OIL RESOURCE ABUNDANCE AND SECTORAL PERFORMANCES IN NIGERIA, 1970 - 2010

BY

AUGUSTINE CHIDIEBERE, OSIGWE

(Matriculation Number: 140625)

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CERTIFICATION

I certify that this work was carried out by Augustine Chidiebere OSIGWE in the Department of Economics, Faculty of the Social Sciences, University of Ibadan, Ibadan, Nigeria.

……

Supervisor
Professor Adeola Adenikinju
B.Sc., M.Sc., Ph.D (Ibadan)
Department of Economics
University of Ibadan, Nigeria

DEDICATION

To God Almighty; the blazing sun of hope that illuminates my mind

and also to the honoured memory of late Ikemba Nnewi

- Dim. Chukwuemeka Odumegwu Ojukwu -

who impressed upon me early in life via his Ahiara declaration for Biafaran revolution

that “anyone with imagination, integrity, who works hard, can rise to any height”.

ABSTRACT

Oil Resource Abundance (ORA) has dominated the Nigerian revenue since the 1970s, contributing over 70.0%. Empirical literature have focused on the effects of ORA on aggregate macroeconomic variables (annual average growth in export to import price ratio, agricultural output growth rate, manufacturing output growth rate, public consumption, exchange rate and trade openness), while little attention has been devoted to the multi-sectoral dimension of the effects. This study, therefore, examined the effects of ORA on sectoral investment and output in Nigeria between 1970 and 2010.

A macroeconometric model, predicated on the 'Dutch disease' theoretical framework was estimated. The framework recognised how a booming sector can hamper growth in the activity sectors (agriculture, services, building and construction, and manufacturing) of the economy. The model considered the linkages between ORA and the activity sectors and ORA was measured as the ratio of revenues from oil to total government revenues. Three Stage Least Squares estimation technique that took cognisance of serial error correlation among the equations in the system, and controlled for endogeneity in the presence of sector-specific effects was employed. Simulation of the model was performed for both ex-post and ex-ante forecasting under different policy scenarios. The data were collected from Central Bank of Nigeria's Statistical Bulletin, Nigerian National Petroleum Corporation's Annual Statistical Bulletin and World Development Indicators. Statistical tests for internal consistency using Theil's inequality coefficients and its decomposition, as well as graphical representations that compared the actual and predicted values of the endogenous variables were carried out to ascertain the model's forecast accuracy.

A 1.0% increase in ORA significantly led to diverse effects on the sectors through public spending channel. Investment dropped in agriculture (4.3%) and services (1.1%) and improved in manufacturing sector (5.2%) and building and construction sector (0.2%). Output declined in agricultural sector (0.5%), services sector (0.3%) and increased in manufacturing sector (0.6%) and building and construction sector (0.5%). For ex-ante forecast of 5.0% increase in ORA, investment declined in agriculture (1.0%), manufacturing (0.5%), services (0.4%), and building and construction (0.4%). Output

decreased in services (0.1%) and agriculture (0.1%) and rose in building and construction (0.2%) and manufacturing (0.2%). Under the forecast scenario of 5.0% decrease in ORA, investment increased in all the sectors (services-0.8%, agriculture-0.5%, building and construction-0.2% and manufacturing-0.1%). Output rose in services (0.1%) and agriculture (0.01%) and declined in building and construction (0.2%) and manufacturing (0.04%).

Oil resource abundance had negative and positive impacts on the activity sectors of the economy. The negative impact was indicative of the presence of the 'Dutch disease' syndrome while the positive implied growth in national earnings through a favourable shift in the production activities of the sectors involved. There is the need, therefore, for the government to diversify the economy in order to enhance investment and output in the activity sectors.

Keywords: Oil resource abundance, Sectoral performance, Macroeconometric model, Dutch disease
Word count: 461

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'I will extol thee, o Lord, for you have lifted me up'. – Psalm 30:1a.

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CHAPTER ONE

INTRODUCTION

1.1: Introduction

In developed and developing countries, the relationship between resource[1] abundance and economic growth has been the subject of a growing literature. In the early 1950s, some development economists have suggested that natural resource abundance would help the backward states to rise above their capital shortfalls and provide revenues for their governments to offer public goods and lift citizens out of the despair of poverty. Notably, since the 1990s, a growing number of studies have established a link between resource abundance and a number of socio-economic problems. Natural resource abundance has been associated with slow growth (Sachs and Warner, 1995b), increased inequality and poverty for a large majority of a country's population (Ross, 2005).

The Nigerian economy was driven by the non-oil sector, especially agriculture in the 1960s, before the advent of the oil boom of the 1970s. However, the scenario changed with oil sector dominating the economic landscape. The oil boom of the 1970s and 80s, followed by the excessive appreciation of the exchange rate reduced agricultural competitiveness and encouraged rent-seeking behaviour in the economy. The Nigerian economy has over the years witnessed prolonged economic stagnation, rising poverty levels and infrastructural decay. The United Nation Human Development Indicators (UNHDI) for Nigeria were low compared with those of other developing countries like Indonesia and Malaysia, that were at the same level of development as Nigeria in the early 1960s.

[1] In this study, the resource interest is only on oil. Crude oil is simply a mixture of hydrocarbons that exists in liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities. Generally, natural resources occur naturally within environments that exist relatively undisturbed by mankind. There are various methods of categorising natural resources, these include source of origin, stage of development, and by their renewability. The depletion of natural resources is caused by 'direct drivers of change' such as mining, petroleum extraction, fishing and forestry as well as 'indirect drivers of change' such as demography, economy, society, politics and technology. The practice of agriculture is another factor causing depletion of natural resources. Certain resources on earth are in limited supply and are being depleted quickly. An example of this is oil. Oil is being pumped out of the ground faster than it can be replenished by the earth. However, NNPC (2009) clearly reveals that Nigeria is oil resource abundant.

In the last four decades, crude oil has been a major source of revenue, energy and foreign exchange in Nigeria. As the mainstay of the economy, it plays a vital role in determining the economic and political bearing of the country. Nigeria can be classified as a country that depends on primary product exports (especially oil products). Since independence in 1960, Nigeria has experienced regional, ethnic and religious tensions, magnified by the significant inequalities in economic, educational and environmental development. These in part could be attributed to the discovery of oil in the country which impinges on and is in turn affected by economic and social components.

Given that the oil sector is very essential, there is the compelling need for a desirable and appropriate production and export policy for the sector. Though crude oil has contributed largely to the economy, the revenue has not been properly utilised. Considering the fact that there are other sectors in the economy, the excess revenue made from the oil sector should have been invested in them to diversify and also increase the total GDP of the economy.

1.2: The Problem

Oil discovery in the late 1950s and the subsequent entry of Nigeria into the league of major net oil exporters in the 1970s, with an average daily production of about two million barrels, marked a new and often volatile era in Nigeria's economic history (Iwayemi, 1990). Before the 1970s, the Nigerian economy was essentially agriculture-based, but with the first oil boom episode (1973-1974), drilling and mining gained substantial economic relevance. According to NNPC (2011) oil reserve as at 1961 stood at 300 million barrels proven reserves, 20 years later, it rose to 16,500 million. In 2001, it even grew higher to 32,245 million barrels, almost double of the 1981 value. In 2009, the oil proven reserve assumed a downward trend by dropping to 31,884.78 million barrels. Observably, in the first decade of independence, primary agricultural produce were the main exports, but as from the 1970s, crude oil dominated. From 1974 to date, there had been no year when the proportion of crude oil exports in total export earnings fell below 91%. For example, in 1999, Nigeria exported 706,693,478 barrels of crude oil as against 769,195,205 barrels (96% of total export) in 2009 (NNPC , 2011).

It is striking to note that oil discovery and its exploitation have resulted in mixed blessings for Nigeria, impacting positively and negatively on the macroeconomy. The revenue[2] generated from oil has always been the main source of financing governmental projects, payment of internal and external obligations as well as public administration among other commitments. The output of crude oil, especially petroleum products, has been put into various uses (cooking, lighting, source of motive power for vehicles and other industrial equipment and machinery), which have in one way or the other affected household and industrial activities in Nigeria. Oil has been a major production sector in the economy and has contributed positively to the nation's trade balance since 1970s.

However, oil has also impacted negatively on the economy, given the economy's oil dependence. Nigeria is abundantly rich in crude oil and has earned billions of petrodollars. Nonetheless, the country seems to be facing the problem of successfully translating this huge oil wealth into sustainable development. In recent years, 95% of government revenue and 99% of total exports were derived from oil. The economy is highly monoproduct. This is unsustainable for the economy given the depletable nature of oil and its price volatility. The latter renders the economy vulnerable to external shocks and subject its development to multiple ''fractures'' (Ogunleye, 2008). Nigeria has over the years experienced the boom and bust cycles of the world oil market. This situation has often times manifested in the overvaluation of its currency (the Naira), leading to increases in the prices of non-tradable goods and services, thus hurting the rest of the tradable goods sector. According to Iwayemi (1994), the overdependence on commodity (agricultural) exports as the main engine of growth in the pre-1970 era was replaced by oil in the post-1970 period.

Experience gained from the last five decades has shown that exporting oil does not readily and mechanically transform poor countries into flourishing economies. In earlier years, many experts thought the 'black gold' would guarantee sustainable economic development. Evidently, their expectations are markedly off target with respect to Nigeria because the country still has a sluggish-than-expected economic growth, poor economic diversification, dismal social welfare indicators, devastating environmental impacts, high

[2] Oil revenue as percentage of total government revenue stood at 76.6%, 84.5%, and 83% in 2000, 2005 and 2008, respectively.

level of poverty[3] and inequality, rampant corruption, high incidence of conflict and exceptionally poor governance.

According to Gelb (1988), natural resources availability and any consequent boom should relax the three traditional constraints of economic development, namely, fiscal revenues, domestic savings and foreign exchange, but, it is evident this is not the case in Nigeria. The truth is, crude oil resource availability and its boom have resulted in the economy being extremely dependent on oil at the detriment of the other sectors. The need to correct the existing structural distortions and put the economy on the path of balanced and sustainable growth is, therefore, compelling. This no doubt requires new thoughts and initiatives.

Arguably, the oil sector is indispensable in the Nigerian economy. Issues or policies relating to oil production, exportation and above all, how this can be harmonised with the potentialities embedded in the non-oil sector to achieve sustainable growth and development should be of utmost importance to policymakers. The extent to which these issues are adequately understood and carefully constructed will determine the future economic performance of Nigeria.

From the foregoing, two research questions become pertinent. They are: what is the size of the effects of oil resource abundance[4] on investment in the activity sector[5] of the Nigerian economy? And, what is the magnitude of these effects on the output of the activity sectors?

1.3: Objectives of the study

In broad terms, this study empirically examined the effects of ORAon sectoral investment and output in Nigeria. The specific objectives are to:

[3]Nigeria fares much worse on measures of poverty and income distribution. Between 1970 and 2000, the poverty rate, measured as the share of the population subsisting on less than US$1 per day increased from close to 36% to just under 70% (Sala-i- Martin and Subramanian, 2003)

[4]In this study, ORA will be used interchangeably with oil resource dependence.

[5]According to the CBN (2009), the activity sector in broad terms includes; agriculture, industry, building and construction, services and wholesale as well as retail trade.

i. estimate the effects of ORA on investment in the activity sector of the Nigerian economy; and

ii. evaluate the magnitude of the effects of ORA on the output of the activity sector.

1.4: Justification for the study

The justification for this study is threefold – covering theoretical, methodological and empirical issues. In general terms, there are a number of studies (for developing and developed countries) that examined the relationship between resource abundance and economic development. A considerable number of these studies adopt what the literature classifies as "the channel approach" (Ogun[6], 1990; Sachs and Warner, 1995; Ajayi, 2002; Sala-i-Martin and Subramanian, 2003; Papyrakis and Gerlagh, 2004; Jacob, 2010). A little departure from the status-quo (in the case of Nigeria) was Ogunleye (2008) who empirically examined the longrun impact of the huge oil wealth accruing to Nigeria on its economic development. His approach is consistent with the "direct impact approach". This study established innovative ties and robust bridge between the two approaches. Unlike most previous studies (Sala-i-Martin and Subramanian, 2003 and Jacob, 2010) preoccupied with the aggregate economic impacts, this study focuses on sectoral adjustment processes to ORA in Nigeria.

Second, unlike most previous studies, this study contributes to knowledge methodologically by adopting a standard econometric method of analysis. This method is the macro-econometric[7] modeling approach which involves the use of econometric recursive algorithm such as Gauss-Siedel, Newton and Broyden to solve and obtain parameters for policy simulations/forecasts. Most previous studies employ the single-equation (direct) approach that ignores the possibility of simultaneity bias (Ding and Field, 2004; Rodriguez and Sachs, 1999; Egert and Leonard, 2007; and Odularu, 2008). The use of macro-models enables policymakers to build alternative policy evidence, and

[6]Ogun (1990) examined the monetary effects of an export boom in Nigeria.

[7] According to Valadkhani (2004) a macroeconometric model is a 'quantitative analysis of an economy via the estimation or computation of an interrelated system of equations using economic theory, data and a good knowledge of econometrics to achieve three objectives, viz., structural analysis, forecasting and policy evaluation'. These three objectives, however, correspond, respectively, to the descriptive, predictive, and prescriptive uses of econometrics (see Intriligator, *et al*; 1996). What then emerges from this definition is that modellers use econometric models to examine structural relationships amongst variables, predict the behaviour of variables, and/or make policy inferences.

thus, this approach proves to be superior to the alternative approaches based on intuitive or judgmental criteria. More so, the macro-econometric model of this study incorporates current econometric tools by considering the time series properties of macroeconomic variables that feature in the models. In addition, the small-scale macro-econometric model possesses the structure necessary to conduct appropriate or logical policy analysis and capable of supporting economic projections consistent with Nigeria's macroeconomic environment.

Although efforts are still ongoing at the top policy level, such as the National Planning Commission (NPC), the Central Bank of Nigeria (CBN), and the Ministry of Finance, Nigeria is yet to develop a fundamental macro model that can be used for policy projection and forecasts. At the research level, two studies have remained prominent; namely Soludo (1995) and Olofin and Iyaniwura (1983). Soludo (1995) built a medium-sized macroeconomic model of the Nigerian economy that captures only the basic elements of the SAP policy environment. On the other hand, Olofin and Iyaniwura (1983) built a macro model of the Nigerian economy to investigate the transition from an oil-based economy to a stage characterised by increased diversification of exports and more sectoral balanced growth. The two models have some challenges. For instance, the Soludo's model is aggregative in nature. It requires the refinements of the supply block and alternative modelling of exchange rate behaviour. Olofin and Iyaniwura (1983) complained of data constraints and covered only a very short-term, 1960 to78, calling into question the consistency of the estimates. The model of this study recognised these gaps and in an attempt to validate and appraise the models, historical simulation was carried out.

Third and on the empirical front, since this study does not employ exactly the same variables as most previous studies, its empirical results emerged obviously different. For instance, most studies[8] that have adopted the impact approach usually examine only the manufacturing and the agricultural sectors. In this study, however, the macro-econometric models built do not only capture these two sectors but also two additional sectors, namely,

[8] see paragraph one of this section

the building and construction[9] and the services sectors that have not received much attention in previous studies. At least, the services sector has witnessed phenomenal growth in recent times more generally occasioned by the liberalisation and privatisation policies pursued by the government, ignoring these sectors may lead to omission bias problem and consequently, result in biased and inefficient estimate. This paradigm shift has added to the empirical results of this study and also provided more robust evidence for policy purpose.

