingly difficult. Furthermore, even if these economies produce comparable goods, differences in quality as perceived by consumers are likely to make the hypothesis of similar elasticities of substitution unacceptable

Razmi (2005, 2011, 2016) specifically contended that exporters from the Periphery-South cannot compete with producers from the Centre-North on identical level in international trade. While the Centre-North has succeeded in properly improving the composition of their export baskets; the Periphery-South economy like Nigeria still lags behind in diversifying its export structure (Panshak, et al. 2019a). This makes substitution between the export goods and foreign ones increasingly difficult. Furthermore, even if these economies produce comparable goods, differences in quality as perceived by consumers are likely to make the hypothesis of similar elasticities of substitution unacceptable.In line with the above; Spilimbergo & Vamvakidis (2003) estimated manufacturing export functions for 56 countries for a period of 26 years. The functions used included standard *REER* or two distinct *REERs* disaggregated into two parts: standard *REER* for Organization for Economic Co-operation and Development (OECD) countries and the other with respect to non-OECD countries. The result rejected the hypothesis of identical elasticities. The results of the two relative prices differ significantly. Hence, it would be inappropriate to assume that the elasticity of substitution between

the goods from the center-North and Periphery-South is the same[2]. This argument is anchored on the relative differences in trade shares and product quality. Furthermore, export and import elasticities of relative price differences may possibly be dissimilar across different time horizons.This could be attributed to likely factors, such as production bottlenecks, contractual commitments, changes in policies, informationlags, subsistence of a money illusion, and partial exchange rate pass-through in the short run

Therefore, having exhaustively examined the role of technological contents in growth; this chapter of the thesis seeks to:

i Employ a Centre North-Periphery South technology gap model which blends the Schumpeterian perspective on technological gap with the demand-led perspective on effective demand and the *BOP* as constraints to long-run growth.

ii. Demonstrate how export quality evolves in demand-led framework for a small open economy and it improves external perormance. This addition is motivated by the fact that for a correct determination of long-run growth path of an economy from the Periphery-South, the role of technological learning and upgrading in shaping exports quality as important restriction ought to be included. While in the Centre-North, the principal restriction on long term growth is foreign demand as established by traditional Thirlwall's model; this may not be the same for a country in the South as a result of severe technological gap that subjects Periphery-South exports to low quality products category.

The remainder of the chapter is structured as follows. Section 7.2 presents the model. Section 7.3 covers the role of *NIS* in shaping and enhancing quality of exports. Section 7.4 presents data and the econometric method used, the empirics regarding the structural characteristics of the variables, descriptive statistics and the determination of *BOP* equilibrium growth rates and policy recommendations are given in Section 7.5. The conclusion is given in the last part.

7.2 ModellingThirlwall's (1979) Growth Model with Technology Gap

As earlier indicated, the objective of this chapter is to incorporate evolutionary view relating technological gap and *NIS* in long-run growth determination. Accordingly, this study augments the most influential model advanced by Thirlwall (1979) with *NIS*.

The specification of the model starts by specifying two set of equations (7.1 and 7.2) as well as an identity (7.3) as follows:

$$M = A\left(\frac{P^*}{P} \times E\right)^{\varepsilon_{mp}} Y^{\varepsilon_{my}} \qquad \textit{Import demand function} \qquad (7.1)$$

$$X = B\left(\frac{P}{P^*E}\right)^{\varepsilon_{xp}} Y^{*\varepsilon_{x\dot{y}^*}} \Omega^{\varepsilon_{xq}} \qquad \textit{Export demand function} \qquad (7.2)$$

Where, *M* is real imports, *P* is the national price level in the South (de-nominated in Southern currency), *P** is the foreign price level, *E* is the nominal exchange rate (units of national currency to US dollars), *Y* is domestic real income, *X* is real exports, *Y** represents real world income. This study calibrated the initial model by the incorporation of the role of national innovation system in shaping and enhancing quality of exports. Therefore, Ω is exports quality and sophistication indicator. As expected, increase in price elasticities of exports ($\varepsilon_{xp} > 0$) and imports, signify appreciation of the domestic currency; hence a loss of competitiveness. Similarly, income elasticities are positive:$\varepsilon_{x\dot{y}^*} > 0$represents the income elasticity of export demand; $\varepsilon_{my} > 0$ represents the domestic income elasticity of imports.ε_{xq}> 0 is a positive parameter representing the quality and sophistication sensitivity of exports. *A* and *B* are positive constants. Here, Nigeria which is an economy from the Periphery-South is small open and thus its growth is insignificant in affecting the rate of growth of its major trading partners assumed to be from the Centre-North.

Attaining *BOP* equilibrium in terms of domestic currency requires that the export equation is equated with the import equation:

$$EP \times M = XP \qquad \textit{Trade balance identity} \qquad (7.3)$$

When Equations (7.1) and (7.2) are substituted into (7.3) it produces:

$$EP \times A\left(\frac{P^*E}{P}\right)^{\varepsilon_{mp}} Y^{\varepsilon_{my}} = PB\left(\frac{P}{P^*E}\right)^{\varepsilon_{xp}} Y^{*\varepsilon_{xy^*}} \dot{\Omega}^{\varepsilon_{xq}} \quad (7.4)$$

After differentiating Equation (7.4) with respect to time and expressing in log linear form, and solving algebraically produces an all-encompassing specification as:

$$\dot{y}_{B1} = \frac{1}{\varepsilon_{my}}\left[\left(\varepsilon_{xp} + \varepsilon_{mp} + 1\right)\left(\dot{p} - \dot{p}* - \dot{e}\right) + \varepsilon_{xy^*}\dot{y}* + \varepsilon_{xq}\dot{\Omega}\right] \quad (7.5)$$

Equation (7.5) reveals that the domestic income growth rate compatible with BOP equilibrium is determined by foreign income growth rate, the Centre-North, the *REER* growth rate, as well as the growth rate of quality index of export. The above equation corresponds to the original version of Thirlwall's *BOPCG* model with the incorporation of a novel determinant—the quality of exports.

Assumptions

In order to efficiently apply the model (i.e. Equation 7.5); the below assumptions are required:

i. The model assumes that there are only two countries in the world economy: center-North and Periphery-South: They produce a single product that is traded without trade barriers with positive elasticity of substitution.
ii. The Periphery-South is a small open economy whose production cannot affect major economic indices in the international market.
iii. The model is exclusively *BOP* constrained and, for that reason, it is the demand-side factors that deter- mine the growth of domestic income
iv. National innovation system is the most important driver of the technological learning process in the Periphery-South: It performs a critical function in the setup because it determines how export quality of products evolves over time.
v. The central problem that Periphery-South is con- fronted with is how to hasten learning process and trim down the comparative technology gap to advance the quality of the products it

manufactures and enlarge the domestic and foreign markets (through improving its export structure and raising non-price competitiveness

The fundamental question that remains is: *How does export quality evolve in demand-led framework?*

7.3 Evolution of Export Quality: The Role of National Innovation System (NIS)

It becomes relevant to elucidate the endogenous evolution of export quality constraint. Central to this process is the fundamental hypothesis that technology lag or gap subsists which severely challenges the comparative capability of the Periphery-South to enhance the quality of the products it manufactures. Therefore, the rate of change of export quality indicator (Ω) linearly depends on the inverse of the Centre-North and Periphery-South technology gap, given as $TG = (T_{PS}/T_{CN})$, where (T_{PS}/T_{CN}) symbolizes the extent of technological advancement of the Periphery-South (Centre-North). Here, an element of increasing returns is introduced in the set up which shows that the degree to which a country produces export products of superior quality is a function of its technological strength and capacity it has already established(Porcile, et al. 2007). Therefore, government policy of investment in *R&D* is important, especially in Periphery-South.

This critical hypothesis (technological gap) finds its basis and authority from both the empirical and theoretical narratives on the factors that determine technological change as well as specialization. Cimoli & Dosi (1994) content that the evolution of quality of exports follows a cumulative process in which the chances of discovering an innovation, imitate and adapt leading technological firm (Centre-North) increases as soon as the firm (for instance from the Periphery-South) approaches the technological frontier and when considerable externalities (at the industry and country levels) are already in place. This is analogous to Schumpeterian competition given that it accentuates the importance of increasing returns as well as virtuous circles of learning, competitiveness and domestic income growth. Specifically, Arthur

(1994) maintains that this increasing return is higher for the component of the economy that is knowledge-based. The author gave three reasons for this: (i) the knowledge-based component is gained from learning by doing and learning by making use of it (ii) the knowledge-based component utilizes experience earned from the use of a specific technology to master associated technologies and to create novel products and processes, and lastly (iii) the knowledge-based component creates dynamic and high technology complementarities that encourages other innovators, imitators and adaptors.

The above explanation is essentially facilitated by the technological path pursued or established by different countries toward improving quality of its products as well as productive structure. Key to this is the concept of *NIS.* Albuquerque (1999) views the concept of *NIS* as an institutional framework that propels technological progress, which enables the flow of systematic and technological information and knowledge essential for the innovation evolution to occur.

According to evolutionary theory, *NIS* is indispensable for the spread and diffusion of novel knowledge and innovation all over the economy. In addition, it requires the existence of dynamic connections linking diverse participants, including business firms/companies, financial organizations, research/education institutions, public sector funding, liaison organizations, as well as horizontal associates within institutions (Freeman, 1995). The author further contends that there is a relationship connecting the structure of production and income sensitivities of trade flows, which can be explained by the complexity of the production chain in the country. Thus, even countries that have made some progress in industrialization continue to suffer from external constraint on growth when *NIS* is not in place.

Romero, Silveira& Jayme (2011) explain that the existence of external crisis on the current accounts of Southern economies is because of their substantial technological backwardness, which mainly stems from the lower stage of development and diffusion of its technological dynamic hub. The basic idea is that new knowledge originating from the technological dynamic hub enhances the trade competitiveness of the structure of production, which makes the

export sector to gain from the development of high-quality manufactured goods with superior income sensitivity. This is to say that the achievement of a country in international market depends on product innovation, specifically, producing high-quality products for which world demand will rapidly grow. Therefore, it may be unlikely that simply lowering prices of available goods by compressing costs and real wages will be a sustainable policy in the long run.