1.5: Scope of the Thesis

The focus of this study is to empirically estimate the effects of ORA on the sectoral performances of the Nigerian economy. The sectors of interest are; agriculture, manufacturing, building and construction as well as services. The study covers 1970 to 2010. This period is considered for two reasons; It allows the researcher to track histories that explain the effects of ORA on the Nigerian economy, and the period provides uniform availability of data set for the variables of interest.

1.6: Plan of the Thesis

The rest of this thesis is structured as follows. This introductory chapter is followed by chapter two, with the central theme; 'ORAand the Nigerian macroeconomic performance'. Specifically, this chapter presents the general review, brief history, and a brief comparative analysis of the performance of oil and other key sectors of the Nigerian economy. The last section of the chapter dwells on oil revenue management in Nigeria.

Chapter three focuses on the literature review. It highlights the theoretical, methodological, and empirical literature on the effects of ORA on the economy. The theoretical framework and methodology are contained in chapter four. The theoretical underpinnings are discussed in this chapter. Also, discussed in this chapter is the model formulation and a flowchart that reinforces the theoretical framework and major linkages in the model blocks.

[9] One of the indicators of growth in any given economy is the construction industry and the number of buildings.

Chapter five presents the results from the estimated equations of the model, their interpretations and simulation results. Chapter six, is on the summary, conclusion and policy lessons emanating from this study. The limitations and suggestions for future research are also treated in this chapter.

CHAPTER TWO

BACKGROUND TO THE STUDY

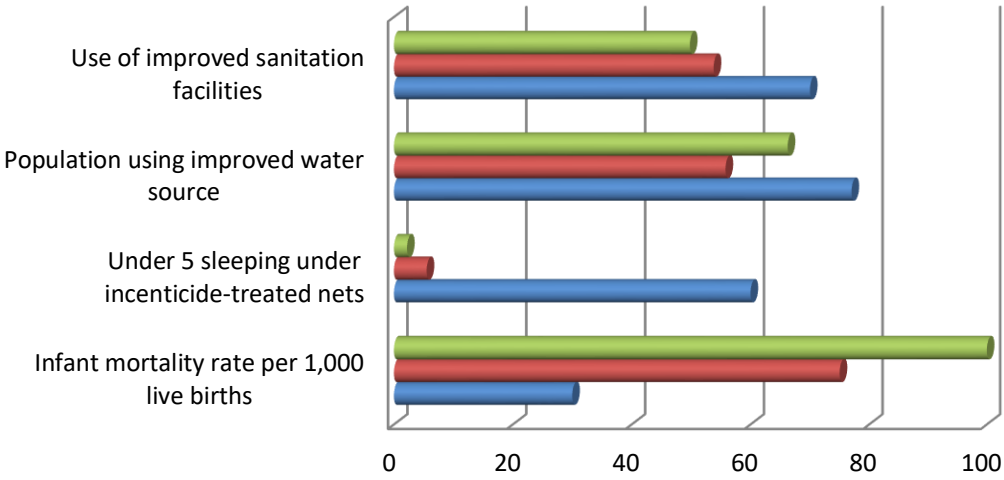
Broadly, this chapter presents the background to this thesis. It begins with an overview of the Nigerian macroeconomic environment, moving on to the analysis of the output performance of the Nigerian macroeconomy as well as the sectoral performances. This is followed by a brief history of oil in Nigeria. Next, is the section on ORA and the Nigerian economy. Following this, is a section that captures issues relating to oil revenue management. The last section puts in perspective issues on some of the major challenges of the Nigerian economy.

2.1: An overview of the Nigerian macroeconomic environment

Nigeria has abundant supply of natural and human resources. Its estimated population of over 160 million people makes it the most populous country in Africa. Shortly after its independence, Nigeria experienced several years of military rule and poor economic management, which culminated in prolonged period of rising poverty level, economic sluggishness, and the decline of its public institutions. Besides, the grossly inadequate public investments in the preceding decades meant infrastructural bottlenecks that mired private sector activities. Specifically, the poor state of the power sector prior to economic reforms illustrated the gravity of Nigeria's infrastructure insufficiency. Iwuala and Okonjo (2007) observe that Human Development Indicators (HDIs) in Nigeria were comparable to other less developed countries in spite of widespread corruption which undermined the effectiveness of various public expenditure programmes.

Figure 2.1 showcases some selected human development indicators, namely use of improved sanitation facilities, population using improved water source, under-five children sleeping under insecticide–treated nets and infant mortality rate per 1000 live births. Except for infant mortality rate, Nigeria still needs to do a lot of catching up to meet the MDGs target for 2015. In terms of under-five children sleeping under insecticide-treated nets, Nigeria is still too far from meeting the 2015 target (2.2%-2003; 5.5%-2008; and 16%-2015). Figure 2.2 compares Nigeria with some of its contemporaries, namely South Africa, Malaysia and Indonesia. The truth that emerges

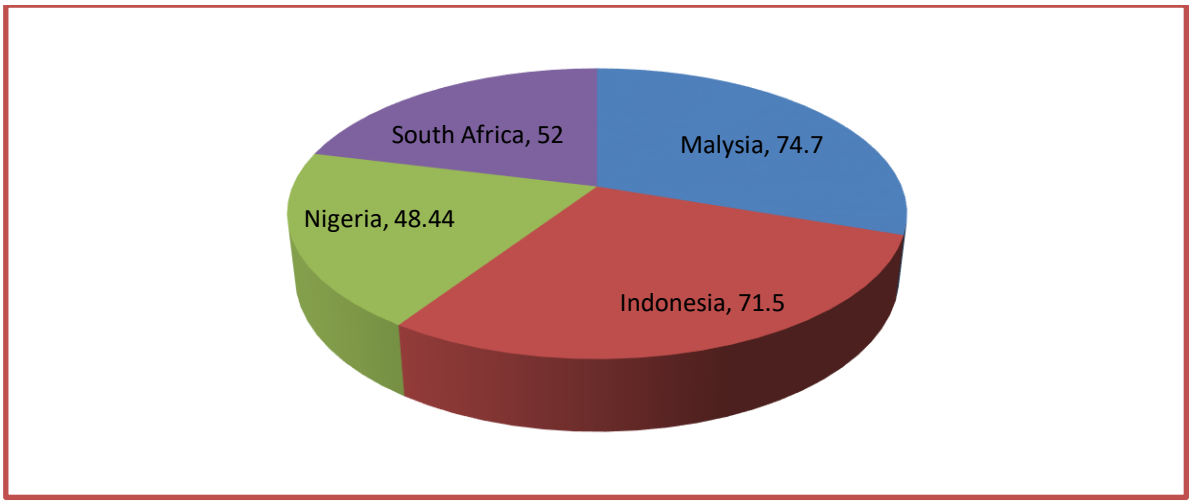
from the two Figures is that due to wasteful spending, Nigeria has dismal HDIs which are inconsistent with the scale of its earnings. For example, using life expectancy as a proxy to measure how Nigeria score on human development, 48.44 years for Nigerians fall short of the 52 years for citizens of South Africa, 71.5 years for Indonesia, and 74.7 years for Malaysia (Figure 2.2). Indeed, Nigeria qualifies to serve as the world record holder in the rank of countries blessed with abundant natural resources that tend to have poor human development scores. In the face of its lagged human development scores, Nigeria has continued with its spree on oil revenue and as such became stuck in recurring decline of its national competitiveness.



	Infant mortality rate per 1,000 live births	Under 5 sleeping under incenticide-treated nets	Population using improved water source	Use of improved sanitation facilities
2003	100	2.2	66.25	49.8
2008	75	5.5	55.8	53.8
MDGs Target for 2015	30	60	77	70

Source: **Author's initiative with data obtained from NPC (2011).**

Figure 2. 1: Selected Human Development Indicators for Nigeria.



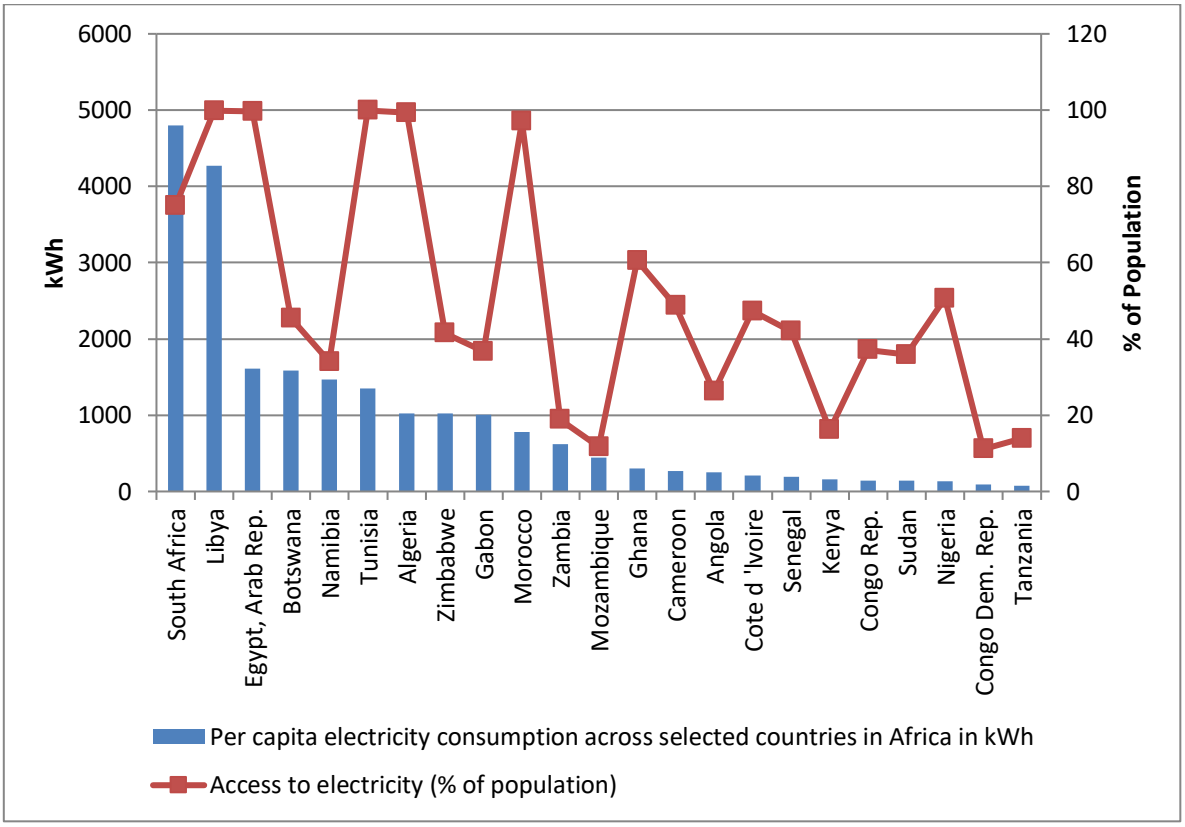
Source: **Author's initiative with data obtained from NPC (2011).**

Note: Life expectancy at birth is measured in years.

Figure 2. 2: Life Expectancy at Birth in 2010.

Further, the story of the Nigeria's electricity sector since independence has been a sorry one. Per capita power consumption in Nigeria was 82 kilowatts (kW) compared with an average of 456kW in other Sub-Saharan African (SSA) countries and 3,793kW in South Africa (Iwuala and Okonjo, 2007). According to the IEA (2012), in 2008, total energy consumption in Nigeria was 4.4 Quadrillion Btu (111,000 kilotons of oil equivalent). Of this, combustible renewables and waste accounted for 81.3% of total energy consumption. This high percentage share represents the use of biomass to meet off-grid heating and cooking needs, mostly in rural areas. IEA data for 2009 reveal that electrification rates for Nigeria were 50% for the country as a whole - approximately 76 million people do not have access to electricity in Nigeria.

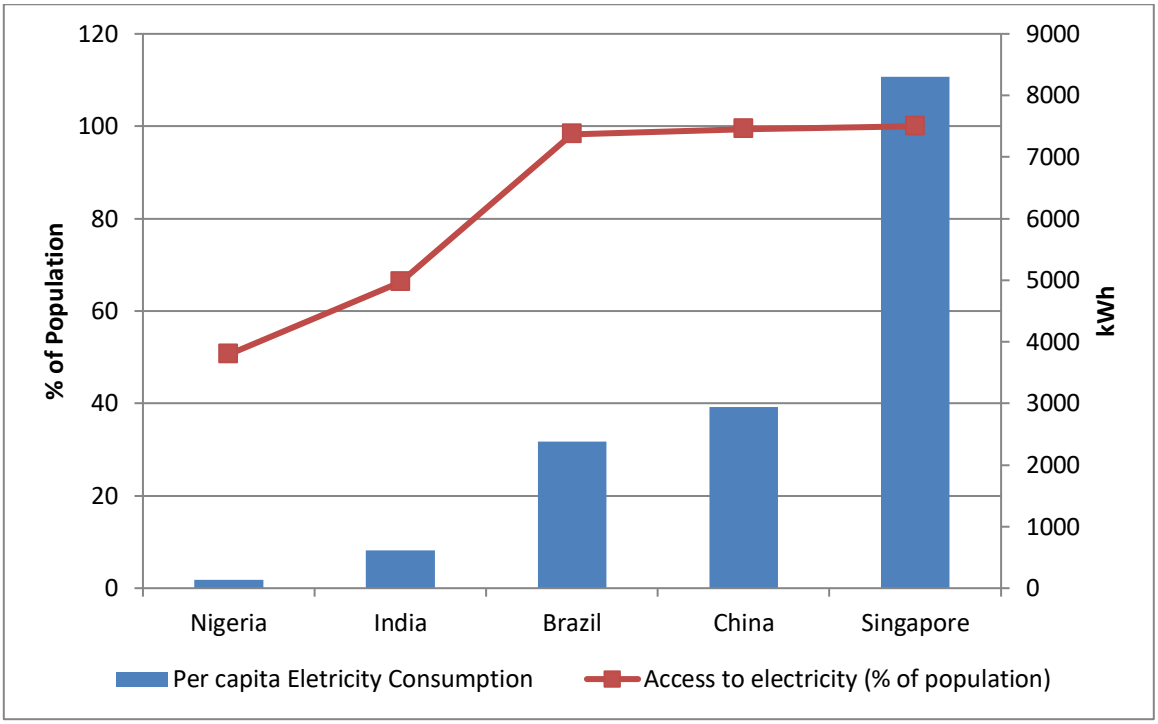
Figure 2.3 on per capita electricity consumption and access to electricity across selected African countries shows that actions and not words are needed to remedy the electricity crises in Nigeria. It is disheartening to notice that out of the 23 African countries examined in the Figure, Nigeria is in the 21st position (136kWh), coming just after Sudan (141kWh) and before Congo Democratic Republic (95kWh). The percentage of the Nigerian population that have access to electricity is still low. This situation, no doubt, does not present a promising macroeconomic environment. It is also observed from the Figure that South Africa (4,803 kWh) led the countries, followed by Libya (4,270 kWh) and then Egypt (1,608kWh). Evidence from developed countries reveals that energy drives the growth of an economy. In fact, the history of development is always in tune with the history of energy transition. It is established that a nation that cannot control its energy sources cannot be in charge of its development.



Source: **Author's initiative with data obtained from World Bank (2012).**

Figure 2. 3: Per capita electricity consumption in kWh and access to electricity across selected countries in Africa in 2010.

A comparison of Nigeria with other countries which it aims to meet up with or overtake at least in its bid to become one of the largest 20 economies in the world, shows that the country still lags far behind (Figure 2.4). The Figure clearly reveals that Nigeria is still behind in terms of per capita electricity consumption and access to electricity. It is clear that while per capita electricity consumption in Nigeria in 2,010 was 136kWh, it was 616kWh in India, 2,384kWh in Brazil, 2,944kWh in China and 8,307kWh in Singapore. Also, from the Figure, it is realised that every person residing in Singapore has access to electricity as against the case of Nigeria where only 50.6% of the total population has access to electricity. Given the huge size of the Nigerian population, this percentage figure is not a small one. It simply means that more than 75 million people residing in Nigeria do not have access to electricity. The truth is that low access to electricity has been generally identified as one of the major causes of macroeconomic stagnation. To some, electricity is the fulcrum upon which the wheel of progress revolves. The obvious truth is that modern agriculture, manufacturing and services cannot thrive under this insignificant electricity supply in Nigeria.



Source: **Author's initiative with data obtained from World Bank (2012).**

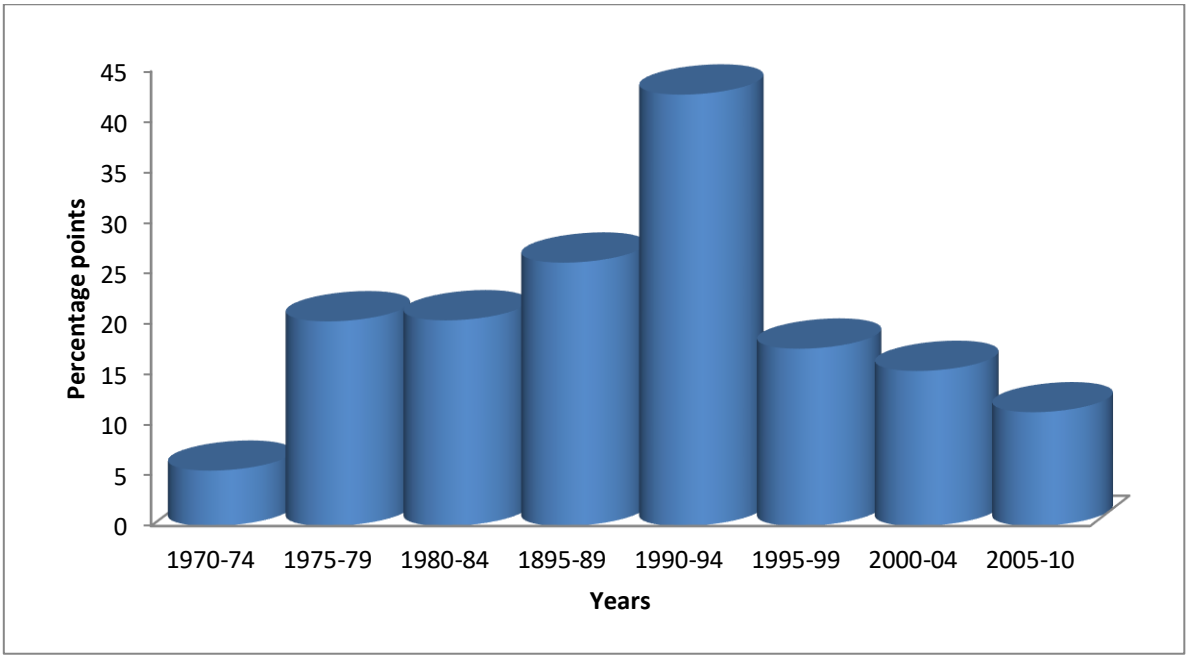
Figure 2. 4: Per capita electricity consumption in kWh and access to electricity in some selected countries in 2010.

The Nigerian electricity sector experienced mixed fortunes from 2008 to 2010. The sector recorded a growth rate of 48.42% in terms of generation capacity in 2009 although installed capacity dipped by -15.58% during the year. Specifically, generation capacity improved from an average of 2,226.68 MW/H between 2005 to 2008 to 2,900 MW/H in 2009. But installed capacity declined from an average of 7,631.50 MW between 2005 to 2008 to 7,150 MW in 2009. Capacity utilisation trended the same direction with generation capacity, increasing from 23.07% in 2008 to 39.16% in 2009. The capacity utilisation attained in 2009 compared favourably with an average of 29.67% for 2005 to 2008. Given Nigeria's population and the desire to sufficiently power the industrial sector, generation capacity remains grossly inadequate as does capacity utilisation. Low water level and vandalisation of gas pipelines have been identified as critical factors stalling improvements on these fronts (NPC, 2011).

Next, one of the major determinants of the macroeconomic environment of Nigeria is considered. This is the inflation rate which has the potentials to undermine any given economy if it not properly managed. The monetary value of a nation can go under and deteriorate significantly when contending with serious inflation, thus, a once thriving economy can turn below par with depressing currency, reduced productivity and Gross Domestic Product (GDP).

Analysis of data from the CBN (2010) presented in Figure 2.5 shows that average inflation rate from 1970 to 1974 stood at 5.5%. The average inflation between 1975 and 1979 grew higher to 20.3% and even slightly higher between 1980 and 1984 (20.4%). The average inflation rate from 1985 to 1989 was 26.1%. Nigeria recorded its highest inflation rate between 1990 to 1994, when the average inflation rate stood at an all high value of 42.7%. This period, no doubt, was associated with disturbing macroeconomic trend in Nigeria. From 1970 to 1994, inflation rate was on the rising trajectory. However, beyond 1990 to1994, the rate began to wane. For instance, it dropped from 42.7% (1990-1994) to 17.6% (on average) between 1995 and 1999. It shrunk further to 15.4% from 2000 to 2004. From 2005 to 2010, the annual average inflation rate came down to 11.3%. Though these recent rates need not to be celebrated, they at least indicate some improvement in the management of the Nigeria's macroeconomic environment. The uncontroversial truth

is that to make the macroeconomic environment of Nigeria attractive to the indigenous and foreign investors, inflation rate must be confined to a single digit.



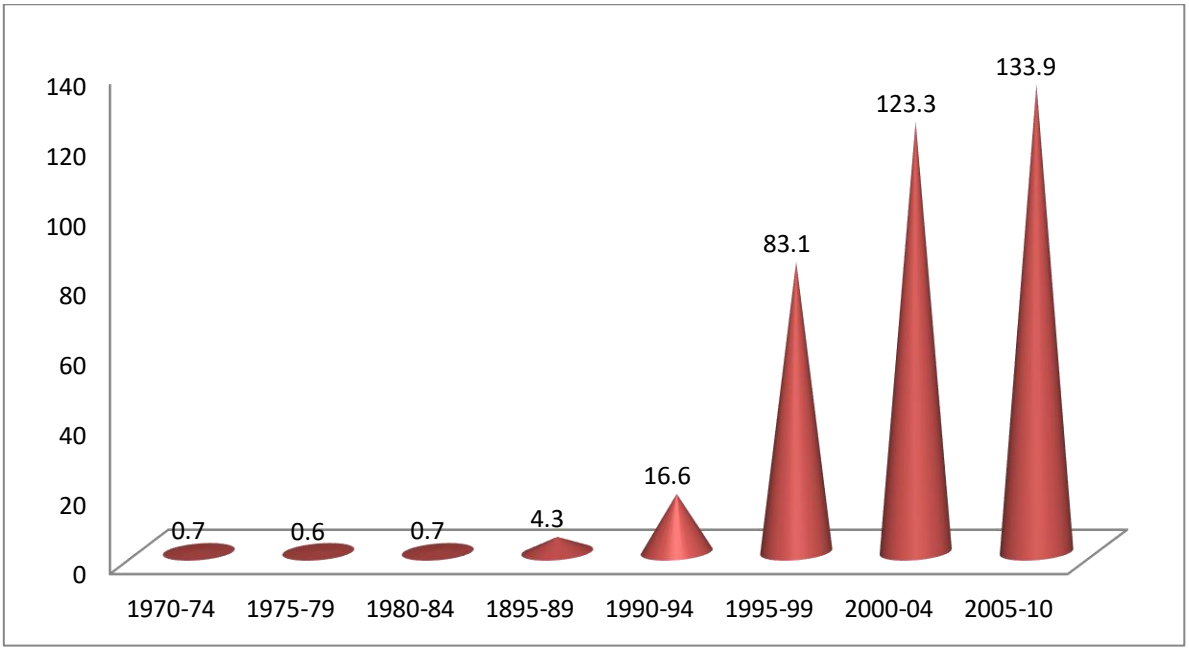
Source: **Author's initiative with data obtained from CBN (2012).**

Figure 2. 5: Inflation Rate in Nigeria (Average Annual %).

Next, the trend of exchange rate in the Nigerian economy is characterised. Exchange rates are essential because the value of money is not the same universally. For instance, if the value of exchange rate in one country is higher than it is in another, it means that the value of money is worth more when trading with a country which has money of a lower exchange rate.

In Nigeria, the exchange rate policy has undergone substantial transformation from the immediate post-independence period when the country maintained a fixed parity with the British pound, through the oil boom of the 1970s, to the floating of the currency in 1986, following the near collapse of the economy between 1982 and 1985. In each of these epochs, the economic and political considerations underpinning the exchange rate policy had important repercussions for the structural evolution of the economy, inflation, the balance of payments and real income (Dada and Oyerenti, 2012).

From Figure 2.6 it is observed that in the 1970s and 1980s, the Naira official exchange rate with the US Dollar was favourable to the Nigerian economy. In fact, the Figure reveals that within the periods, Nigeria's Naira had a higher value than the US Dollar. This implies that one US Dollar traded for less than one Nigerian Naira, this began to change as from the 1990s. For example, the average Naira official exchange rate with the US Dollar from 1990 to 1994 stood at 16.6 Naira. However, between 1995 and 1999, the average figure grew to 83.1 Naira and even higher to 123.3 Naira between 2000 and 2004. From 2005 to 2010 the average of the Naira official exchange rate with the US Dollar rose to 133.9 Naira. The upward trending exchange rate, indicates that the value of Naira in the international arena is going down, this has advantages and disadvantages. The advantage is that it would have boosted the export of made in Nigerian goods assuming Nigeria were to be a producer of export goods. The obvious disadvantage that arises is that the upward trending exchange rate makes imported goods more expensive. The domestic industries would have taken advantage of this to boost their competitive position internationally but could not do so given the harsh macroeconomic environment they contend with.

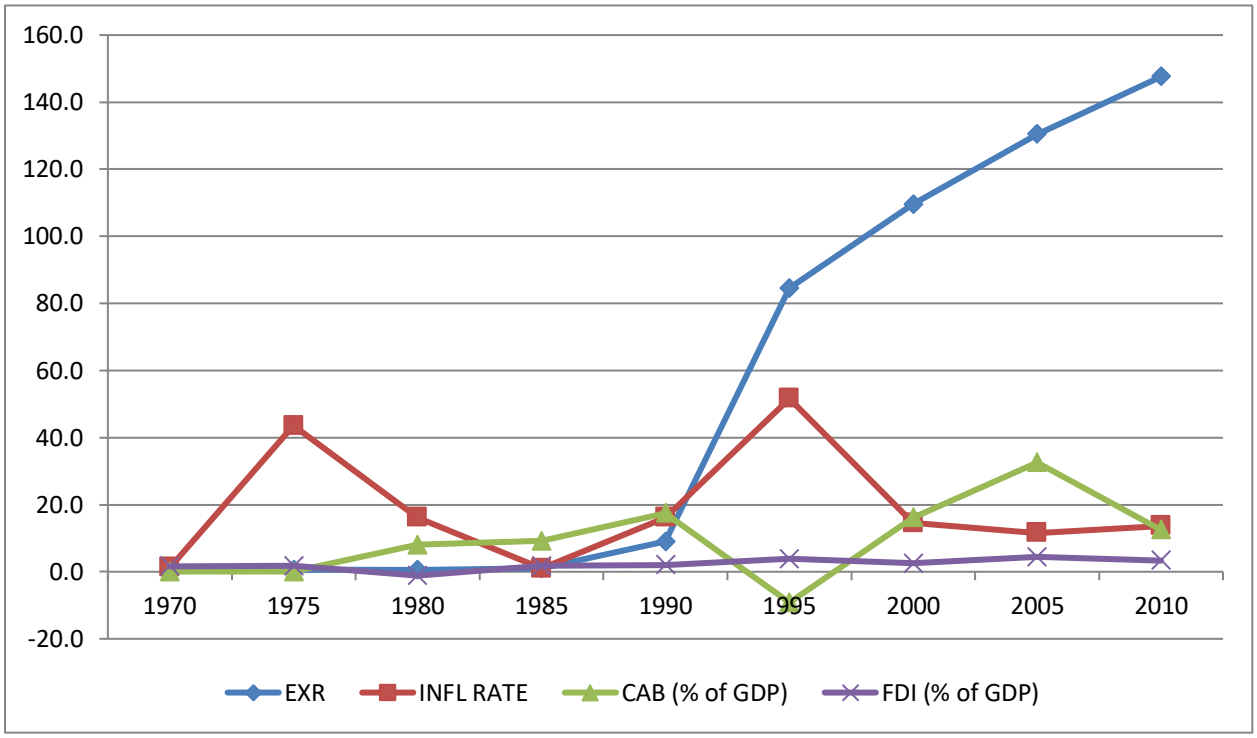


Source: **Author's initiative with data obtained from CBN (2012).**

Figure 2. 6: Five year average Naira official exchange rate with the US Dollar

Figure 2.7 shows the trend of some macroeconomic indicators in Nigeria. It reveals that the exchange rate (EXR) remained unchanged over the period before the introduction of the free floating regime in 1986. This trend changed following the subjection of the exchange rate to the forces of demand and supply and has since remained on the rising curve. Sequel to this is the sharp jumps witnessed in the inflation rate (INFL RATE). There was a spike in inflation rate between 1970 and 1975 and to 1980. Of all the periods captured in the Figure, 1975 and 1995 had the most inflationary jumps. It also shows that inflation rate begun to fall after 1995 until 2010 when it marginally resumed a rising trend. The fall in the inflation rate after 2000 could be attributed to the macroeconomic stabilisation policies of the then civilian government.

Figure 2.7 further reveals that percentage contribution of the current account balance (CAB) to the GDP kept rising until 1990 before it decreased in 1995. In fact, from 1990 to 2000, inflation rate and CAB moved in opposite directions. Another fact worthy of notice is that the percentage contribution of CAB to the GDP in 1995 dropped by 9%. However, it recovered and contributed a high value of 33 % in 2005 before decreasing gradually to 13% in 2010. Also from the Figure, one observes that the percentage contribution of the Foreign Direct Investment (FDI) to the GDP remained at the background during the entire periods covered. This inconspicuousness of the FDI's contribution to the GDP could as well be traced to the unstable macroeconomic environment in Nigeria which scared investors away. At least, a case at hand is the Boko Haram insurgence which came just as the attacks by the Niger Delta militants waned. This disturbing trend points to the need that a lot should still be done by the government to restore the confidence of investors, to put the economy on the path that leads to sustained growth and development.