Gabriel et al. (2016) recently caution developing countries that economic growth and the prospects for them to catch up with the developed countries is connected to the historical narrative of economic development and the superiority of their *NIS*. In this sense, economies that have constructed better capability for learning and absorbing spillovers have a greater privilege or chance of catching up. If not, they would continue to remain in a low-growth corner.

Romero et al. (2011) and Resende & Torres (2008) observe that the value of a country's exports depends on four distinct features of the markets for exported goods: themarket structure, the dynamism of the exported product market, the degree of protection, and, finally, the diversification of the productive base of the economy. The last feature is linked to the advancement of *NIS*, given that the system influences the extent of technological complexity of manufactured national output, with substantial consequences on its exports through the convergence process. The innovation system is critical to Southern economies to realize technological standard as observed in the Northern economies. Thus, the more efficient the *NIS*, the higher the likelihood of evolution toward the technological frontier of diverse production sectors of the economy. In a somewhat different perspective, Gabriel et al. (2016) employ the framework developed by Bresser-Pereira, Marconi & Oreiro (2015) to show that an advanced *NIS* may possibly affect the "industrial equilibrium" *REER*. Hence, a country with a strong *NIS* could potentially be more competitive in international trade.

Apparently, the advancement of the *NIS* permits for better technological sophistication in the productive structure, which is mirrored in the dynamism of trade income sensitivities: superior income sensitivity of export demand and

lesser income sensitivity of demand for imports. This ultimately assists in the loosening of the external restriction and higher long-term growth of domestic income. In recognition of the role of *NIS* in the Nigerian context, different regimes since 1960 have revealed interest in development of *NIS* in national socioeconomic advancement. The comprehension of this reality stimulated the reestablishment of the Federal Ministry of Science and Technology (FMST) as a distinct body in 1985. Since then, there has been considerable resource allocation to the institution for R&D, though grossly below the 1% of *GDP* minimum international benchmark prescribed by *UNESCO*. As a synopsis, the nonprice competitiveness of a firm or the aggregate economy depends on the relative technological levels, and that firms or countries nearer to the technological frontier ascend the quality hierarchy and ranking more rapidly relative to the ones that are far off. This exerts substantial consequences on international trade performance. The technological gap could be formally expressed as.

$$\dot{\Omega} = \Lambda TG = \left[\frac{T_{PS}}{T_{CN}}\right] \qquad (7.6)$$

Where $0<\Lambda \leq 1$; it should be realized that the existence of technology gap influences the level of productivity in both center-North and Periphery-South. The flow of quality upgrading that permits a country to realize a superior rate of growth of exports is connected to the distance of that country with respect to the technological frontier (Porcile et al., 2007)..

Substituting Equation (7.6) into Equation (7.5) while assuming that *REER* is insignificant in the growth process and $\Lambda = 1$ (to make the model uncomplicated); the model reduces to:

$$\dot{y}_{B2} = \frac{1}{\varepsilon_{my}}\left[\varepsilon_{xy^*}\dot{y}^* + \varepsilon_{xq}\dot{\Omega}\right] = \frac{1}{\varepsilon_{my}}\left[\varepsilon_{xy^*}\dot{y}^* + \varepsilon_{xq}TG\right] \qquad (7.7)$$

Equation (7.7) indicates that domestic income growth compatible with *BOP* equilibrium rises with world income growth (of the center-North) and the technology gap (TG, the income sensitivity to the demand for exports ($\varepsilon_{xy^*} >$

0), and the quality sensitivity of the demand for exports ($\varepsilon_{xq} > 0$).On the contrary, domestic income growth reduces with an increase in the income sensitivity of the demand for import ($\varepsilon_{my} > 0$).

Hausmann, Pritchett & Rodrik (2005) note that a superior quality of exports tends to promote long-term growth anchored on spillover of knowledge/information, which leads to ever-increasing returns in the manufactured and service sectors of the economy. This means that for viable spillover knowledge from the center-North to Periphery-South, the existence of a sound institution such as the national science technology innovation system ought to be in place. Similarly, Lall, Weiss&Zhang (2005) construct an indicator of export sophistication based on the average income levels of exporting entities, alongside other conventional measures such as *R&D* expenditure, to show that the modern sectors of an economy positively respond to export quality and sophistication index. Note that these empirical evidences (Hausmann et al., 2005) are not in *BOPCG* framework, hence, the necessity of the present essay.

Furthermore, when export quality and sophistication is not taken into consideration, the equilibrium growth rate reduces to Thirlwall's original model:

$$\dot{y}_{B3} = \frac{\dot{x}}{\varepsilon_{my}} \tag{7.8}$$

Or,

$$\dot{y}_{B4} = \frac{1}{\varepsilon_{my}}\left[\varepsilon_{xy^*}\dot{y}*\right] \tag{7.9}$$

As earleir shown, making use of the estimates of the long-run income elasticity of import ε_{my}; Thirlwall (1979) demonstrated that Equation (7.8) as well as (7.9) roughly approximates the growth experience of most advanced countries.

7.4 Data Description and Econometric Methodology

The description and sources of data used in this chapter is obtainable from the Appendix A7.1.

Once more, ΔY_t is modelled as a conditional ECM:

$$\Delta Y_t = \sum_{j=1}^{n} a_j \Delta Y_{t-j} + \sum_{j=1}^{k} \sum_{j=0}^{n} b_{i,j} \Delta Z_{i,t-j} + \sigma Y_{t-1} + \sum_{i-1}^{k} d_i Z_{i,t-1} + dum \qquad (7.10)$$

Where Δ represents the first difference of the series, and σ captures the speed of adjustment of the variable toward the long-run equilibrium. *Y* represents the dependent variable. Set of *Z* variables comprises three potential determinants: growth rate of world real income, *REER* and growth rate of export quality index. The study determines the appropriate lag structure of the equation based on the *AIC* criteria. Similarly, the study also proceeds to conduct diagnostic tests such as the Breusch-Godfrey test for serial correlation, the Breusch-Pagan-Godfrey test for heteroskedasticity, the *ARCH*test, normality test, Ramsey Regression Specification Error Test (RESET), Cumulative Sum of the recursive residuals (CUSUM) and Cumulative Sum of Squares (CUSUMSQ). As in the preceding two chapters, the study, after establishing the adequacy of the models, employs*F-t-stat* ascertain the existence or otherwise of long-run relationship between the variables.

7.5 Empirical Examination

7.5.1 *Unit Root Test*

Prior to the estimation of the model, unit root test ought to be carried out to ascertain the order of integration of the variables. Nevertheless, for a scope of study as in the present one, it is extremely probable that there could be a structural break in the variables. It is important to appreciate the underlying statistical properties of the variables included in the estimation. Accordingly, the study carries out structural break unit root test to ascertain the stationarity of the variables. The analysis is conducted on basis of the three models (Equations 5.8 to 5.10) specified in Chapter 5.

The break points of the demand functions were determined using multiple breakpoints of global versus none. The export equation is estimated with dum2002 as fixed regressor; while the imports function with dum1987 and dum2007. These break points are necessary to take into account the effect of Trade liberalization policy of 1986, outlier in real *GDP* growth in the 2002 which is adjudged to be propelled by oil price increases and the global financial crisis of 2007/08.

The results of the log levels of the variables from Table 7.1 show that only real exchange rate and real exports are stationary at levels under *ADF* and Zivot-Andrew unit root test techniques. Therefore, in line with the econometric understnading that the first difference of non stationary series is often stationary, I assert that that the series are essentially a mixture of *I*(0) and *I(1).* A substantive description, explanation and sources of the series are clearly presented in Appendix A7.2.

Table 7.1:Unit root test

Mean	ADF	PP	Zivot-Andrew
Log of real domestic income,(y)	0.701	-1.473	-4.40
Log of of real world income,(y^*)	0.436	0.826	-3.160
Log of real exchange rate, $(p^* - p - e)$	-2.969**	-2.604	-3.151
Log of real exports,(x)	-1.533	-1.6315	-12.850$\dagger\dagger\dagger$
Log of real imports, (m)	0.8140	0.2314	-3.883
Log of export quality indicator, (Ω)	-2.499	-2.604	-3.554

(Source: Author's computation)

The critical values of ADF and PP at 0.01, 0.05, and 0.10are approximately -3.62, 2.96 and -2.62 respectively. Therefore, ***/**/* signifies significance at 0.01, 0.05, and 0.10 respectively.

$(\dagger)$The critical values of ZAU with intercept at 0.01, 0.05, and 0.10 are:-5.34, -4.936and -4.58 respectively. Therefore,$\dagger\dagger\dagger/\dagger\dagger./\dagger$indicates their significance at respective critical point

7.5.2 *Descriptive Statistics*

In order to fully understand the dynamics of the overall economy, a descriptive statistics is conducted and presented in Table 7.2. By observing the historical tendency of the growth performance of the economy, average growth of the economy is about 4.77% with maximum and minimum values at 21.18% and –10.75%, respectively. The minimum growth rate could arguably be regarded as the initial effect of the *SAP.* 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 as well as phenomenal rise in oil prices that tends to have significant consequences on the growth.

Considering the value of standard deviation that 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 growth rate of world real income and *REER*[29].

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

Table 7.2: Descriptive statistics

	GDP	Export	Import	REER	Export quality index	World real income
Mean	4.77	5.39	2.82	2.785	0.531	2.723
Median	5.32	3.010	3.68	-3.818	2.156	2.839
Maximum	21.18	60.21	85.51	145.90	20.09	5.683
Minimum	-10.75	-30.70	-37.14	-54.66	-17.88	-2.163
Std. Dev.	6.38	21.91	30.47	32.65	6.673	1.538
Skewness	0.16	0.588	0.679	2.573	-0.158	-1.064
Kurtosis	4.36	3.09	2.924	11.88	4.545	4.711
Jarque-Bera	3.04	2.146	2.854	162.51	3.838	11.50
Probability	0.21	0.341	0.239	0.000	0.146	0.003
Sum	176.73	199.7	104.4	103.0	19.66	100.7
Sum Sq. Dev.	1466.0	17293	33430	38399	1603.	85.25
Observations	37	37	37	37	37	37

(Source: Authors' computation)

Regarding export quality index, it could also be said that the variable is normally distributed with the rate of change of about 20.09% corresponding to 1989. Perhaps, the reestablishment of the ministry of national science, technology and innovation system of 1985 substantially contributes in the improvement of the index. The growth of *REER* averaged 2.785111 over the sample period. The country has passed through different foreign exchange rate policy regimes. After achieving the highest growth of about 60.21% a year before the global financial crisis, the export sector suffered the most loss in 2009 with a growth rate of about −30.7018430%. This slow growth is attributed to the fall of commodity prices in the international market as well the unbalanced productive structure of the economy. With fall in government revenue and deteriorating exchange rate, the stability and fiscal sustainability of the Nigerian economy over the medium and long terms seem depressing.

7.5.3 *Econometric Evidence, Interpretation and Discussion*

The basic research question of this part of the study can be clearly stated as follows: To what extent does the incorporation of evolutionary determinant of growth in *BOPCG* model explain Nigeria's economic growth process? And in achieving this objective, Equations (7.1) and (7.2) are estimated to determine the elasticity coefficients essential for the computation of the growth rate of domestic income consistent with *BOP*, as specified inEquations (7.5) and (7.7).

From a cursory examination of the overall results from Table 7.3, it can be asserted that the parameter estimates are obviously in conformity with the underlying theoretical postulations as they demonstrate their expected signs and significance. Starting with the export demand equation, it is shown that the export growth is highly elastic and statistically significant to changes in the growth of world real income (ε_{xy^*}=*2.645332*) at 0.01 level. The study also confirms that *REER* is an important policy variable in the Nigerian economy. The estimated result shows that *REER* (ε_{xp}= -0.130348) is significant at 0.10 level. In order to be consistent with previous chapters, increase in *REER* (depreciation of the domestic) tends to increase exports performance for the Nigerian economy.

An important aspect of the present study has to do with ascertaining the role of *NIS* in facilitating the evolution ofquality content of exports as well as how it contributes to improving productive structure. The study found that the export growth is highly elastic to variations in export quality index. at .05 level of significance. Given that export quality is an important driver of export performance; investment in *R&D* activities would encourage the scientific community to develop novel ideas, methods, and technologies to further sustain exports growth

Table 7.3: Estimated elasticities of export demand function, 1981 to 2017

Variables	***Coefficient***	***Standard error***	***t-stat***	***Prob***
World real income,	(ε_{xy^*})2.645332	0.749401	3.529	0.0010
REER	(ε_{xp})-0.130348	0.071755	-1.816	0.080
Export quality,	(ε_{xq}) 1.894623	0.863079	2.195	0.037
Diagnostics				
Normality		4.61(0.09)		
Breusch-Godfrey Serial Correlation test		0.37(0.25)		
Breusch-Pagan-Godfrey Heteroskedasticity test		0.97(0.96)		
ARCH test		0.86(0.86)		
Ramsey RESET		0.40(0.52)		
Cointegration test				
F-stat		-20.07***		
t-stat		-8.85***		

(Source: Author's computation)

Note. ARCH = Autoregressive Conditional Heteroskedasticity; RESET = Ramsey Regression Specification Error Test.

An important aspect of the present study has to do with ascertaining the role of *NIS* in facilitating the evolution of quality content of exports as well as how it contributes to improving productive structure. The study found that the export growth is highly elastic to variations in export quality index $(\varepsilon_{xq}$*=1.894623*)[30]at 0.05 level of significance. Given that export quality is an important driver of export performance; investment in *R& D* activities would encourage scientific

[30]One could contend in line with a pure BOPCG set up that world real income growth itself contributes to export quality variable and that the results above mirrors this channel. However, if this is the fact, then, in a regression of the form*:* $\dot{x} = constant + \varepsilon_{xp}(\dot{p} * - \dot{e} - \dot{p}) + \varepsilon_{xq}TG$; the estimated value of export quality should decline and turn insignificant since the effect of export quality that emanates from world real income growth would be absent. But carrying out a regression as in the above; still leaves ε_{xq} significant at 0.01. This strongly indicates that other factors are possibly at work. This gives more credibility to the role of national innovation system contributing to export growth performance.

community to develop novel ideas, methods and technologies in order to further sustain exports growth[31].

The findings show that there is a long-run relationship between the variables, given that the *F-stat* falls outside the upper critical bounds at .01 level of significance. This is similarly confirmed by t test at the same level of significance. Note that Thirlwall's initial model requires the computation of the aggregate income elasticity of demand for imports. Here, *ARDL* model with structural break for the estimation is employed to obtain robust estimates as follows:

$$m = \varepsilon_{my}\mathrm{y} + \varepsilon_{my}(p^* + p - e) + Dum + v \qquad (7.14)$$

Real imports (m) depends on real domestic income (y) and *REER* $(p^* + p - e)$.The long-run income and price elasticities of demand for imports are obtained as ε_{my}*=1.812045* and *−0.164582* respectively. The estimated coefficients are in conformity with their corresponding values in the export demand function. In particular, the outcome on *REER* is in line with some recent demand-side literatures (Razmi, 2011; Soukiazis et al., 2013, 2014) that relative prices are essential constraints in long-run growth process. Therefore, given a sound foreign exchange rate policy, Periphery-South *REER* may possibly adjust to appropriately clear or satisfy the restriction on the current account. Another point to note is the more than unitary elasticity of real income in both demand equations. This fundamentally confirms the broad spectrum of findings in this area that trade depends on income comparative with relative prices as the coefficient of the *REER* is comparatively smaller. The Breusch–Godfrey Serial Correlation test of autocorrelation shows that there is no problem of serial correlation in the equation residuals. Similarly,

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The study compares the estimated result obtained using ARDL with Fully modified ordinary least squares (FMOLS) method and found that the coefficients are close in terms of significance and magnitude. From the export demand function, the estimated elasticity of real world income, *REER* as well as export quality indictor as *2.275759, -0.163678* and *0.395198* respectively. Similarly, the variables are all significant at 0.01 level except export quality indicator which is significant 0.05 level. Augmented Dickey-Fuller test of cointegration confirms that there is long-run relationship between the variables. Similarly, the normality test result corroborates the outcome of the ARDL that the series are normally distributed.

Breusch–Pagan–Godfrey Heteroskedasticity test as well as the *ARCH* test confirm that variance is homoskedastic in the long run. Finally, the normality hypothesis of residuals also confirms that the residuals are distributed normally. Similarly, Ramsey RESET is implemented to further illuminate our analysis. The outcome of the test in Table 7.3 shows that there is no specification error in the model as the coefficient on the power of fitted dependent variable is greater than all the levels of significance (.10, .05, and .01). Therefore, it is concluded that the estimated equation does not suffer specification error. This is further supported by the residual stability tests; *CUSUM* and *CUSUMSQ*, in Figure 7.1 and Figure 7.2. The decision regarding these tests is that when the statistics fall within a .05 level of significance represented by two direct lines whose functional form is specified in Brown, Durbin, and Evans (1975), it is concluded that the estimated elasticity coefficients of the variables are stable over time. Given that the statistics of the two tests are inside the .05 level of significance, it is concluded that the estimated model is stable.

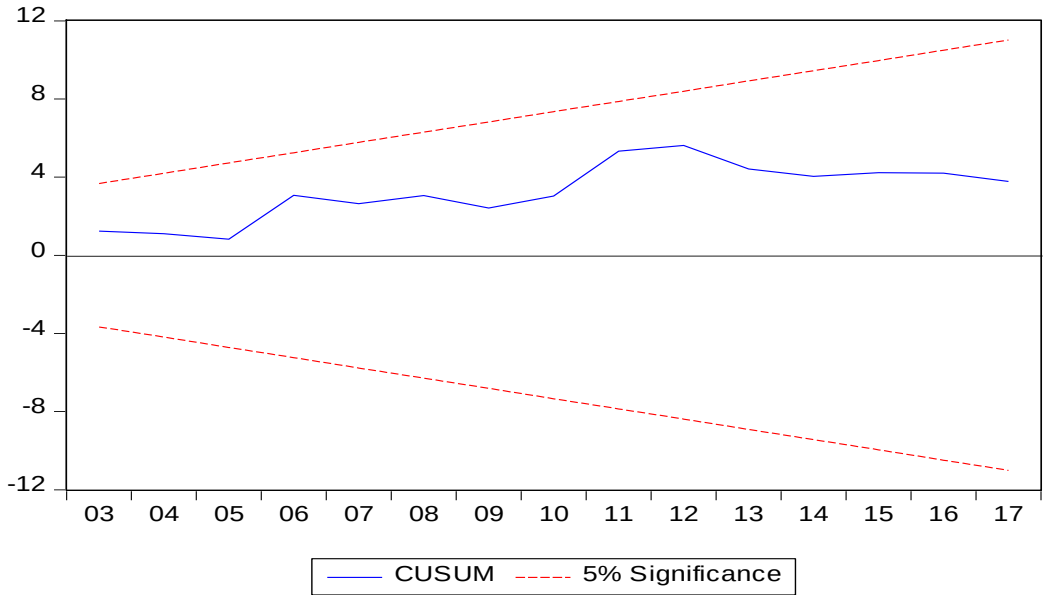

Figure 7.1: CUSUM Plot

(Source: Obtained on the basis of the underlyingdata)