Source: **Author's initiative with data obtained from CBN (2012).**

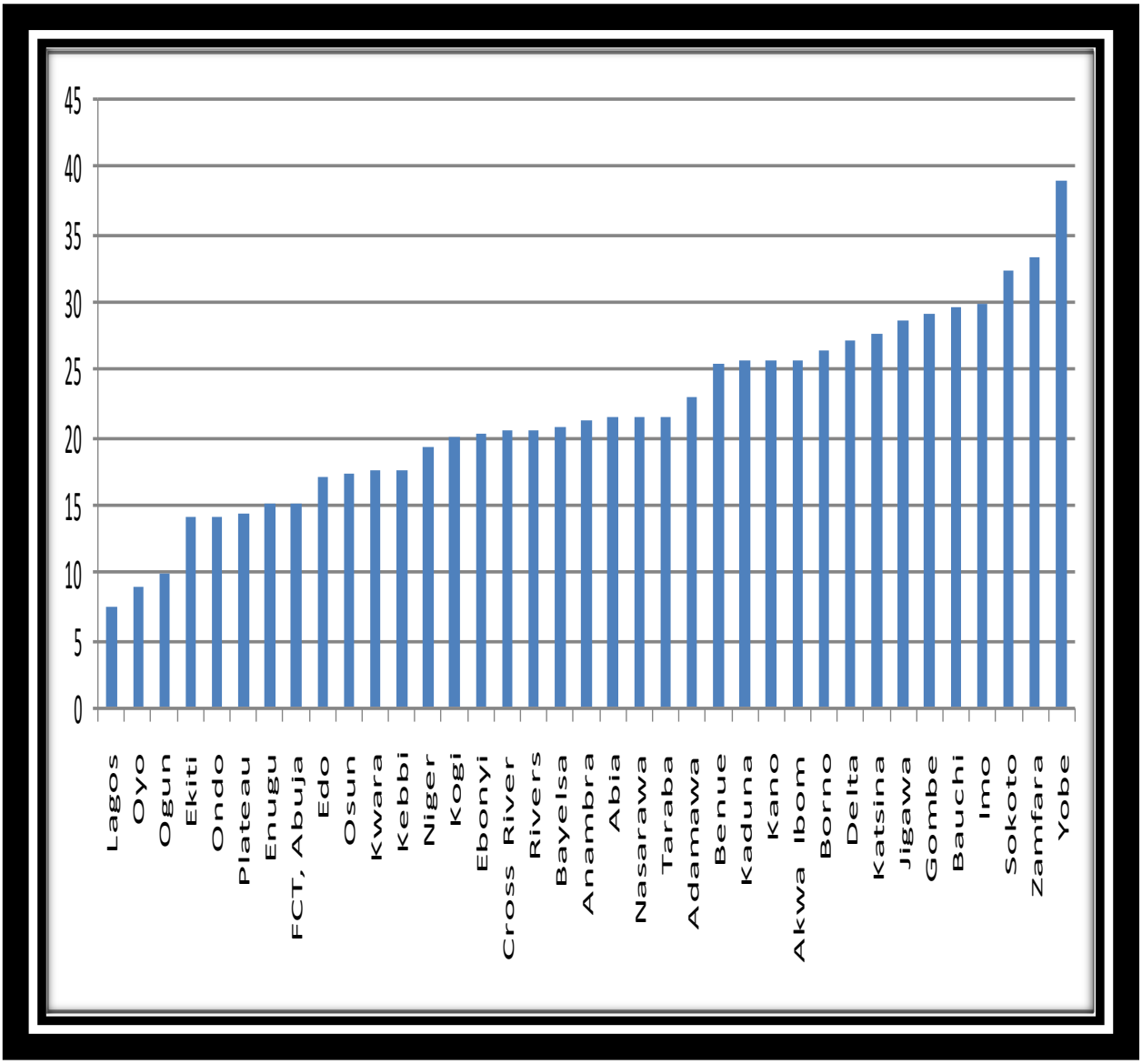
Figure 2. 7: Trend of some Macroeconomic Indicators in Nigeria.

The problem of unemployment is hydra-headed in Nigeria. It has been around for a long time, defying all attempt to solve it. Bello (2003) notes that, the subject of unemployment has always been an issue of serious concern to economists, policymakers and economic managers; giving its devastating effect on individuals, the society and the economy at large. NBS (2008) documents that in recent times, the incidence of unemployment has been deep and widespread, cutting across all facets of age groups, educational strata and geographical entities. One peculiar feature of the unemployment problem in Nigeria is that considering 1960 to 1990, it was more in the early 1980s. For instance, unemployment rate rose from 4.3% in 1976 to 6.4 % in 1980 (NBS, 1990). The unemployment rate oscillated between 5.3% and 6.4% between 1980 and 85 and between 2.8% and 4.7% during 2000 to 2004. It grew sharply to 14.6% in 2005. In 2007, unemployment rate in Nigeria stood at about 14% and later rose to 21.10% in 2010 (NBS, 2011). The truth is that the level of unemployment in Nigeria poses a great threat to the peace of the nation if left unchecked by government.

NBS (2011) further reveals that economic growth in Nigeria has not been accompanied by significant employment creation as unemployment rate soared. This inclined the economy to more youth restiveness, given the prevalence of unemployment among the youths. The economic downturn did not only discourage new investment, but also forced government to implement stabilisation measures including restrictions on importation. Given the high import-dependency of most manufacturing enterprises, the import restriction forced many companies to operate below installed capacity, causing most of them to close down or retrench a significant proportion of their workforce.

The national unemployment survey by the NBS (2011) shows that among the 36 states plus the Federal Capital Territory (FCT), Lagos State has the lowest unemployment rate (7.5%) in Nigeria. This could be ascribed to enormous economic opportunities available in the state. The unemployment rate in Lagos State is noticeably lower than those in its surrounding states, Oyo (8.8%), Ogun (9.9%), Ekiti (14.0%), Ondo (14.1%), and Osun (17%) (Figure 2.8). States like Cross River, Rivers and Bayelsa found in the South-South and Anambra, Abia, and Eboyi located in the South-East fall within the middle of the rank of the states. The Figure clearly shows that unemployment is highest in Yobe State. From

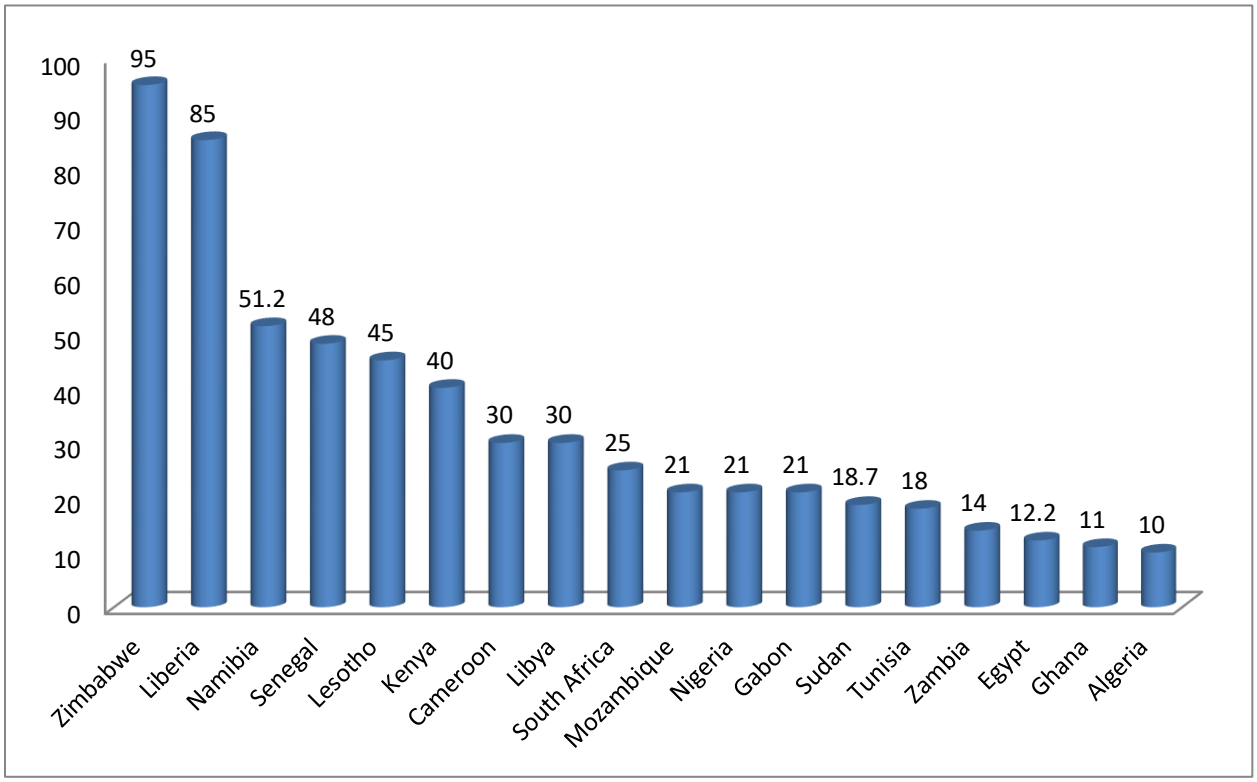
the Figure, one can ascertain that unemployment in Nigeria is more prevalent in the northern part.



Source: **Author's initiative with data obtained from NBS (2011).**

Figure 2. 8: Unemployment by States including Federal Capital Territory (FCT), 2011(%).

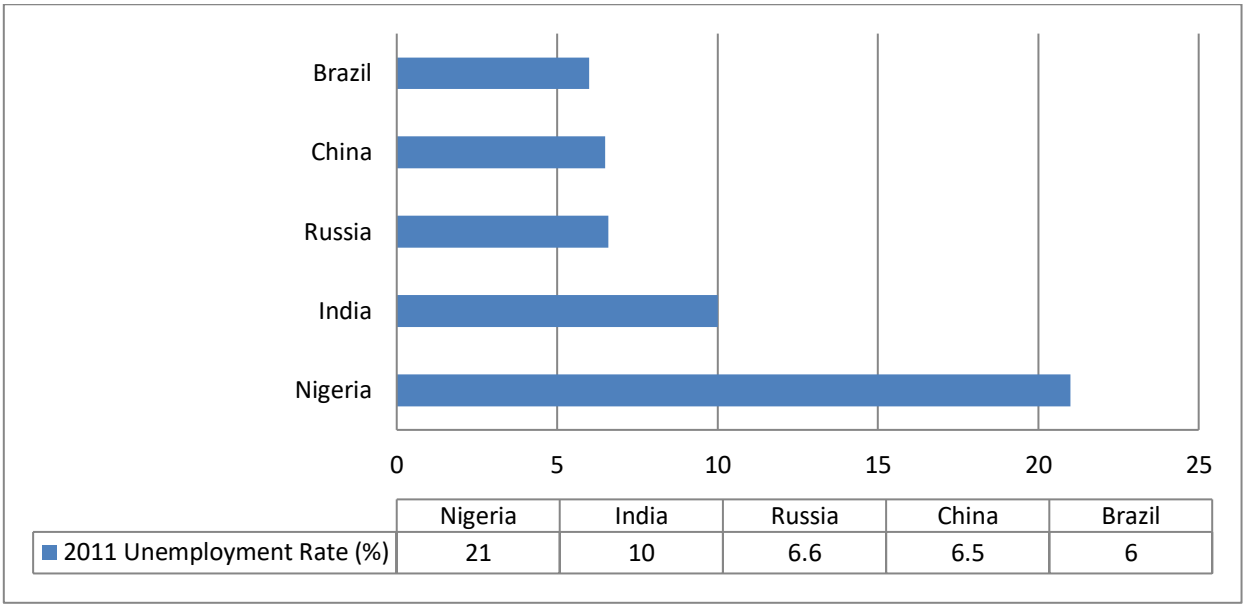
A comparison of Nigeria with some African countries for which their 2011 unemployment rate data are available shows that Nigeria, Mozambique and Gabon, each had unemployment rate of 21% in 2011 (Figure 2.9). As depicted in the Figure, among all the African countries, Zimbabwe had the highest unemployment rate (95%), closely followed by Liberia with an unemployment rate of 85%. It is lucid from the Figure that out of the 18 African countries analysed, Algeria emerged with the lowest unemployment rate of 10%. Egypt and Ghana had unemployment rate of 12.2 % and 11%, respectively.



Source: **Author's initiative with data obtained from CIA World Factbook (2012).**

Figure 2. 9: 2011 Unemployment Rate (%) in some African Countires.

A comparison of Nigeria with the four countries popularly referred to as the BRIC (Brazil, Russia, India and China) shows that unemployment rate is high in Nigeria. Figure 2.10 shows the BRIC's countries dwarfed in terms of unemployment rate by Nigeria. Except India that has unemployment rate of 10%, all others (Brazil, Russia, and China) had a less than 7% unemployment rate in 2011. Even with its huge population size, China had 6.5% unemployment rate. Thus, Nigeria has no reason for turning out a high level of unemployment rate regardless of its population.