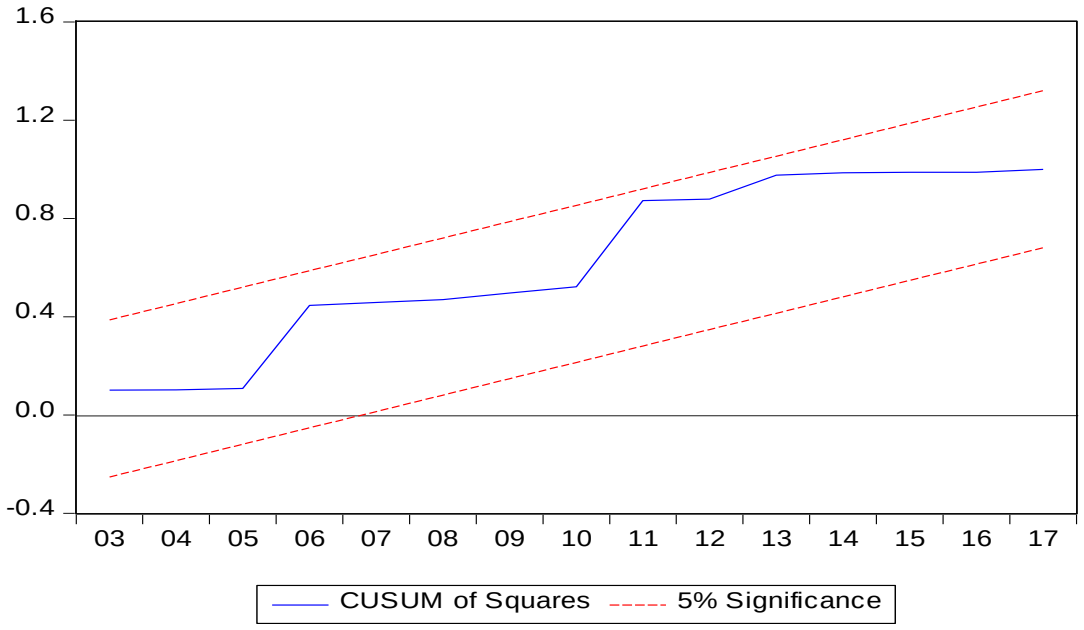

Figure 7.2: CUSUMSQ Plot

(Source: Obtained on the basis of the underlying data)

Given that thestatistics of the two tests are inside the 0.05 level of significance, it is concluded that the estimated model is stable.

7.5.4 *Computation of Balance of Payment Constrained Growth Rate*

Having obtained the required growth rates and elasticities (Table 7.3), it is then possible to calculate the growth rate compatible with the BOP equilibrium and it put side by side with the actual growth rate over the period 1981 to 2017. The long-run averages in Table 7.4 are taken from the descriptive statistics in Table 7.2.

Table 7.4*:* Computation of Balance of Payment Constrained Growth Rate, 1981 to 2017

Equations (7.5) and (7.7)		$\dot{y}_B - \dot{y}$
$\dot{y}_{B1} = \frac{(1+\varepsilon_{xp}+\varepsilon_{mp})(\dot{p}-\dot{p}*-\dot{e})+\varepsilon_{xy^*}(\dot{y}*)+\varepsilon_{xq}TG}{\varepsilon_{my}}$	5.55%	0.78
$\dot{y}_{B2} = \frac{\varepsilon_{xy^*}(\dot{y}*)+\varepsilon_{xq}TG}{\varepsilon_{my}}$	4.07%	−0.70
Required averages		
Real growth of domestic income, $\dot{y}$	4.77	
Real growth of world income, $\dot{y}*$	2.72	
Average growth of real exchange rate, $\dot{p} - \dot{p}* - \dot{e}$	2.78	
Technology gap, TG	0 .10	

(Source: Author's computation)

Note that income (ε_{my}) and price (ε_{mp}*);* elasticity of demand for imports are *1.812045* and *-0.164585* respectively. T_{PS}*= 0.28%* GDP and T_{CN} *=2.7%* GDP (we use US R&D to represents the technological advancement in the Centre-North)[32]

This chapter estimates two main equilibrium rates of growth.From Equation (7.5) the BOP equilibrium growth rate obtained as $\dot{y}_{B1}$*= 5.55%* is higher than the actual growth rate*ẏ =4.77%)* for the time frame examined. Therefore, one may assert that Nigeria grows at a rate that is*0.78%* relatively lower per annum than that permitted by the balance of payment equilibrium condition. When Thirlwall's model as specified by Equation (7.7) is estimated; *BOP* growth turns out to be lower *($\dot{y}_{B2}$= 4.07%)* than the actual growth of domestic income (*ẏ=4.77*%). Therefore, without considering other factors, one may assert that Nigeria grows at a rate that is *-0.70%* relatively higher per annum than is permitted by the balance of payment equilibrium condition per

[32] The further a country's position from technological frontier, the higher the opportunity spillover of knowledge. In the Nigerian context, the technological gap is calculated as 0.10, which is far from 1; hence enormous capacity to learn and adapt foreign technology in production

se.Therefore, relying on the estimate of Equation (7.5) which incorporates all relevant determinants, it is asserted that Nigeria grows slower than the rate permitted by *BOP* equilibrium. In line with the intuitive prediction of the *BOPCG* model, Nigeria has enormous capacity to accelerate growth than it actually experienced. It is evident that growth of domestic income could be biased downward when *REER* and the role of *NIS* in enhancing export quality are disregarded in *BOPC* growth model. To grow at a sustainable rate, Nigeria ought to grow at equilibrium growth rate of $\dot{y}_{B1}$ = 5.55% if the NIS is fully exploited and when *REER* is set at a competitive level

7.6 Conclusion

The present chapter reevaluates the *BOPCG* framework by the use of a model that parsimoniously blends post-Keynesians and evolutionary perspectives and produces results close to the original model. The chapteras in the two preceding essays uses *ARDL* to basically take into consideration the heterogeneous nature of order of integration of the variables, which spans 1981 to 2017.

The coefficients of the variables are in conformity with a priori expectation in terms of signs, magnitude, and significance. It clearly reveals that when relative prices and the export quality index are not included in the estimation, domestic income growth rate may be biased downward. Although the empirical investigations in the previous empirical chapters indicate that the various versions of Thirlwall's model (*SCA-BOPCG* and *MBOPCG* models) are appropriate in determining growth path for Nigeria, a plausible hypothesis is, however, one that need not only be correct mainly because of demand-side factors only. Evolutionary microeconomic factors relating to technological gapand institutions (*NIS*) in shaping quality of export products are also important for a developing country.

The study therefore recommends, among other things, some structural changes that have the capacity of increasing the growth rate of domestic income without hampering the *BOPs* position of the economy. Therefore,

aside: (a) raising the share of exports; (b) cautious reduction of various components of imports, especially final consumption; (c) changing or improving the income sensitivity of exports; and (d) investment in *R&D* activities; when technical know-how changes, individuals can create more with either the equivalent quantity or lesser inputs, thus raising productivity. When productivity increases, domestic income follows suit.

Other essential recommendations may include investment in human capital, investing in infrastructure, and public–private partnership toward creating conducive environment for research and innovation. This would assist in improving the country's ranking in Global Competitiveness from the current 125th out of 137 to a more superior and competitive level. This would also encourage the inflow of foreign direct investment (FDI) and, given that *FDI* is often characterized with substantial hi-tech technology, the opportunity of learning and adapting foreign technology would increase.

GENERAL CONCLUSION AND FUTURE RESEARCH OPPORTUNITY

The view that balance of payment imposes a binding restriction on longrun growth of domestic income has been a major area of much analysis by demand-side-led growth theorists, particularly ever since the emergence of Thirlwall (1979). Accordingly, this thesis follows this perspective to explain Nigeria's growth experience from 1981 to 2017. The study started by the presentation of an overall background of the thesis focus, problem and motivations in Chapter 1. Subsequently, an overview of the Nigerian economy as well as the review of related literature and theoretical development on BOPCG theory is given in Chapters 2 and 3 respectively.

The first empirical essay in Chapter 4 examined whether Nigeria's growth is constrained by internal and external factors. It was found that the most binding constraint on manufactured exports is the growth of intermediate goods. This outcome supports my finding on the significance of the growth of imported capital goods in the domestic investment function.

The secondempirical essay in Chater 5 decomposed the Nigerian economy based on oil and non-oil sectors to investigate the implication of intermediate goods on growth performance.The empirical outcome revealed that massive reliance of manufactured exports on foreign contents could have negative effect on long-run growth.

Further disaggregation of the tradable sectors based on Lall (2000) technological classification was carried out in Chapter 6 with a view of identifying sectors with substantial income elasticities of demand. Accordingly, the thesis modified Romero & McCombie (2016) not only to reflect technological contents but also to demonstrate the effects of intermediate goods in growth process. The result of the chapter showed that long run growth of domestic income is highly connected to sectoral differences in elasticities of income, and depends on the technological content embedded in tradable goods produced in the economy. In line with preceding chapters, the chapter revealed that over reliance of manufactured exports on foreign contents could be harmful for growth in the long-run.

Chapter 7 examined the role technology gap andnational innovation system in shaping export quality and enhancing robust long-run growth performance. The chapter argued that the diffusion and absorption of technical progress are subject to different economic structures particular for Centre-North and Periphery-South economies. An economy that that exports a final good with high income sensitivity of demand tends to have superior technological progress and thus exhibit more rapid growth, in broad, relative to an economy that exports a final good with small income sensitivity of demand. Theoutcome of the chapter contributes to the understanding that technological gap have important implication for growth in a balance of payments-constrained growth model. More specifically, it showed that national innovation system enhances the growth exports quality and sustainable growth thereby improving the non-price competitiveness of domestic goods.

In terms equilibrium growth computation, I assert that all the variants of the BOP-constrained growth models are suitable for explaining actual growth of domestic income for Nigeria. On the average, it is revealed that that the actual rate of economy grew sluggishly than that permitted by the *BOP* equilibrium. Therefore, it would be appropriate to affirm that the *BOPCG* growth rates closely fit the actual average growth of domestic income.

The Implication for Future Research

It should be noted that we have not explicitly controlled for trade barriers such as tariffs in any of the estimates in this thesis. It would be appropriate to also examine whether the *REER* was not a good measure of relative prices of traded goods during the pre-liberalization period, when such barriers were high. This is intuitive if we think that the composition of final demand may become more responsive to changes in the relative price of local versus foreign goods, following controls on the free global flow of goods are removed in 1986 with implementation of *SAP.*

In addition, future research should focus on further examining the implication research intensity on productivity. This would be decisive in understandingthe Verdoorn-Kaldorian cumulative idea on growth.

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Appendix A2.1: Import Structure Based on Level of Production

	Raw material and intermediate goods[1]
SITC Rev. as reported 2	**Crude material products**
	Chemicalsical and Chemicalsical products
SITC Rev1. 512	Organic Chemicals
SITC Rev1. 513	Inorganic Chemicalsical elements, oxides, halogen salts
SITC Rev1. 514	Other inorganic Chemicals
SITC Rev1. 515	Radioactive and associated materials
SITC Rev1. 561	Fertilizers
	Beverages and others
SITC Rev1. 0015	Miles and hinnies
SITC Rev1. 0460	Flour of wheat of meslin
SITC Rev1. 0488	Preparations of cereals, flour and starch
	Components and Parts
SITC Rev1. 71492	Parts of office machinery, NES
SITC Rev1. 7199	Parts and accessories of machinery, NES
SITC Rev1. 7317	Parts of railway locomotives and rolling stock
SITC Rev1. 7328	Bodies and parts of motor vehicles ex. motor cycles
SITC Rev1. 7333	Trailers and other vehicles not motorised, and parts
SITC Rev1. 73312	Parts of vehicles of heading 733 11 and 733 4
SITC Rev1. 7349	Parts of aircraft, balloons, airship
SITC Rev1. 73281	Bodies for motor vehicles not motor cycles

	Capital goods
SITC as reported 7	Machinery and equipment

	Final goods
SITC as reported	Including beverages and tobacco (1); mineral fuels (3); animals and vegetables, fats and oils (4); Chemicals (5); manufactured items classified chiefly by material (6) Miscellaneous manufactured articles (8), Commodities not classified according to SITC (9)

(Source: COMTRADE, 2018)

We largely follow Yates (2001) in using SITC 7 as capital imports. The categorization of the various imports sectors is in line with complete

correlations of HS- SITC BEC 2017 tables. However, we restricted our analysis to components for which data is available. We minus various items regarded as intermediate imports from the total Chemicalsical (5). Similarly, we subtracted components and parts from machinery and equipment (7) and added to raw and intermediate imports. However, beverages and others were not deducted from the final component because of their insignificant content in their total (about 0.015 only).

Even though the Nigerian trade data starts from 1963, there are some years that data are unavailable. Therefore, we interpolated for such periods (1982, 1988 1990, 1992-1995, 2004-2005). This is a typical problem confronting developing countries. However, in order to ascertain whether our extraction of the various SITC categories closely approximates those given by World Integrated Trade Solution (WITS) of the World Bank WITS, we estimated WITS import shares and compare them with ours. The result of the exercise shows that the shares of our intermediate plus capital is approximately 55.20%; while the share of final goods import is about 44.8%. These shares are close to WITS data 58.26% and 41.74% respectively, for same period (1996 to 2014).

Similarly, Englama, Oputa, Sanni, Yakub, Adesanya, and Sani (2013) disaggregated Nigeria's import function into intermediate plus capital goods and final imports from 1970 to 2013 to show that intermediate and capital imports has been dominant over the years. They computed the imports shares for 1970 to 1980* 1981 to 1990* and 1991 to 2000* using their respective averages. The overall share of the import categories from 1981 to 2011 shows that intermediate and capital imports is approximately 56.45% and 43.14% for the respective periods.

Closely related to our data extraction process, is Rodrik (2016), who recently used backward process of extrapolation to address unavailable data for China's manufacturing share.

Appendix A4.1: Explanation of the Series and Sources of Data used

$\dot{x}_{mt}$— Annual average growth of real manufactured exports. The World Bank defines manufactured export to comprise commodities in SITC sections 5 (Chemicals), 6 (basic manufactures, chiefly by materials), 7 (machinery and transport equipment), and 8 (miscellaneous manufactured goods), not including group 68 (non-ferrous metals). The data is retrieved from the COMTRADE extracted on 20th September, 2018.

$\dot{m}_t$—Growth of intermediate capital goods imports (annual % growth) is calculated be summing raw materials, intermediate imports and capital goods for which data is available. The data is retrieved from the UNcomtrade extracted on 20th September, 2018.

$\dot{c}_t$— Annual average growth of private consumption expenditure at 2000 prices (national currency; annual percentage change).

k_t— Gross fixed capital formation (annual % growth). Average annual growth of gross fixed capital formation based on constant local currency.

$\dot{g}_t$ — General government final consumption expenditure (annual % growth) based on constant local currency (extracted on September 20th, 2018)

$\dot{r}_t$—Lending rate to the private sector annual. It is obtained from *indexmundi* (on April 11, 2018).

$\dot{y}_t$—Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars (extracted on January, 28, 2017)

y_{dt}— Annual percentage growth rate of GDP per capita based on constant local currency(extracted on January, 28, 2017)

$\dot{y}_t^*$— Annual growth rate of real foreign income of five major trading partners of Nigeria (India, United states, France, Netherlands and Spain) (Extracted on May 03, 2018)

$\dot{p}_t$— 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 of price deflator GDP at market prices(measured in US currency)(extracted on April, 12 2017).

*(P*e/P)* — The real effective 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, selected countries, and the euro area (extracted on March11, 2017)

i_t*— Nominal long-term interest rates (percent) for United States (extracted on March11, 2017)

W_X—Exports of goods and services (% of GDP) (extracted on March11, 2017)

W_M— Imports of goods and services (% of GDP) (extracted on March11, 2017)

Data on, $\dot{c}_t$, invt$_t$$\dot{g}_t$, y_t,*, ẏdt, $\dot{p}$, ṗ*, ṙ, W_M, W_X, and i_t * were Sourced from World Bank national accounts data and OECD National accounts data files).

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 African development bank (AFDB). (Extracted on the 19th April, 2017)

W_B— Share of government's debt on GDP—General government consolidated gross debt (percent of GDP). (Extracted on the 1th March, 2017)

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 thosenon-compulsory(Extracted on the 19th April, 2017).

ξ_B & ξ_D— Debt financed by foreign and domestic markets respectively.

Data on W_G, W_D, W_B, *t*, $\dot{y}$ were extracted on the 19th April, 2017 from African Development Bank Group available at:http://dataportal.opendataforafrica.org/resource/embed/xedzxdg

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

θ_i^m — share of intermediate goods imports. See Appendix A.2 for detailed description.

θ_k^m — share of capital goods imports. This represents the import of machinery and equipment goods imports. See Appendix A.2 for detailed description.

θ_m^x — The share of manufacture goods exports (SITC 5+6+7+8). The description as is in $\dot{x}_{mt.}$

$\dot{x}_0$ —Average growth of other Exports of goods and services (chiefly oil and agricultural products) based on constant local currency (from the UNcomtrade).

$\dot{p}_0$ — Average growth of prices of other Exports of goods and services (chiefly oil and agricultural products)

APPENDIXA 4.2: Two-Stage Least estimation of each equation of the structural model, Nigeria 1982–2015

	Coefficient	Std. Error	t-Statistic	Prob	Sargan (J-stat)	Norm	Hetero	LM
Import growth, $\dot{m}$								
Constant	9.872659	7.237264	1.364143	0.1847**				
Consumption, $\dot{c}$,	(ε_{mc})1.228831	0.518878	2.368247	0.0259	17.89(0.71)	39.02(0.00)	0.97(0.96)	0.15
Investment, $\dot{k}$,	(ε_{mk})0.564183	0.272386	2.071267	0.0488**				
Gov. expenditure, $\dot{g}$,	(ε_{mg})-0.082648	0.038654	-2.138155	0.0425**				
Manufactured exports, $\dot{x}_m$,	(ε_{mx})0.136578	0.063810	2.140396	0.0423**				
Relative price, $\dot{p}^*+\dot{e}-\dot{p}$,	(ε_{mp})-0.282050	0.275532	-1.023659	0.3158				
Consumption growth, $\dot{c}$								
Constant	2.425553	1.479987	1.638902	0.1230				
Disposable income, $\dot{y}_d$,	(ε_{cy})1.134597	0.114945	9.870817	0.000***	27.67(0.40)	1.79(0.40)	0.66(0.65)	0.07
Investment growth, $\dot{k}$								
Constant	-6.106029	3.026381	-2.017601	0.0537*				
Domestic income, ẏ,	(ε_{ky})1.678916	0.373355	4.496839	0.0001***	24.67(0.42)	0.62(0.73)	0.27(0.25)	0.21
Interest rate. ṙ,	(ε_{kr})-0.502606	0.152514	-3.295477	0.0028***				
Cap. goods imports, $\theta_k^m \dot{m}$,	(ε_{km}) 0.190886	0.093327	2.045349	0.00507*				
Manufactured export growth, $\dot{x}_m$								
Constant	-10.05318	41.90905	-0.239881	0.8122				
World income, ẏ*,	(ε_{xy^*})11.83074	13.02632	0.908218	0.3718	24.27(0.45)	7.36(0.02)	0.07(0.07)	0.12
Relative price, $\dot{p}^*+\dot{e}-\dot{p}$,	(ε_{xp})0.114794	0.936536	0.122573	0.9034				
Intermediate imports, $\theta_i^m \dot{m}$,	(ε_{xm})0.892476	0.465964	1.915333	0.0661*				

Appendix A4.3: Derivation of the Growth Rate

Imports Demand Function

$$M = C^{\varepsilon_{mc}} G^{\varepsilon_{mg}} X^{\varepsilon_{mx}} K^{\varepsilon_{mk}} \left(\frac{P * E}{P}\right)^{\varepsilon_{mp}}$$

Growth rates of import demand function;

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

Manufactured Export Demand Function

$$X = Y^{*\varepsilon_{xy^*}} \left(\frac{P^* e}{P}\right)^{\varepsilon_{xp}} M^{\varepsilon_{xm}}$$

Growth rates of manufactured export demand function;

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

(Imports have 3 components; intermediate goods, capital goods and other final goods; their share sum to 1 $\theta_i^m + \theta_k^m + \theta_f^m = 1$)

Total export=$\theta_m^x(\dot{p} + \dot{x}_m) + (1 - \theta_m^x)(\dot{p}_0 + \dot{x}_0)$