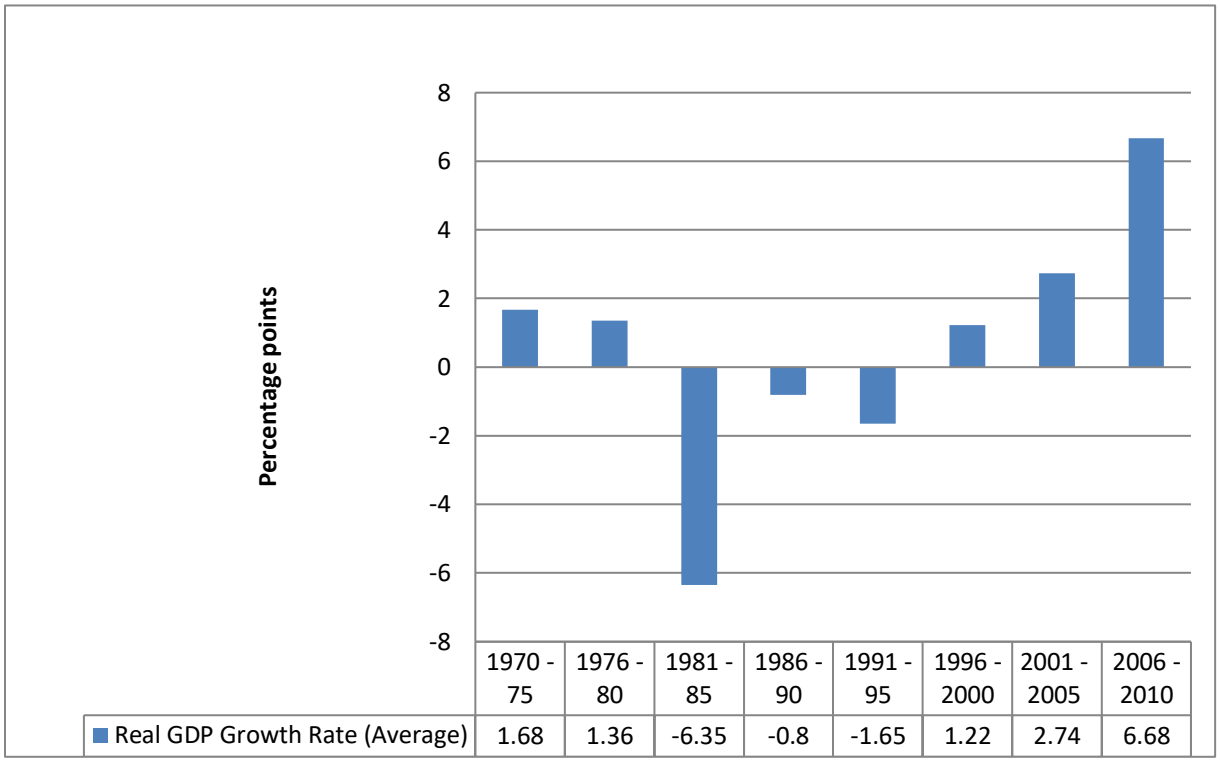


Source: **Author's initiative with data obtained from CIA World Factbook (2012).**

Figure 2. 10: 2011 Unemployment Rate (%) (Analysis of Nigeria and the BRIC)

2.2: Output performance of the Nigerian economy

Nigeria recorded positive growth rates in its Real Gross Domestic Product (RGDP) in the early 1970s. For example, the growth rate of RGDP rose consistently from 2.8% in 1972 to 8.3% in 1974, this was attributed to the first positive oil price shock in 1973. In spite of negative growth rates in 1975 and 1978, Nigeria on the average still recorded a positive growth rate in its RGDP of 4.09% over 1971 to 1980. Between 1981 and 1985, the RGDP dropped by 6.35%, the huge decline reduced to 0.80% between 1986 and 1990. This decline has been traced to imprudent fiscal policy, especially poor quality of public spending. The growth rate of the RGDP of Nigeria for 1991 to 1995 stood at -1.65%, before increasing to 1.22% from 1996 to 2000. From 2001 to 2005, growth rate on average became 2.74% and later rose to an all high value of 6.68% between 2006 and 2010 (Figure 2.11).



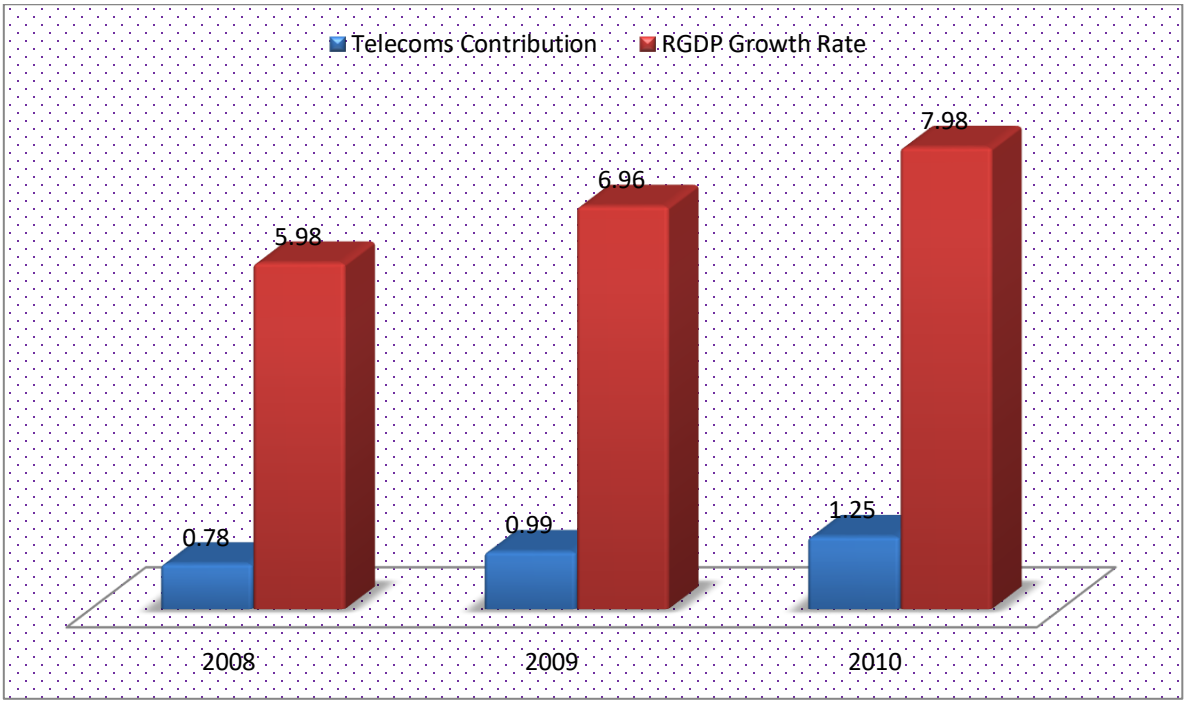
Source: **Author's initiative with data obtained from WDI (2011).**

Figure 2. 11: Nigeria's Real Gross Domestic Product (RGDP) growth rates (1970 - 2010)

At current population growth rate of 3.2% and a total population figure of 159.28million in 2010, the real GDP growth rate of 7.86% in 2010 led to real per capita growth rate of 4.52%. Further, at current basic prices, data realeased by NPC (2011) reaveal that the per capita GDP which was N160, 637.5 or US$ 1,070 in 2009 rose to N183, 325 or $1,222 in 2010. More so, from 6.66% in 2009, the growth rate of real GDP registered 7.87% in 2010 as recovery of the global economic progressed. This was short of the expected 8.2% growth rates for 2009 in the Federal Government budget and lagged behind double-digit growth rate anticipated for realising the Vision 20:2020 (NPC, 2011).

The analysis of sources of growth shows that non-oil sectors have broadly powered growth in in the recent times. The NPC (2011) reveals that non-oil GDP accelerated by 8.40% while oil and gas registered modest growth rate of 5.0%. The building and construction sectors expanded slightly by 12.07% in 2010 as against 11.97% in 2009. Primary activities, comprising agriculture, solid minerals and oil and gas grew by 5.49% in 2010, reflecting the depressive effects of performance of the oil and gas sector. When decomposed into oil and the non-oil GDP contributions, non-oil GDP share was 89.68% of overall GDP growth – representing a modest structural change in the economy.

The telecommunications subsector of the service sector remained the fastest growing sector of the Nigerian economy at least from 2008 to 2010 (NPC, 2011). Its growth of 34.18% in 2009 almost matches the 34.08% achieved in 2008. This growth was largely driven by mobile lines that expanded by 16.05% in 2009 as against the 55.93% growth rate of 2008. Fixed lines grew by 8.51% in 2009 as against -17.22% in 2008. Meanwhile, teledensity rose from 45.93 in December 2008 to 53.23 in December 2009 (NPC, 2011). Thus, in terms of sectoral contribution to the overall growth rate of the real GDP, the telecommunication sector has consistently remained impressive with its contribution hovering between 0.78 in 2008 and 1.25 in 2010 (Figure 2.12).



Source: **Author's initiative with data obtained from NPC (2011).**

Figure 2. 12: The Percentage Contribution of Telecommunications to the Nigeria's Real GDP Growth Rate.

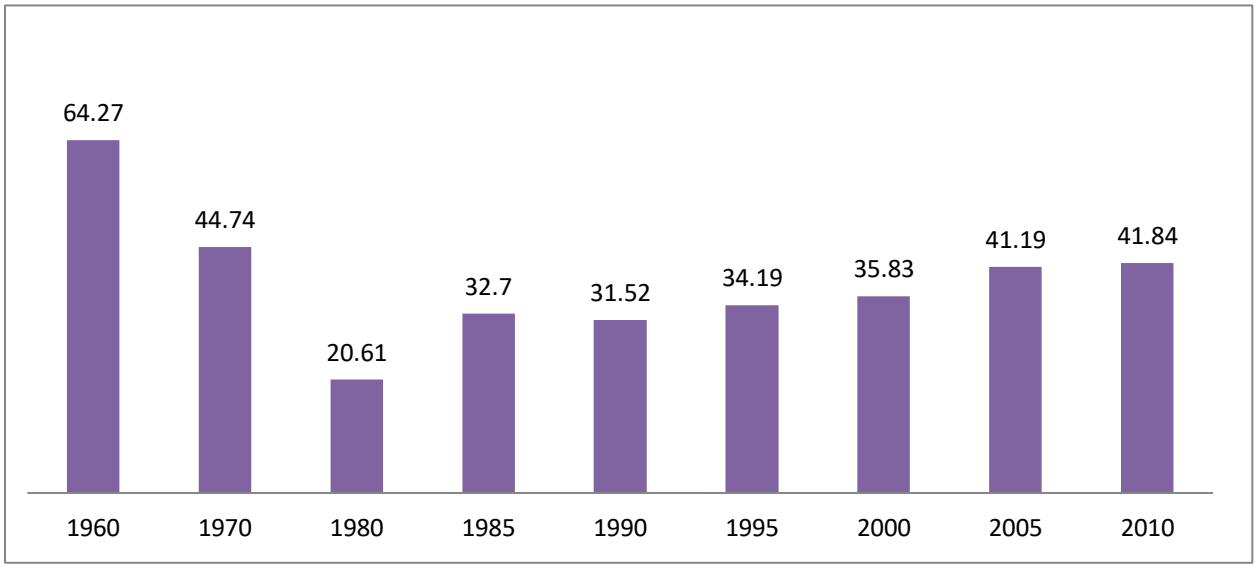
In terms of nominal values, NPC (2011) maintains that the GDP at current basic prices stood at N29.2trillion, equivalent to US$ 194.31 billion in 2010 compared to N24.7 trillion, equivalent to US$164.8 billion in 2009. In retrospect, Nigeria's GDP more than doubled in five years, rising from N14.57 trillion in 2005 to N29.2 trillion in 2010. At this rate of growth, the size of the economy could quadruple to about N210.9 trillion or US $1.1 trillion by 2020. A comparison of Nigerian economy's performance with that of Belgium and Indonesia, which the country aspires to equal in terms of size by 2020 reveals that Nigeria's nominal GDP was a mere 41.1% of Belgium's and 39.8% of Indonesia's in 2008. A disaggregation of 2010 GDP for Nigeria reveals that non-oil and oil GDP totalled N19.39 trillion and N9.8 trillion respectively in comparison to N17.4 trillion and N7.3 trillion respectively in 2009. Further examination of the nominal GDP exposes the dominance of primary production activities in the Nigerian economy compared with secondary production activities. This structure explains the susceptibility of the economy to external shocks.

2.2.1: Sectoral performances

Agriculture

Primary agricultural produce constituted Nigeria's main exports in the first decade of independence. World Bank (1975) and CBN (2000) assert that between 1960 and 1970, on the average, the agricultural sector accounted for about 50% of the GDP and employed 72% of the labour force. Specifically, analysis of data from the CBN (2011) shows that the percentage agricultural sector composition of the RGDP in 1960 was 64.27. Ten years after independence and following the jumbo revenue that accrued to the Nigerian government from the export of crude oil, the sector's composition sharply declined to 44.74%. It even declined further in 1980 when it recorded its lowest contribution value of 20.61%, but it rose sharply to 32.70% in 1985. As at 2000, the percentage agricultural sector composition of the Real GDP grew to 35.83 and even higher to 41.84% in 2010 (Figure 2.13). The story being developed here is that the agricultural sector composition of the RGDP recorded its highest values in the years before the first major positive oil price shock (1973). The composition has never gone as high as 60% since 1970 till date. In contrast, crude oil subsector increased consistently from 1970 to 1990. Thus, while the crude oil subsector has been growing, the agricultural sector remained below its pre-1970

values. This no doubt could be a symptom of the Dutch disease. Daramola *et al* (2007) hold the view that the major cause of the decline in agricultural exports was the oil price shocks of 1973 to 74 and 1979, which resulted in large inflows of foreign exchange and neglect of the agricultural sector.



Source: **Author's initiative with data obtained from CBN (2011).**

Figure 2. 13: Agricultural Sector Percentage Composition of Real GDP in Nigeria

Observably, in the most recent period, the GDP of Nigeria indicated that value-added in the agricultural sector which consists of crops production, livestock, forestry and fishing continued to be the foremost contributor to the economy's strength in 2009 and 2010. About N0.30 trillion (or 41.8%) of total value-added in 2010 came from the sector. In terms of the structure of agricultural output, crops production remains dominant (89.5% of the total in 2010). According to NPC (2011) crop production was the most important sub-sector of the Nigerian economy in terms of source of employment, followed distantly by livestock with a share of 6.4% of total agricultural production in 2010. The performance of the subsector could be ascribed to a number of factors comprising favourable weather, presidential initiatives on some agricultural products, especially cassava, cocoa, cotton, rice, and the promotion of commercial agriculture.

The livestock, forestry and fishing subsectors hold tremendous potentials for growth and development of the Nigerian economy being a principal source of inputs for industrial production. Their combined output in nominal terms totalled N1,113,668.33 billion in 2010. As a share of GDP, they contributed 4.47% in 2010. Their growth performance was moderate with livestock growing by 6.45% in 2010 down from 6.5% in 2009, while fishing output increased by 5.97% and 6.57% respectively, between 2009 and 2010. Forestry production, on the other hand, rose to 5.84% in 2010 from 5.85% in 2009. The sporadic outbreak of avian influenza in the last four years constrained growth of the livestock sector (NPC, 2011).

Ekpo and Egwakhide (1994) affirm that agricultural export commodities contributed well over 75% of total annual merchandise exports in the 1960s. In line with this, Abolagba *et al*, (2010) note that Nigeria was the largest exporter of palm-oil and palm-kernel; ranked second in cocoa and occupied a third position in groundnut. Thus, it is regrettable to note that since after the 1960s, agriculture's share of total export value from Nigeria, has remained small. NACCIMA (2013) claims that the oil sector of the Nigerian economy "is killing the economy". Its position is that the oil sector is affecting businesses in the country negatively by failing to add real value to them. The body maintains that the oil sector has caused substantial decline in agricultural exports, which began in the mid-1960s and continues to date.

Mining and Quarrying

Mining is the extraction (removal) of mineral occurring naturally such as coal, ores, crude petroleum and natural gas. Mining industries have been viewed as key drivers of economic growth and development process (Bradshaw, 2005), and as lead sectors that drive economic expansion which can lead to higher levels of social and economic well-being (Bridge, 2008). In Nigeria, mining remains one of the oldest economic activities, dating back to the ancient times when man crudely exploited clay, iron and perhaps other metals, for the production of items like cosmetics, utensils and other crude implements. Mallo (2012) notes that the history of organised mining in Nigeria began in 1903 when the Mineral Survey of the Northern protectorates was created by the British colonial government. Following this development, the Mineral Survey of the Southern Protectorates was founded one year after. For the next four decades, the mining industry witnessed the influx of British and German foreign mining companies such as the amalgamated tin mining company of Nigeria, Exlands, Gold and Base Metals

Before the discovery of petroleum, Nigeria was notably sustained by agriculture and few solid minerals, namely coal, columbite, gold and tin (Table 2.1). For instance, tin yielded substantial foreign exchange earnings while coal met copiously the needs of Nigeria's railway system and electricity supply. In addition, these minerals presented employment opportunities. The private sector was virtually the dominant operator in the mining industry up to the early 1970s. The indigenisation policy (1972/1977) marked the first noteworthy government involvement in the mining subsector beside the petroleum subsector. The oil boom of the early 1970s heralded the prolonged negligence of mineral investment/development. According to Mallo (2012), it is disheartening to note that the mining of minerals contributed only a meager 0.3% to the GDP of the national economy given the enormous mineral potential of Nigeria. According him, many reasons have been attributed to this abysmal performance, with overdependence on the country's vast and non-renewable oil resources as the most convincing.