Private Final Consumption

$$C = [((1-t) + rw_{BH})Y]^{\varepsilon_{cy}}$$

Growth rates of private final consumption

$$\dot{c} = \varepsilon_{cy}\left(\frac{(\Delta r)W_{BH} + r(\Delta W_{BH})}{(1-t) + rW_{BH}} + \dot{y}\right)$$

Assuming that the share of home bondholders on public debt does not change over time, $\Delta w_{BH}=0$, the consumption function reduces to

$$\dot{c} = \varepsilon_{cy}\left(\frac{(\Delta r)W_{BH}}{(1-t) + rW_{BH}} + \dot{y}\right)$$

or alternatively;

$$\dot{c} = \varepsilon_{cy}\left(\dot{y} + \frac{(\Delta i - \Delta\dot{p})W_{BH}}{(1-t) + rW_{BH}}\right)$$

Private Investment

Gross investment

$$K_t^{gr} = \lambda(K_t^* - K_{t-1}) + \delta K_{t-1}$$

Desired capital stock

$$K_t^* = Y_t^{\varepsilon_{ky}} r_t^{\varepsilon_{kr}} M^{\varepsilon_{km}}$$

Replacing K* and taking variation

$$\Delta K_t^{gr} = \Delta(\lambda K_t) = \Delta(\lambda Y_t^{\varepsilon_{ky}} r_t^{\varepsilon_{kr}} M^{\varepsilon_{km}})$$

$$\frac{\lambda Y_t^{\varepsilon_{ky}-1} r_t^{\varepsilon_{kr}} M_t^{\varepsilon_{km}}}{Y_t^{\varepsilon_{ky}-1}} \varepsilon_{ky} \frac{\Delta Y_t}{Y_t} Y_t^{\varepsilon_{ky}} + \frac{\lambda Y_t^{\varepsilon_{ky}} r_t^{\varepsilon_{kr}-1} M_t^{\varepsilon_{km}}}{r_t^{\varepsilon_{kr}-1}} \frac{\Delta r_t}{r_t} r_t^{\varepsilon_{kr}} +$$

$$+ \frac{\lambda Y_t^{\varepsilon_{ky}} r_t^{\varepsilon_{kr}} M_t^{\varepsilon_{km}-1}}{M_t^{\varepsilon_{km}-1}} \varepsilon_{km} \frac{\Delta M_t}{M_t} M_t^{\varepsilon_{km}}$$

$$\frac{\Delta Y_t}{Y_t} = \dot{y} \quad \frac{\Delta r_t}{r_t} = \dot{r} \quad \frac{\Delta M_t}{M_t} = \dot{m}$$

$$\Delta K_t^{gr} = \lambda r_t^{\varepsilon_{kr}} Y_t^{\varepsilon_{ky}} M_t^{\varepsilon_{km}} \varepsilon_{ky} \dot{y} + \lambda r_t^{\varepsilon_{kr}} Y_t^{\varepsilon_{ky}} M_t^{\varepsilon_{km}} \varepsilon_{kr} \dot{r} + \lambda r_t^{\varepsilon_{kr}} Y_t^{\varepsilon_{ky}} M_t^{\varepsilon_{km}} \varepsilon_{km} \dot{m}$$

Dividing Equation by K_t and rearranging terms, we obtain;

$$\frac{\Delta K_t^{gr}}{K_t^{gr}} = \lambda \frac{K_t^*}{K_t^{gr}} (\varepsilon_{ky} \dot{y} + \varepsilon_{kr} \dot{r} + \varepsilon_{km} \theta_i^m \dot{m})$$

Setting:

$$\varepsilon_{ky} = \lambda \left(\frac{K_t^*}{K_t^{gr}} \right) \varepsilon_{ky} \; ; \varepsilon_{kr} = \lambda \left(\frac{K_t^*}{K_t^{gr}} \right) \varepsilon_{kr} ; \varepsilon_{km} = \lambda \left(\frac{K_t^*}{K_t^{gr}} \right) \varepsilon_{km} \text{ and } \frac{\Delta K_t^{gr}}{K_t^{gr}} = \dot{k}$$

the growth rate of investment is given by:

$$\dot{k} = \varepsilon_{ky} \dot{y} + \varepsilon_{kr} \dot{r} + \varepsilon_{km} \theta_k^m \dot{m}$$

Government Sector Identity

$$G_N + iB_H + i * B_F e = tYP + D$$

Growth of real government expenditures $\dot{g}$ is given by:

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

Balance-of-Payments Condition

$$XP + D_F e - i^* B_F e = MP^* e$$

After taking logs and differentiation balance of payments condition final identity becomes:

$$\dot{x} + \dot{p} + (1-\xi)\frac{W_D}{W_x}(\dot{p} + \dot{y} - i^*) - (1-\xi)\frac{W_B}{W_x}\Delta i^* = \frac{W_M}{W_X}\frac{P^* e}{P}(\dot{m} + \dot{p}^* + \dot{e})$$

We further take into account manufacturing and other exports difference

$$\theta_m^x(\dot{x}_m + \dot{p}) + (1-\theta_m^x)(\dot{x}_0 + \dot{p}_0) + (1-\xi)\frac{W_D}{W_X}(\dot{p} + \dot{y} - i^*) - (1-\xi)\frac{W_B}{W_X}\Delta i^* = \frac{W_M}{W_X}\frac{P^* e}{P}(\dot{m} + \dot{p}^* + \dot{e})$$

Import Demand Function (in reduced form)

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

$$\dot{m} = \varepsilon_{mc}\dot{c} + \varepsilon_{mg}\dot{g} + \varepsilon_{mx}\left[\varepsilon_{xy^*}\dot{y}^* + \varepsilon_{xp}(\dot{p}^* + \dot{e} - \dot{p}) + \varepsilon_{xm}\theta_i^m\dot{m}\right] + \varepsilon_{mk}\left[\varepsilon_{ky}\dot{y} + \varepsilon_{kr}\dot{r} + \varepsilon_{km}\theta_k^m\dot{m}\right] + \varepsilon_{mp}(\dot{p}^* + \dot{e} - \dot{p})$$

$$\dot{m}(1 - \varepsilon_{mx}\varepsilon_{xm}\theta_i^m - \varepsilon_{mk}\varepsilon_{km}\theta_k^m) = \varepsilon_{mc}\dot{c} + \varepsilon_{mg}\dot{g}$$

$$+\varepsilon_{mx}\left[\varepsilon_{xy^*}\dot{y}^* + \varepsilon_{xp}(\dot{p}^* + \dot{e} - \dot{p})\right]$$

$$+\varepsilon_{mk}\left[\varepsilon_{ky}\dot{y} + \varepsilon_{kr}\dot{r}\right] + \varepsilon_{mp}(\dot{p}^* + \dot{e} - \dot{p})$$

$$\dot{m} = \frac{1}{(1 - \varepsilon_{mx}\varepsilon_{xm}\theta_i^m - \varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\{\varepsilon_{mc}\dot{c} + \varepsilon_{mg}\dot{g}$$

$$+\varepsilon_{mx}\left[\varepsilon_{xy^*}\dot{y}^* + \varepsilon_{xp}(\dot{p}^* + \dot{e} - \dot{p})\right]$$

$$+\varepsilon_{mk}\left[\varepsilon_{ky}\dot{y} + \varepsilon_{kr}\dot{r}\right] + \varepsilon_{mp}(\dot{p}^* + \dot{e} - \dot{p})\}$$

Substitute exports equation into BOP condition:

$$\underbrace{\theta_m^x[\varepsilon_{xy^*}\dot{y}^*+\varepsilon_{xp}(\dot{p}^*+\dot{e}-\dot{p})+\varepsilon_{xm}\theta_i^m\dot{m}]}_{\dot{x}_m}+\dot{p}+(1-\theta_m^x)(\dot{p}_0+\dot{x}_0)+(1-\xi)\frac{W_D}{W_x}(\dot{p}+\dot{y}-i^*)-(1-\xi)\frac{W_B}{W_X}\Delta i^*$$

$$=\frac{W_M}{W_X}\frac{P^*e}{P}\dot{m}+\frac{W_M}{W_X}\frac{P^*e}{P}(\dot{p}^*+\dot{e})$$

Moving$\theta_m^x\varepsilon_{xm}\theta_i^m\dot{m}$to RHS of BOP condition and further rearranging we obtain

$$\theta_m^x\varepsilon_{xy^*}\dot{y}^*+\theta_m^x\varepsilon_{xp}(\dot{p}^*+\dot{e}-\dot{p})+\dot{p}+(1-\theta_m^x)(\dot{p}_0+\dot{x}_0)+(1-\xi)\frac{W_D}{W_x}(\dot{p}+\dot{y}-i^*)-(1-\xi)\frac{W_B}{W_x}\Delta i^*$$

$$=\left(\frac{W_M}{W_X}\frac{P^*e}{P}-\varepsilon_{xm}\theta_m^x\theta_i^m\right)\dot{m}+\frac{W_M}{W_X}\frac{P^*e}{P}(\dot{p}^*+\dot{e})$$

Substitute imports equation into BOP condition above we obtain

$$\theta_m^x\varepsilon_{xy^*}\dot{y}^*+\theta_m^x\varepsilon_{xp}(\dot{p}^*+\dot{e}-\dot{p})+\dot{p}+(1-\theta_m^x)(\dot{p}_0+\dot{x}_0)+(1-\xi)\frac{W_D}{W_x}(\dot{p}+\dot{y}-i^*)-(1-\xi)\frac{W_B}{W_x}\Delta i^*$$

$$=\left(\frac{W_M}{W_X}\frac{P^*e}{P}-\varepsilon_{xm}\theta_m^x\theta_i^m\right)\underbrace{\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m-\varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\left\{\begin{array}{l}\varepsilon_{mc}\dot{c}+\varepsilon_{mg}\dot{g}+\varepsilon_{mx}[\varepsilon_{xy^*}\dot{y}^*+\varepsilon_{xp}(\dot{p}^*+\dot{e}-\dot{p})]\\+\varepsilon_{mk}(\varepsilon_{ky}\dot{y}+\varepsilon_{kr}\dot{r})+\varepsilon_{mp}(\dot{p}^*+\dot{e}-\dot{p})\end{array}\right\}}_{\dot{m}}$$

$$+\frac{W_M}{W_X}\frac{P^*e}{P}(\dot{p}^*+\dot{e})$$

Substitute further consumption and government expenditure into above BOP condition we obtain

$$\theta_m^x\varepsilon_{xy^*}\dot{y}^*+\theta_m^x\varepsilon_{xp}(\dot{p}^*+\dot{e}-\dot{p})+\dot{p}+(1-\theta_m^x)(\dot{p}_0+\dot{x}_0)+(1-\xi)\frac{W_D}{W_x}(\dot{p}+\dot{y}-i^*)-(1-\xi)\frac{W_B}{W_x}\Delta i^*$$

$$=\left(\frac{W_M}{W_X}\frac{P^*e}{P}-\varepsilon_{xm}\theta_m^x\theta_i^m\right)\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m-\varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\left\{\begin{array}{l}\varepsilon_{mc}\underbrace{\left(\varepsilon_{cy}\left(\dot{y}+\frac{(\Delta i-\Delta\dot{p})w_{BH}}{(1-t)+rw_{BH}}\right)\right)}_{\dot{c}}\\+\varepsilon_{mg}\underbrace{\left(\begin{array}{l}\frac{t\dot{y}}{W_G}+(\dot{d}-\dot{p})\frac{W_D}{W_G}-[\Delta i+i(\dot{b}_H-\dot{p})]\frac{W_{BH}}{W_G}\\-[(e\Delta i^*+i^*\Delta e)+i^*e(\dot{b}_F-\dot{p})]\frac{W_{BF}}{W_G}\end{array}\right)}_{\dot{g}}\\+\varepsilon_{mx}[\varepsilon_{xy^*}\dot{y}^*+\varepsilon_{xp}(\dot{p}^*+\dot{e}-\dot{p})]\\+\varepsilon_{mk}(\varepsilon_{ky}\dot{y}+\varepsilon_{kr}\dot{r})+\varepsilon_{mp}(\dot{p}^*+\dot{e}-\dot{p})\end{array}\right\}$$

$$+\frac{W_M}{W_X}\frac{P^*e}{P}(\dot{p}^*+\dot{e})$$

Notes:

1) $\dot{d} - \dot{p} = \dot{y}$

2) $\Delta i + i(\dot{b}_H - \dot{p}) = \Delta i + i\dot{y}$

3) $[(e\Delta i^* + i^* \Delta e) + i^* e(\dot{b}_F - \dot{p})] = \Delta i^* e + i^* e\dot{y}$

BOP Condition becomes

$$\theta_m^x \varepsilon_{xy^*} \dot{y}^* + \theta_m^x \varepsilon_{xp}(\dot{p}^* + \dot{e} - \dot{p}) + \dot{p} + (1-\theta_m^x)(\dot{p}_0 + \dot{x}_0) + (1-\xi)\frac{W_D}{W_x}(\dot{p} + \dot{y} - i^*) - (1-\xi)\frac{W_B}{W_x}\Delta i^*$$

$$= \left(\frac{W_M}{W_X}\frac{P^* e}{P} - \varepsilon_{xm}\theta_m^x \theta_i^m\right)\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m - \varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\left\{\begin{array}{l} \varepsilon_{mc}\underbrace{\left(\varepsilon_{cy}\left(\dot{y} + \frac{(\Delta i - \Delta\dot{p})\xi w_B}{(1-t) + r\xi w_B}\right)\right)}_{\dot{c}} \\ +\varepsilon_{mg}\underbrace{\left(\begin{array}{l}\frac{t\dot{y}}{W_G} + \dot{y}\frac{W_D}{W_G} - [\Delta i + i\,\dot{y}]\frac{\xi W_B}{W_G} \\ -[\Delta i^* e + i^* e\ \dot{y}]\frac{(1-\xi)W_B}{W_G}\end{array}\right)}_{\dot{g}} \\ +\varepsilon_{mx}[\varepsilon_{xy^*}\dot{y}^* + \varepsilon_{xp}(\dot{p}^* + \dot{e} - \dot{p})] \\ +\varepsilon_{mk}(\varepsilon_{ky}\dot{y} + \varepsilon_{kr}\dot{r}) + \varepsilon_{mp}(\dot{p}^* + \dot{e} - \dot{p})\end{array}\right\}$$

$$+\frac{W_M}{W_X}\frac{P^* e}{P}(\dot{p}^* + \dot{e})$$

With further algebra we obtain the following

$$\theta_m^x \varepsilon_{xy^*} \dot{y}^* + \theta_m^x \varepsilon_{xp}(\dot{p}^* + \dot{e} - \dot{p}) + \dot{p} + (1-\theta_m^x)(\dot{p}_0 + \dot{x}_0) + (1-\xi)\frac{W_D}{W_x}(\dot{p} + \dot{y} - i^*) - (1-\xi)\frac{W_B}{W_x}\Delta i^*$$

$$= \left(\frac{W_M}{W_X}\frac{P^* e}{P} - \varepsilon_{xm}\theta_m^x \theta_i^m\right)\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m - \varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\left\{\begin{array}{l} \varepsilon_{mc}\varepsilon_{cy}\dot{y} \\ +\varepsilon_{mc}\varepsilon_{cy}\left(\frac{(\Delta i - \Delta\dot{p})\xi w_B}{(1-t)+r\xi w_B}\right) \\ +\varepsilon_{mg}\dot{y}\left(\frac{t}{W_G} + \frac{W_D}{W_G} - \frac{i\xi W_B}{W_G} - \frac{i^* e(1-\xi)W_B}{W_G}\right) \\ +\varepsilon_{mg}\left(-\Delta i\frac{\xi W_B}{W_G} - e\Delta i^*\frac{(1-\xi)W_B}{W_G}\right) \\ +\varepsilon_{mx}[\varepsilon_{xy^*}\dot{y}^* + \varepsilon_{xp}(\dot{p}^* + \dot{e} - \dot{p})] \\ +\varepsilon_{mk}\varepsilon_{ky}\dot{y} + \varepsilon_{mk}\varepsilon_{kr}\dot{r} + \varepsilon_{mp}(\dot{p}^* + \dot{e} - \dot{p}) \end{array}\right\}$$

$$+\frac{W_M}{W_X}\frac{P^* e}{P}(\dot{p}^* + \dot{e})$$

If we move all the terms on the RHS with $\dot{y}$ to the LHS and all other terms to RHS we obtain

$$(1-\xi)\frac{W_D}{W_x}\dot{y}$$

$$-\left(\frac{W_M}{W_X}\frac{P^* e}{P} - \varepsilon_{xm}\theta_m^x \theta_i^m\right)\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m - \varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\left\{\begin{array}{l} \varepsilon_{mc}\varepsilon_{cy}\dot{y} \\ +\varepsilon_{mg}\dot{y}\left(\frac{t}{W_G} + \frac{W_D}{W_G} - \frac{i\xi W_B}{W_G} - \frac{i^* e(1-\xi)W_B}{W_G}\right) \\ +\varepsilon_{mk}\varepsilon_{ky}\dot{y} \end{array}\right\}$$

$$=$$

$$\left(\frac{W_M}{W_X}\frac{P^* e}{P} - \varepsilon_{xm}\theta_m^x \theta_i^m\right)\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m - \varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\left\{\begin{array}{l} \varepsilon_{mc}\varepsilon_{cy}\left(\frac{(\Delta i - \Delta\dot{p})\xi w_B}{(1-t)+r\xi w_B}\right) \\ +\varepsilon_{mg}\left(-\Delta i\frac{\xi W_B}{W_G} - e\Delta i^*\frac{(1-\xi)W_B}{W_G}\right) \\ +\varepsilon_{mx}\varepsilon_{xy^*}\dot{y}^* + \varepsilon_{mx}\varepsilon_{xp}(\dot{p}^* + \dot{e} - \dot{p}) \\ +\varepsilon_{mk}\varepsilon_{kr}\dot{r} + \varepsilon_{mp}(\dot{p}^* + \dot{e} - \dot{p}) \end{array}\right\}$$

$$+\frac{W_M}{W_X}\frac{P^* e}{P}(\dot{p}^* + \dot{e})$$

$$-\theta_m^x \varepsilon_{xy^*}\dot{y}^* - \theta_m^x \varepsilon_{xp}(\dot{p}^* + \dot{e} - \dot{p}) - \dot{p} - (1-\theta_m^x)(\dot{p}_0 + \dot{x}_0) - (1-\xi)\frac{W_D}{W_x}(\dot{p} \quad - i^*) + (1-\xi)\frac{W_B}{W_x}\Delta i^*$$

take $\dot{y}$, $\dot{y}^*$ *and* $(\dot{p}^*+\dot{e}-\dot{p})$ *paranthesis*

$$\left\{-\left(\frac{W_M}{W_X}\frac{P^*e}{P}-\varepsilon_{xm}\theta_m^x\theta_i^m\right)\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m-\varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\left\{\begin{matrix}\varepsilon_{mc}\varepsilon_{cy}\\+\varepsilon_{mg}\left(\frac{t}{W_G}+\frac{W_D}{W_G}-\frac{i\xi W_B}{W_G}-\frac{i^*e(1-\xi)W_B}{W_G}\right)\\+\varepsilon_{mk}\varepsilon_{ky}\end{matrix}\right\}+\left((1-\xi)\frac{W_D}{W_x}\right)\right\}\dot{y}$$