Table 2. 1: List of some Minerals in Nigeria.

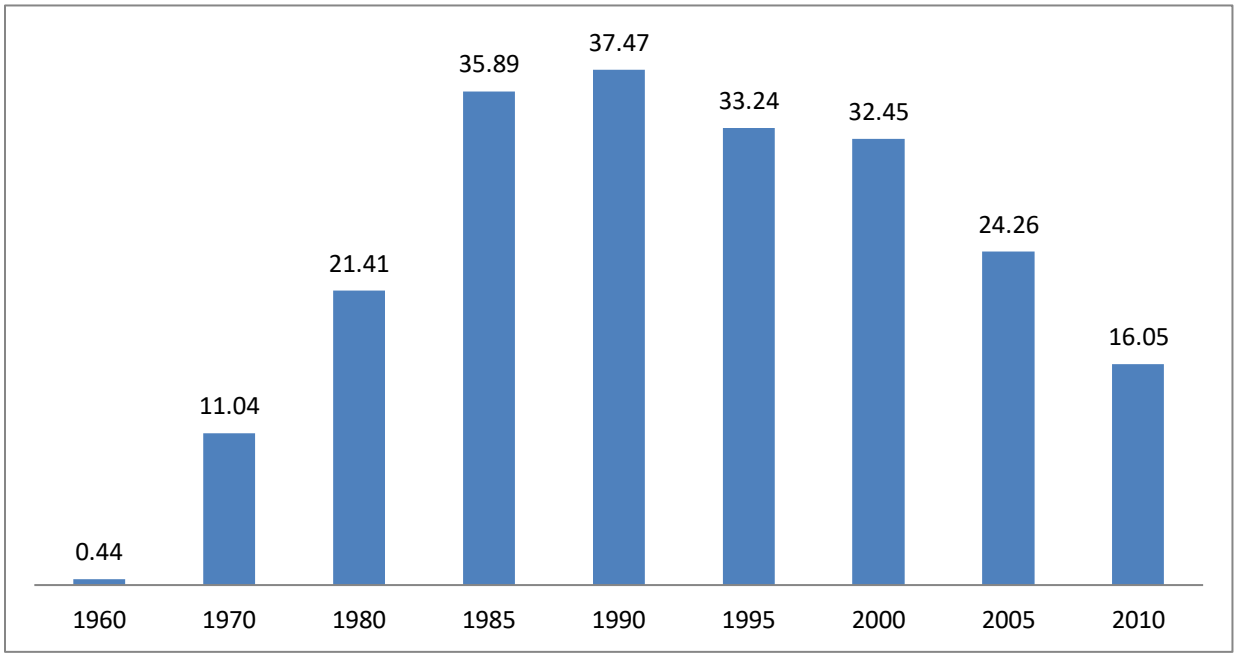
S/N	MINERAL	LOCATION	ESTIMATED RESERVE	USER INDUSTRIES	EXPLOITATION	QUALITY
1	Gold	llesha (Osun State) Niger State ,Igarra (Edo State), Sokoto State Kaduna State, Kwara State		Jewellery and ornament industries	Most of the deposits are not exploited	
2	Lead-Zinc Ore (Galena)	Ririwai (Kano State) Zuru (Kebbi State Wase (Plateau State) Ababaliki (Enugu State) Ohaozara, Ishiagu (Abia) Bauchi, Kogi and Cross River States	1,200,000 (in Abakaliki) other deposits are yet to be analysed	Lead and Zinc for battery manufacturing and engineering industries	Most of the deposits are not exploited	Lead (Pb) 70% Zinc (Zn) 29%
3	Iron Ore	Itakpe (Kogi State), Benue State, Sokoto State, Bauchi State, Borno State, Plateau State, Enugu State	2,500,000,000	Steel manufacture and engineering works	Steel manufacturing and steel rolling mills have been established to exploit some of the deposits.	
4	Columbite	Plateau State, Kaduna State, Buachi State, Kano State, Akwa-Ibom State		Used for producing special steels, ferro-alloys, electronics tube filaments (in rocket and aircraft manufacture)	Small quantities are being exploited. Level of exploitation is < low.	High grade
5	Ilmenite	Jos, Plateau State, Abakaliki in Enugu State		Production of titanium dioxide pigment, and in steel industries	Lack of appropriate technology that can convert ilmenite proven on the Jos Plateau	
6	Cassiterite	Jos, Plateau State, Kwara, Benue, Niger and Ondo State		Tin plating, hardening of copper and lead in alloys	Partial exploration and exploration	High grade
7	Uranium			Ammunition, defense	Very low exploration,	

				industries, generating electricity	investigation and exploitation	
8	Copper	Rishi (Bauchi) Zakare, and Banki in Kano State		Used in ammunition, communication and steel industries	Detailed exploration and evaluation required	
9	Molybdenite	Kigom, Plateau State and Ondo States		Special steel , radar equipment, chemical and paint industries	Detail exploration and evaluation required	
10	Manganese	Kaduna, Niger and Sokoto States		Special steel alloys abbrasives, etc	Lack of detailed exploration and development	
11	Wolframite	Plateau and Kaduna States	Electrical and electronic industries	Special and electronic industries	More detailed exploration and evaluation needed	Good quality
12	Rutile and Diorite	Plateau and Kaduna State		Used in stainless and special steel for military hard wares, also as fillers	Lack of detailed investigation	High grade

Source: **Adopted from Mallo (2007).**

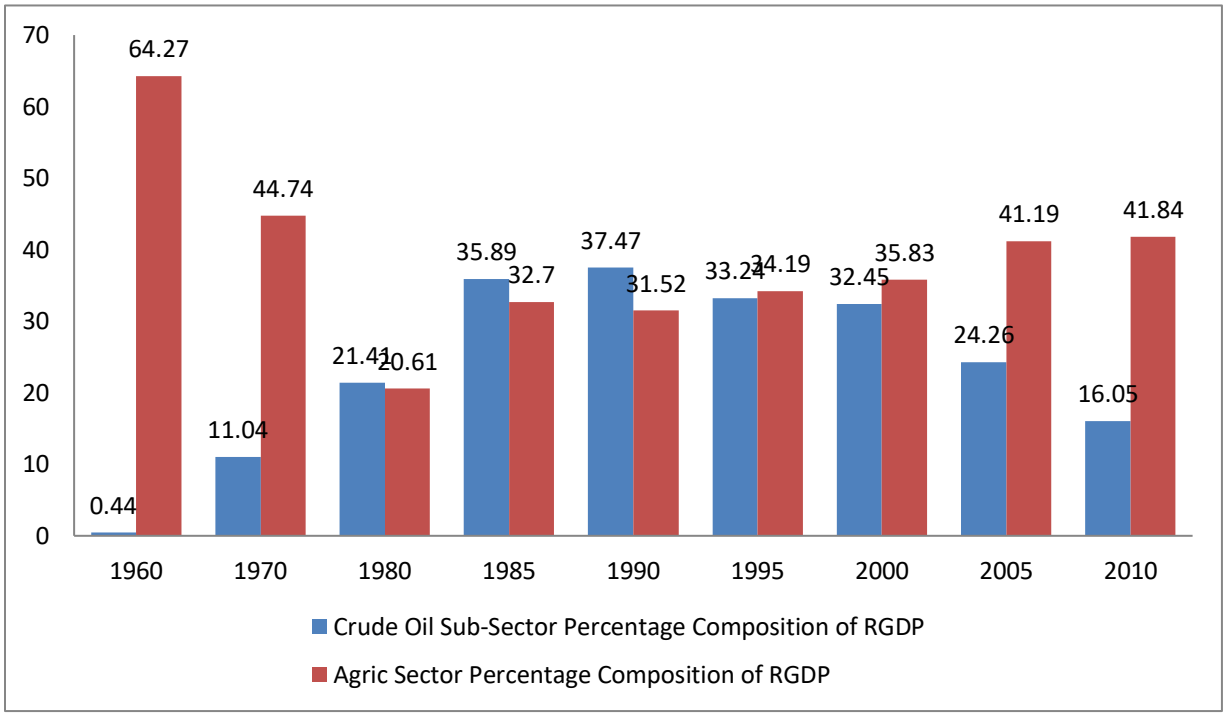
Mining and quarrying sector is heavily dominated by the oil and gas subsector. In this study, the interest in the mining and quarrying sector rest on the oil subsector. Analysis of data from the CBN (2011) reveals that the subsector's percentage composition of the Nigeria's RGDP in 1960 stood at 0.44 before it increased to 11.04 in 1970. The oil subsector maintained a steady increase in its composition of the RGDP till 1990 (37%) before it slightly dropped to 33.24% in 1995. In 2000, this composition became 32.45%, it sustained a downward trend all the way to 2010 when it recorded 16.05% (Figure 2.14). An interesting picture that emerges from the analysis of the CBN data is that over the periods 1960 to 1970 agriculture sector composition of the RGDP was noticeably higher than the oil subsector's percentage composition of the RGDP and afterwards, the duo began to move shoulder to shoulder (Figure 2.15).

NPC (2011) notes that the search for alternative funding arrangements for joint venture activities could enhance the growth of the oil and gas subsector, the subsector experienced a shared loss of more than one percentage points in 2010 to other sectors and its contribution to overall GDP growth rate declined. Solid minerals accelerated by 12.28% in 2010, compared to 12.08% in 2009 and 12.77% in 2008. This growth could be traced to high demand for housing and road construction.



Source: **Author's initiative with data obtained from CBN (2011).**

Figure 2. 14: Crude Oil SubSector Percentage Composition of Real GDP



Source: **Author's initiative with data obtained from CBN (2011).**

Figure 2. 15: Agricultural Sector and Crude Oil Sub-Sector Percentage Composition of Real GDP

Manufacturing

Manufacturing activities play important role in the economy of a nation. They account for a substantial proportion of total economic activities in the developed countries. The manufacturing sector which accounted for 4.58% of Nigeria's RGDP in 1960 stood at 7.53% in 1970. In 1980, it surged to a record high value of 11.05%, which later declined to 5.99% in 1985. In 1990, the value of the manufacturing sector composition of the RGDP came down to 5.50%, even it dropped further to 4.92% and 4.24% in 1995 and 2000, respectively. In 2005 the manufacturing sector's composition to the RGDP became a ridiculously low, with a value of 3.79%. In 2008, it contributed 3.6% of the RGDP before it increased to 4.2% in 2009, it later decreased slightly to 4.19% in 2010 (Figure 2.16).

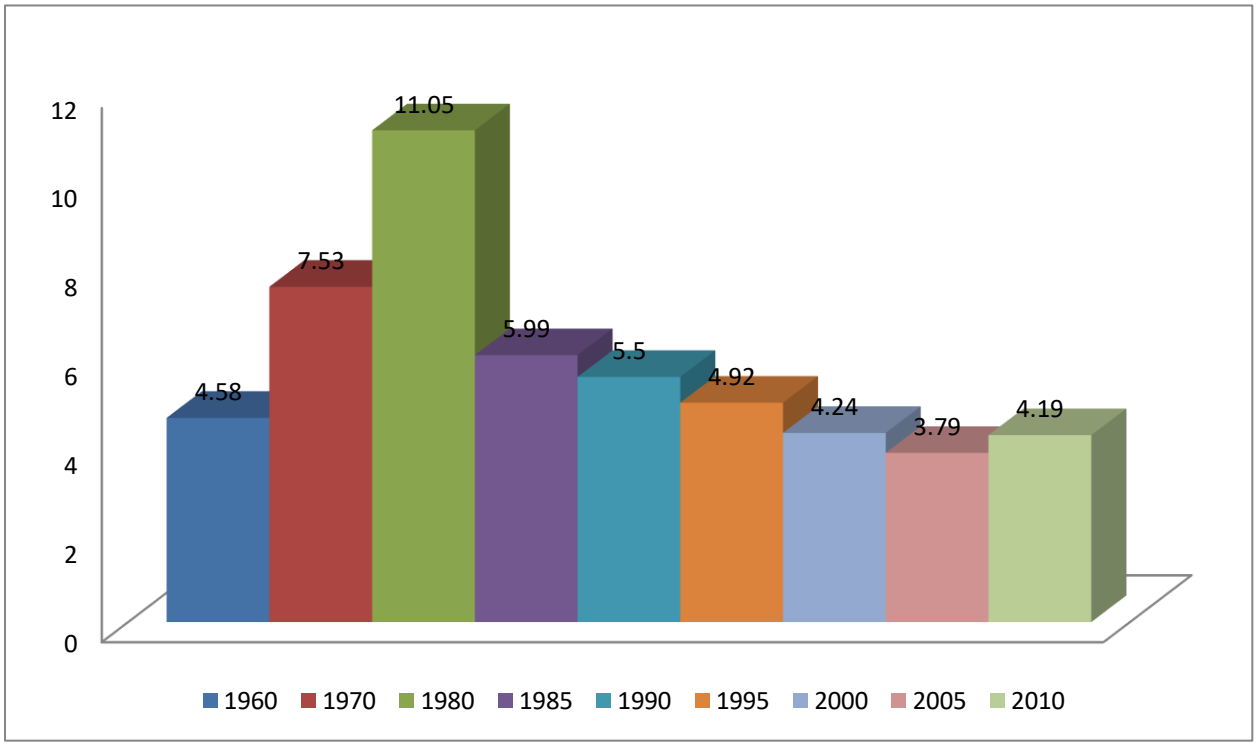
According to the BTIG (2011), Nigeria's manufacturing industry has suffered from neglect ever since the country's economy depended on the petroleum sector. As the government tries to diversify the economy, attempts to reinvigorate the manufacturing sector were put in place to increase its contribution to Nigeria's prosperity. About 60% of Nigeria's industrial base is located in Lagos state and its surroundings. Other main industrial centres include Kaduna and Kano states. Oil refining, cement, beverages, cigarettes, food processing, detergents and textiles are the Nigeria's most important manufacturing industries. BTIG (2011) observes that between 2000 and 2010, more than 850 manufacturing companies either shut down or temporarily halted production. It maintains that capacity utilisation in manufacturing was around 53% and that imports of manufactured goods dwarfed sales of homegrown products – manufactured goods have constituted the biggest category of imports since the 1980s. BTIG (2011) further notes that the government is working to revitalise the ailing sector: in May 2010, the Nigerian government announced a USD1.3 billion fund to help banks extend credit to the manufacturing sector, following the decline in available financing after the onset of the global economic crisis.

Fifty-four years after independence, performance in the Nigeria's manufacturing sector has continued to be retarded by erratic power supply, insecurity, port congestion, inadequate infrastructure, among others. Manufacturers have installed generators to

compensate for the irregular public power supply. Elementary economics indicates that the installation of private generators will sustantially increase the cost of manufactured goods, which will be passed on to the consumer, thus making it difficult for Nigerian goods to compete favourably with the imported ones. Meanwhile, the government has signalled its commitment to turn things around in the power sector with the hope of improving industrial production. At least, the present administration led by President Goodluck Jonathan has recognised that if Nigeria must achieve its set goal of becoming one of the top 20 largest economies of the world, it must embrace manufacturing and the non-oil sector in general. The position of the government is that the country must develop the non-oil sector with resources from oil.