=

$$\left(\frac{W_M}{W_X}\frac{P^*e}{P}-\varepsilon_{xm}\theta_m^x\theta_i^m\right)\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m-\varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\left\{\begin{matrix}\varepsilon_{mc}\varepsilon_{cy}\left(\frac{(\Delta i-\Delta\dot{p})\xi w_B}{(1-t)+\xi r w_B}\right)\\+\varepsilon_{mg}\left(-\Delta i\frac{\xi W_B}{W_G}-e\Delta i^*\frac{(1-\xi)W_B}{W_G}\right)\\+\varepsilon_{mk}\varepsilon_{kr}\dot{r}\end{matrix}\right\}$$

$$+\left\{\left(\frac{W_M}{W_X}\frac{P^*e}{P}-\varepsilon_{xm}\theta_m^x\theta_i^m\right)\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m-\varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\varepsilon_{mx}\varepsilon_{xy^*}-\theta_m^x\varepsilon_{xy^*}\right\}\dot{y}^*$$

$$+\left\{\begin{matrix}\left(\frac{W_M}{W_X}\frac{P^*e}{P}-\varepsilon_{xm}\theta_m^x\theta_i^m\right)\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m-\varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\varepsilon_{mx}\varepsilon_{xp}\\+\left(\frac{W_M}{W_X}\frac{P^*e}{P}-\varepsilon_{xm}\theta_m^x\theta_i^m\right)\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m-\varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\varepsilon_{mp}-\theta_m^x\varepsilon_{xp}\end{matrix}\right\}(\dot{p}^*+\dot{e}-\dot{p})$$

$$+\frac{W_M}{W_X}\frac{P^*e}{P}(\dot{p}^*+\dot{e})$$

$$-\dot{p}-(1-\xi)\frac{W_D}{W_x}(\dot{p}-i^*)+(1-\xi)\frac{W_B}{W_x}\Delta i^*-(1-\theta_m^x)(\dot{p}_0+\dot{x}_0)$$

multiply bothside with (–1) *and rearrange*

$$\left\{\left(\frac{W_M}{W_X}\frac{P*e}{P}-\varepsilon_{xm}\theta_m^x\theta_i^m\right)\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m-\varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\left\{\begin{matrix}\varepsilon_{mc}\varepsilon_{cy}\\+\varepsilon_{mg}\left(\frac{t}{W_G}+\frac{W_D}{W_G}-\frac{i\,\xi W_B}{W_G}-\frac{i*e(1-\xi)W_B}{W_G}\right)\\+\varepsilon_{mk}\varepsilon_{ky}\end{matrix}\right\}-\left((1-\xi)\frac{W_D}{W_x}\right)\right\}\dot{y}$$

$$=$$

$$\left\{\theta_m^x\varepsilon_{xy*}-\varepsilon_{mx}\varepsilon_{xy*}\left(\frac{W_M}{W_X}\frac{P*e}{P}-\varepsilon_{xm}\theta_m^x\theta_i^m\right)\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m-\varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\right\}\dot{y}*$$

$$-\left\{\begin{matrix}\left(\frac{W_M}{W_X}\frac{P*e}{P}-\varepsilon_{xm}\theta_m^x\theta_i^m\right)\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m-\varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\varepsilon_{mx}\varepsilon_{xp}\\+\left(\frac{W_M}{W_X}\frac{P*e}{P}-\varepsilon_{xm}\theta_m^x\theta_i^m\right)\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m-\varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\varepsilon_{mp}-\theta_m^x\varepsilon_{xp}\end{matrix}\right\}(\dot{p}*+\dot{e}-\dot{p})$$

$$+\left(\dot{p}-\frac{W_M}{W_X}\frac{P*e}{P}(\dot{p}*+\dot{e})\right)+(1-\xi)\frac{W_D}{W_x}(\dot{p}-i*)-(1-\xi)\frac{W_B}{W_x}\Delta i*$$

$$-\left(\frac{W_M}{W_X}\frac{P*e}{P}-\varepsilon_{xm}\theta_m^x\theta_i^m\right)\left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m-\varepsilon_{mk}\varepsilon_{km}\theta_k^m)}\right)\left\{\begin{matrix}\varepsilon_{mc}\varepsilon_{cy}\left(\frac{(\Delta i-\Delta\dot{p})\xi w_B}{(1-t)+\xi r w_B}\right)\\+\varepsilon_{mg}\left(-\Delta i\frac{\xi W_B}{W_G}-e\Delta i*\frac{(1-\xi)W_B}{W_G}\right)\\+\varepsilon_{mk}\varepsilon_{kr}(\Delta i-\Delta\dot{p})\end{matrix}\right\}$$

$$+(1-\theta_m^x)(\dot{p}_0+\dot{x}_0)$$

$$\dot{y} = \frac{A\_RHS}{B\_LHS}$$

$$A = \left(\begin{array}{l} \left\{ \theta_m^x \varepsilon_{xy*} - \varepsilon_{mx}\varepsilon_{xy*} \left(\frac{W_M}{W_X}\frac{P*e}{P} - \varepsilon_{xm}\theta_m^x\theta_i^m \right) \left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m - \varepsilon_{mk}\varepsilon_{km}\theta_k^m)} \right) \right\} \dot{y}* \\ \\ -\left\{ \begin{array}{l} \left(\frac{W_M}{W_X}\frac{P*e}{P} - \varepsilon_{xm}\theta_m^x\theta_i^m \right) \left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m - \varepsilon_{mk}\varepsilon_{km}\theta_k^m)} \right) \varepsilon_{mx}\varepsilon_{xp} \\ +\left(\frac{W_M}{W_X}\frac{P*e}{P} - \varepsilon_{xm}\theta_m^x\theta_i^m \right) \left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m - \varepsilon_{mk}\varepsilon_{km}\theta_k^m)} \right) \varepsilon_{mp} - \theta_m^x\varepsilon_{xp} \end{array} \right\} (\dot{p}*+\dot{e}-\dot{p}) \\ \\ +\left(\dot{p} - \frac{W_M}{W_X}\frac{P*e}{P}(\dot{p}*+\dot{e}) \right) + (1-\xi)\frac{W_D}{W_x}(\dot{p}-i*) - (1-\xi)\frac{W_B}{W_x}\Delta i* \\ \\ -\left(\frac{W_M}{W_X}\frac{P*e}{P} - \varepsilon_{xm}\theta_m^x\theta_i^m \right) \left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m - \varepsilon_{mk}\varepsilon_{km}\theta_k^m)} \right) \left\{ \begin{array}{l} \varepsilon_{mc}\varepsilon_{cy} \left(\frac{(\Delta i - \Delta\dot{p})\xi w_B}{(1-t)+\xi r w_B} \right) \\ +\varepsilon_{mg} \left(-\Delta i \frac{\xi W_B}{W_G} - e\Delta i* \frac{(1-\xi)W_B}{W_G} \right) \\ +\varepsilon_{mk}\varepsilon_{kr}(\Delta i - \Delta\dot{p}) \end{array} \right\} \\ \\ +(1-\theta_m^x)(\dot{p}_0 + \dot{x}_0) \end{array} \right)$$

$$B = \left\{ \left(\frac{W_M}{W_X}\frac{P*e}{P} - \varepsilon_{xm}\theta_m^x\theta_i^m \right) \left(\frac{1}{(1-\varepsilon_{mx}\varepsilon_{xm}\theta_i^m - \varepsilon_{mk}\varepsilon_{km}\theta_k^m)} \right) \left\{ \begin{array}{l} \varepsilon_{mc}\varepsilon_{cy} \\ +\varepsilon_{mg} \left(\frac{t}{W_G} + \frac{W_D}{W_G} - \frac{i\xi W_B}{W_G} - \frac{i*e(1-\xi)W_B}{W_G} \right) \\ +\varepsilon_{mk}\varepsilon_{ky} \end{array} \right\} - \left((1-\xi)\frac{W_D}{W_x} \right) \right\}$$

Appendix A7.1: Explanation of the Series and Sources of Data Used in Growth Calculations

$\dot{x}_t$— Annual growth of real gross exports—Exports of goods and services based on constant local currency

y_t^*— Annual growth rate of real foreign income of five major trading partners of Nigeria (India, United states, France, Netherlands and Spain)

$\dot{m}_t$—Annual growth of real Imports-Imports of goods and services based on constant local currency $\dot{x}_t$, $\dot{m}_t$ and $y_t^*$are retrieved from the WorldBank-https://data.worldbank.org/indicator/NE.EXP.GNFS.ZS on 21th April, 2018.

$\dot{y}_t$—Annual growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. Retrieved on 21st, April, 2018 from African development bank data base: http://dataportal.opendataforafrica.org/data?source=AfDB

$\dot{p}_t$— 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

$\dot{p}_t^*$—Annual growth of price deflator GDP at market prices(measured in US currency)

e — Effective exchange rate (nominal measure, 2010 = 100)

$(\dot{p}_t^* + e - \dot{p}_t)$ —Annual growth of real exchange rate

Ω—Export quality is estimated as the unit value adjusted for differences in production costs and for the selection bias stemming from relative distance. It takes into account (trade prices, values and quantities) and a host of otherinformation such as distance. It is retrieved from IMF database:

https://www.imf.org/external/np/res/dfidimf/diversification.htm on the 21thApril, 2018.2015 to 2017 are extrapolated figures.

TG — represents technological gap$\left(\frac{T_{PS}}{T_{CN}}\right)$. This ratio is proxied by the most recent data on R&D of Centre-North to Nigeria's R&D as percentage of GDP obtained from the WorldBank.

BIOGRAPHY

Yohanna Panshak obtained his Bachelor and Master Degree in Economics from the famous University Jos, Nigeria in 2004 and 2010, respectively. He joined the Economics department of Plateau State Unviversity, Bokkos as a lecturer in 2011. He has published some of his works in the Web of Science and are indexed in the social science citation index (SSCI), emerging sources of citation (ESCI) and other sources of citatons.

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ETHICS COMMITEE APPROVAL

28.05.2019

Dear Yohanna Panshak

Your project "**Essays on Balance Of Payment Constraıned Growth: The Case Of Nigeria (1981-2017)"** has been evaluated. Since only secondary data will be used the project it does not need to go through the ethics committee. You can start your research on the condition that you will use only secondary data.

Assoc. Prof. Dr. Direnç Kanol

Rapporteur of the Scientific Research Ethics Committee

Direnc Kanol

Note: If you need to provide an official letter to an institution with the signature of the Head of NEU Scientific Research Ethics Committee, please apply to the secretariat of the ethics committee by showing this document.