NPC (2011) holds the view that the miniature manufacturing sector share of RGDP reflects the abysmal performance of the sector over time constrained by pervasive growth-inhibiting factors such as the appalling state of physical infrastructure. Other constraints include high cost of funds to meet working capital requirements, heavy reliance on the external sector for raw materials and other intermediate inputs, hostile business environment characterised by multiplicity of taxes and levies, widespread application of obsolete technology and machinery, especially in subsectors like textiles and so on. According to the commission, these operating conditions undermined capacity utilisation as average capacity utilisation declined to about 40% in 2010 from 53.52% in 2009. In the meantime, the index of industrial production deteriorated. The net consequence of all these was high mortality rates of industries.

Compared with strong manufacturing sectors in other emerging economies, where structural change has occurred and where millions have been lifted out of poverty, Nigeria is still contedding with diversification into manufacturing. For instance, manufacturing contributes 20% of GDP in Brazil, 34% in China, 30% in Malaysia, 35% in Thailand and 28% in Indonesia (Ogbu, 2012).



Source: **Author's initiative with data obtained from CBN (2011).**

Figure 2. 16: Manufacturing Sector Percentage Composition of Real GDP

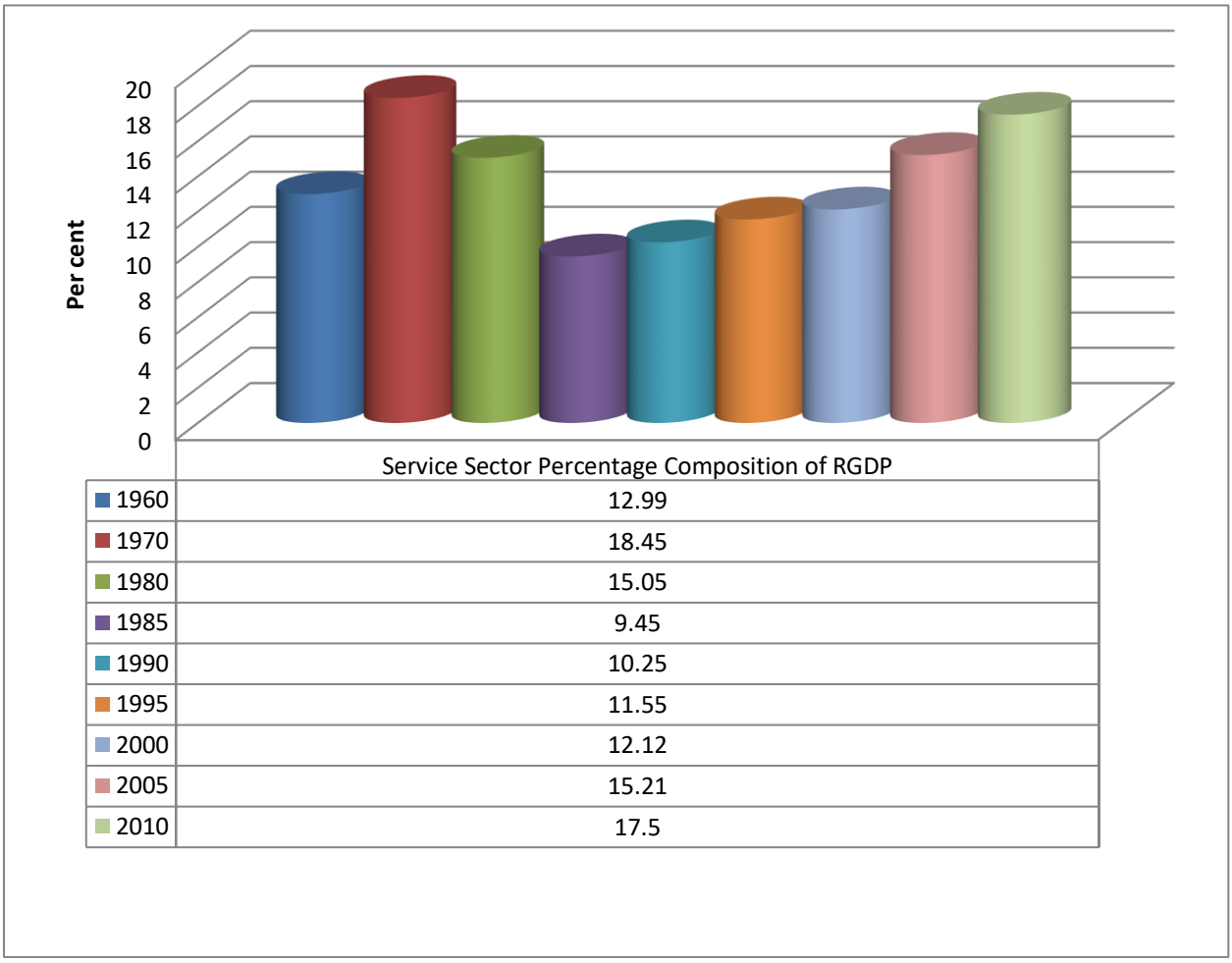
Services

The services sector has emerged to become a vibrant sector whose significance has continued to increase in most economies of the world. The sector remains a dominant factor in the performance of the manufacturing and resource industries in most countries. According to the WTO (1997), the services sector provides important auxiliary outputs to manufacturing firms that increasingly depend on external sourcing of such basic inputs as design, financing, communication and transportation. The Nigerian services sector consists of electricity; water; building and construction; road, rail, ocean, and air transport; communication; wholesale and retailing business; hotel and restaurants; financial services; real estate; housing (dwelling); private non-profit activities; as well as repairs and other services. Some of the subsectors are dominated by public activities especially in electricity, water, rail and ocean transport, and communication services. Extensive government intervention has been the usual practice in the financial and telecommunication services subsectors due to their perceived strategic importance in the economy (Oyejide and Bankole, 2001).

Analysis of data from the CBN (2011) indicates that the services sector accounted for 12.99% of the RGDP as at 1960 and later soared to 18.45% in 1970. In 1980, the sector's composition of the RGDP dropped to 15.05% and even further to 9.45% within a five year interval. The data further reveals that the sector accounted for 10.25% of the RGDP in 1990, 11.55% in 1995, 12.12% in 2000, 15.21% in 2005 and a phenomenal value of 17.5% in 2010 (Figure 2.17).

The growth rate of the services sector was underpinned by increased activities in domestic trade, and the telecommunication subsector. Despite appreciable growth performance of the services sector, it cannot be regarded as the backbone of the economy, especially when viewed from the perspective of the nation's balance sheet with the rest of the world. Whereas, merchandise trade in the balance of payments statement has been in surplus over several years, the services account has consistently registered deficits, reflecting its weak linkage with the rest of the economy. Activities in this sector would have to be deepened so that it could play a more productive role in the economy (NPC, 2011).

Notably, the liberalisation of the telecommunication subsector of the services sector has brought about improved services, encouraged innovation, increased revenue to the government, increased efficiency through competition, eradicates abuse of monopoly power, extended services to the hitherto unserved areas and boosted local and foreign investment in the subsector. It is now a well-known fact that the full liberalisation that greeted the telecom subsector has restricted the government's role in the subsector to policy formulation and sector regulation, thus, minimising the government funding of the subsector infrastructure and allowing resources to be available for other sectors.



1960	12.99
1970	18.45
1980	15.05
1985	9.45
1990	10.25
1995	11.55
2000	12.12
2005	15.21
2010	17.5

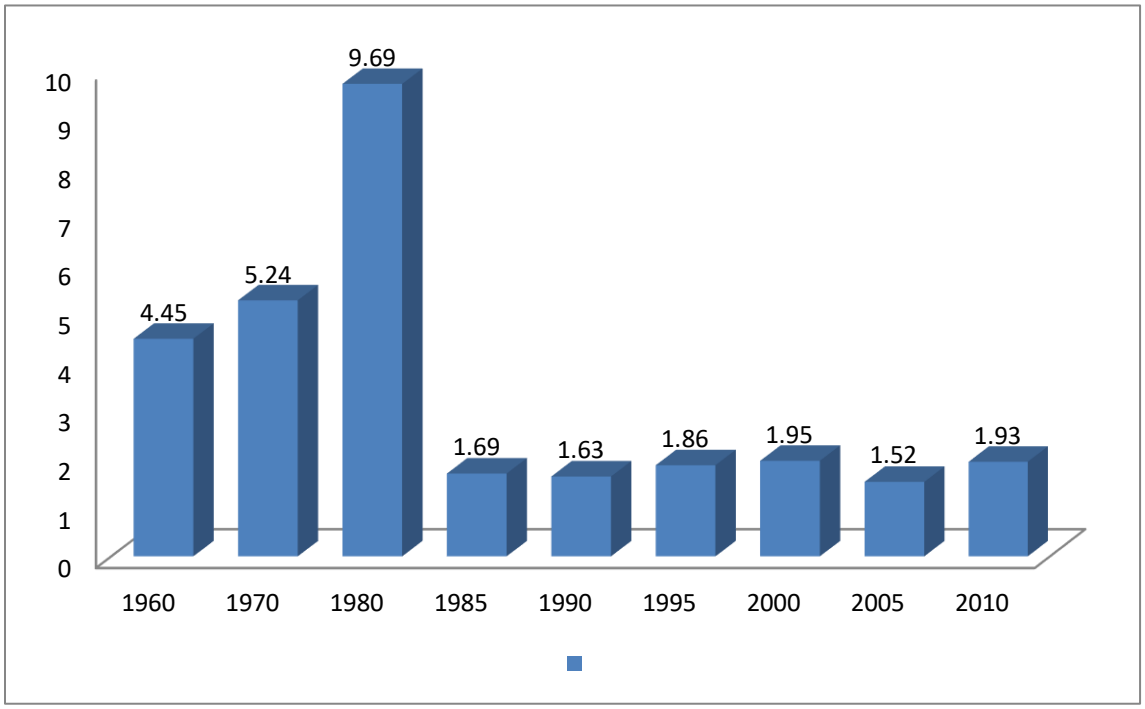
Source: **Author's initiative with data obtained from CBN (2011).**

Figure 2. 17: Services Sector Percentage Composition of Real GDP

Building and Construction

One of the indicators of growth in any given economy is the construction industry and the number of buildings. Since post-1980, the building and construction industry has consistently witnessed slow growth, but the operators in the industry claim that it has high growth potential if only some factors that drive growth are suitably addressed. Some blame the slow growth of the industry on lack of capacity for expansion; others trace the problem to policy issues. A third school considers the industry is not growing as a result of foreign firms' dominance and government's failure to meet its financial requirements to contractors.

The building and construction sector accounted for 4.45 % of the RGDP in 1960, and by 1970, the composition rose to 5.24%. It increased further to 9.69% in 1980 before it shrunk to 1.69% in 1985. Since then, the sector has remained a laggard. For instance, the sector only contributed 1.63% to the RGDP in 1990. In 1995, it slightly increased to 1.86%. As at 2000, the composition stood at 1.96% and decreased to 1.52% in 2005. In 2010, the building and construction sector accounted for 1.93% of the total RGDP (Figure 2.18).



Source: **Author's initiative with data obtained from CBN (2011).**

Figure 2. 18: Building and Construction Sector Percentage Composition of Real GDP

2.3: Brief history of oil in Nigeria

Before 1950s, thesearch for oil is a generally neglected period in Nigeria's oil history with no book or article absolutely devoted to it. The formal extension of British control over Nigeria from the late nineteenth century onwards ensured attention was directed at the oil potentials of the colonies and protectorate in the new surge of global oil exploration activities that began at the turn of the twentieth century.

The dawn of the oil industry can be traced back to 1908, when a German entity (Nigerian Bitumen Corporation (NBC), commenced exploration activities in the Araromi area, West of Nigeria. This pioneering effort ended unexpectedly as a result of the outbreak of the First World War in 1914. In 1937, oil prospecting resumed, when Shell D'Arcy (the forerunner of Shell Petroleum Development Company of Nigeria) was awarded the sole concessionary rights covering the whole territory of Nigeria. The Second World War interrupted their activities. In 1956, oil was discovered in commercial quantity at Oloibiri, in the present day Bayelsa state after series of concerted efforts that includes the investment of millions of Naira. This discovery by the Shell-BP brought a radical change in the structure of the Nigerian economy.

The discovery opened up the Nigerian oil industry in 1961, bringing in the major Western oil companies, namely Mobil, Agip, Safrap (now Elf), Tenneco and Amoseas (now Texaco and Chevron respectively) to join the exploration onshore and other areas of Nigeria. This development was enhanced by the extension of concessionary rights to the newcomers in the industry. In doing this, the government aimed at increasing the pace of exploration and production of Petroleum in Nigeria. Even now, more companies have won concessionary rights and are also producing (Tables 2.2).

Table 2. 2: Major Events in the History of the Nigerian Oil and Gas

1908	Nigerian Bitumen Co. & British Colonial Petroleum commenced operations around Okitipupa.
1938	Shell D' Arcy granted Exploration license to prospect for oil throughout Nigeria.
1955	Mobil Oil Corporation started operations in Nigeria.
1956	Changed name to Shell-BP Petroleum Development Company of Nigeria Limited.
1958	First shipment of oil from Nigeria.
1961	Shell's Bonny terminal was commissioned. Texaco overseas started operations in Nigeria.
1962	Elf started operations in Nigeria. (As Safrap) Nigeria Agip Oil Company started operations in Nigeria
1963	Elf discovered Obagi field and Ubeta gasfield Gulf's first production
1965	Agip found its first oil at Ebocha Phillips Oil Company started operations in Bendel State
1966	Elf started production in Rivers State with 12,000 b/d
1967	Phillips drilled its first well (Dry) at Osari –I Phillips first oil discovery at Gilli-Gilli -I
1968	Mobil Producing Nigeria Limited was formed. Gulf's Terminal at Escravos was commissioned
1970	Mobil started production from four wells at Idoho Field Agip started production Department of Petroleum Resources Inspectorate started.
1971	Shell's Forcados terminal commissioned Mobil's terminal at Qua Iboe commissioned
1973	First participation agreement; Federal Government acquires 35% shares in the oil companies Ashland started PSC with then NNOC (NNPC) Pan Ocean Corporation drilled its first discovery well at Ogharefe –
1974	Second participation agreement, Federal Government increases equity to 55%. Elf formally changed its name from "Safrap" Ashland's first oil discovery at Ossu –I
1975	First oil lifting from Brass terminal by Agip DPR upgraded to Ministry of Petroleum Resources
1976	Pan Ocean commenced production via Shell-BP's pipeline at a rate of 10,800 b/d
1977	Government established Nigerian National Petroleum Corporation (NNPC) by Decree 33, (Nigerian National Oil Corporation (NNOC) & MPR extinguished).
1979	Third participation agreement (throughout NNPC) increases equity to 60% Fourth participation agreement; BP's shareholding nationalised, leaving NNPC with 80% equity and Shell 20% in the joint venture. Changed name to Shell Petroleum Development Company of Nigeria (SPDC)
1984	Agreement consolidating NNPC/Shel1 joint venture.
1986	Signing of Memorandum of Understanding (MoU)
1989	Fifth participation agreement; (NNPC=60%, Shell = 30%, Elf=5%, Agip=5%).
1991	Signing of Memorandum of Understanding & joint venture operating agreement (JOA)

1993	Production sharing contracts signed –SNEPCO Sixth participation agreement; (NNPC=55%, Shell=30%, Elf= 10%, Agip=5%). The coming on-stream of Elf's Odudu blend, offshore OML 100.
1995	SNEPCO starts drilling first exploration well. NLNG's Final Investment Decision taken
1999	NLNG's first shipment of gas out of Bonny terminal.
2000	NPDC/NAOC service contract signed
2001	Production of Okono offshore field.
2002	New PSCs agreement signed. Liberalisation of the downstream oil sector. NNPC commences retail outlet scheme
2003	Total liberalisation of the downstream oil sector. Shell achievement of 1 million barrels per day. Petroleum Products Pricing Regulatory Bill passed and signed into law
2004	Shell restructuring exercise that change business approach and place Nigeria on top positions
2005	Jan.- Basil Omiyi appointed as first Nigerian Managing Director and headquarters of SPDC moved from Lagos to Port Harcourt Sept.- Basil Omiyi appointed country Chair shell companies Nigeria, Oando became the first African company to be listed on the Johannesburg Stock Exchange.
2006[10]	Eleven (11) oil companies operating 159 oil fields and 1,481 wells in the Niger Delta in Nigeria.
2007	The National Oil and Gas Policy was approved by the Federal Executive Council under the chairmanship of President Umaru Musa Yar'adua on the 5th of September, 2007. Nigeria had proved oil reserves of 36.22 billion barrels at the end of 2007 or 2.92% of the world's reserves[11].
2008	The Nigerian government introduced the Petroleum Industry Bill (PIB). Four years later, the bill has not become law.
2009	Nigeria offered amnesty to militant groups[12]. Total daily production in Nigeria averaged 480,000 barrels of crude oil (224,000 net), 111 million cubic feet of natural gas (48 million net) and 3,000 barrels of liquefied petroleum gas (LPG) (1,000 net)[13].
2010	Nigeria Oil and Gas industry Local Content Development Act was launched. The Federal Government announced the removal of the statutory $1m performance deposit required from investors, for the establishment of private refineries in Nigeria.

Source: www.pengassan.org (1908- 2005) and others compiled by the author.

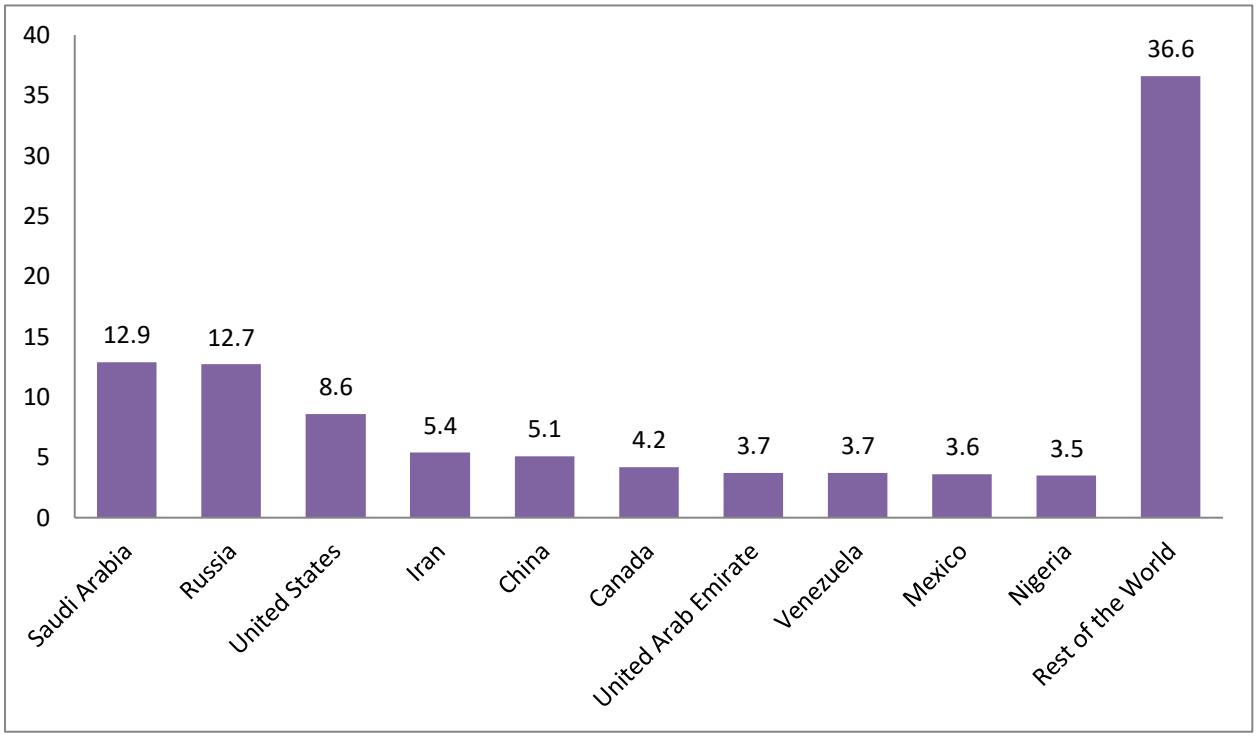
[10] The Guardian (2006).
[11] BP Statistical Energy Survey (2008)
[12] The Guardian (2009).
[13] NOGII (2010)

2.4: Oil resource abundance and the Nigerian economy: A Synopsis

Nigeria is the 12th largest producer of petroleum in the world, the 8th largest exporter, and has the 10th largest proven reserves (OPEC[14], 2011). Nigeria had an estimated 37.2 billion barrels of proven oil reserves as at January 2011. The bulk of these reserves are located along the Niger River Delta and offshore in the Bight of Benin, the Gulf of Guinea, and the Bight of Bonny. Current exploration activities are mostly focused in the deep and ultra-deep offshore with some activities in the Chad basin, located in the northeast of Nigeria (EIA, 2012).

According to the Oil Market Report (OMR) of the IEA (2012), the top ten countries produced over 63% of the world oil production in 2011. These countries with their respective production shares of about 63% include: 1) Saudi Arabia (12.9%); 2) Russia (12.7%); 3) United States (8.6%); 4) Iran (5.4%); 5) China (5.1%); 6) Canada (4.2%); 7) United Arab Emirates (3.7%); 8) Venezuela (3.7%); 9) Mexico (3.6%); 10) Nigeria (3.5%); and Rest of the world (36.6%), (Figure 2.19).

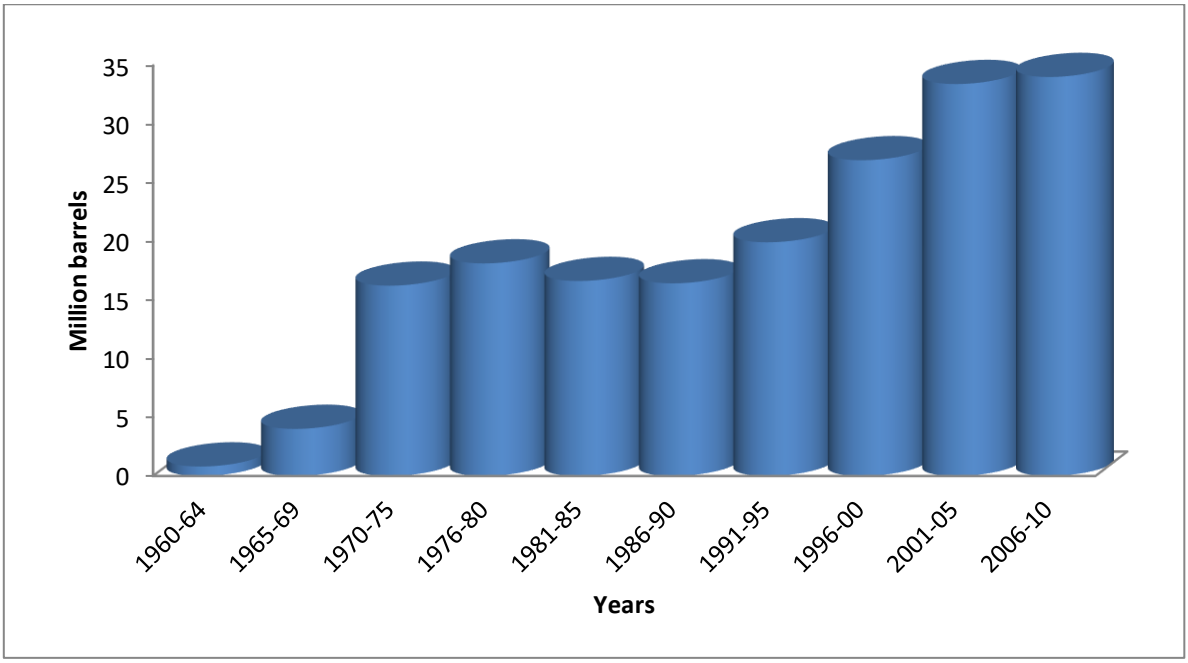
[14] OPEC means Organization of Petroleum Exporting Countries.



Source: **Author's initiative with data obtained from IEA (2012).**

Figure 2. 19: Top Ten Countries that Produced 63.4% of the World Oil Production in 2011

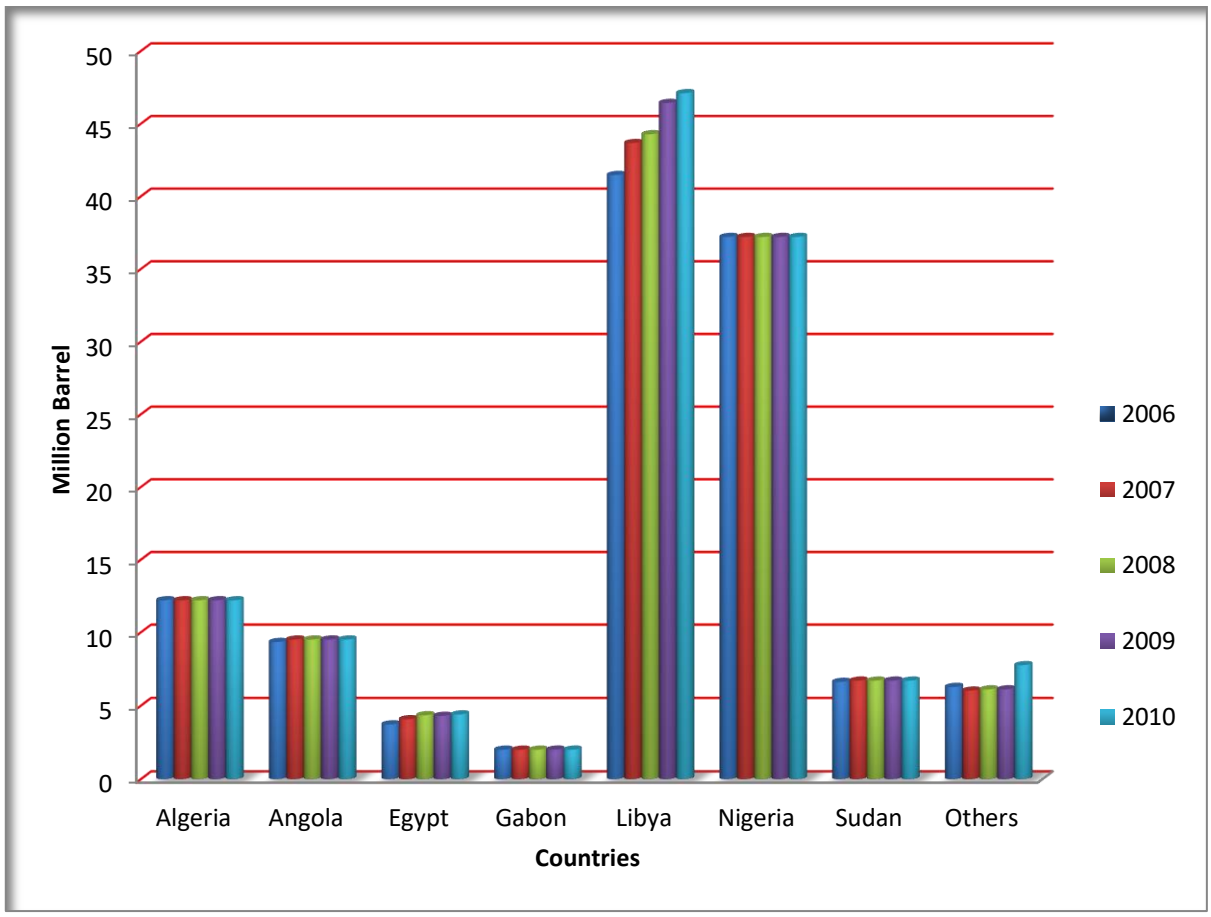
Figure 2.20 which shows the crude oil reserve of Nigeria reveals a steady upward trending reserve. For instance, average oil reserve between 1961 and 1964 was 0.8 million barrels. Between 1965 and 1969, it averaged 4million before it recorded a phenomenal jump from 1970 to 1975 (16.2 million barrels) and 1976 to 1980 (18.1 million barrels). It dropped slightly to 16.6 million barrels between 1981 and 1985 and a bit further between 1986 and 1990. Crude oil reserve for Nigeria resumed its upward movement from 1991 to 1995 with an annual average reserve of 19.9 million barrels. From 1996 to 2000, the average reserve rose to 26.9 million barrels and even further to 33.4 million barrels between 2001 and 2005. The annual average oil reserve for Nigeria between 2006 and 2010 jumped to an all high value of 34 million barrels.



Source: **Author's initiative with data obtained from OPEC (2011).**

Figure 2. 20: Crude Oil Reserve in Nigeria (million barrels).

When compared with fellow oil producing countries in Africa (Figure 2.21) Nigeria possesses a remarkable oil reserve. Except for Libya, Nigeria comes first in this regard. All the other oil producing countries apart from Libya seem diminutive. For instance, Algeria which comes next after Nigeria does not possess up to one third of the Nigeria's oil reserve in all the years considered. Among these countries, Gabon ranks last, with Egypt being marginally above it.



Source: **Author's initiative with data obtained from OPEC (2011).**

Figure 2. 21: Africa Proven Crude Oil Reserve by Country.

NNPC (2013) asserts that with a maximum crude oil production capacity of 2.5 million barrels per day, Nigeria is Africa's largest producer of oil. According to the NNPC, Nigeria produces only high value, low sulphur content, light crude oils - Antan Blend, Bonny Light, Bonny Medium, Brass Blend, Escravos Light, Forcados Blend, IMA, Odudu Blend, Pennington Light, Qua-Iboe Light and Ukpokiti. NNPC through its subsidiary, the Nigerian Petroleum Development Company (NPDC), is directly responsible for four oil and gas fields with a total production of 15,000 bpd and is committed to expanding its production capacity and has thus entered into strategic alliance with Agip Energy to develop the Okhono offshore field.

Nigeria has been a member of OPEC[15] since 1971. In 2011, Nigeria produced about 2.53 million barrels per day (bbl/d) of total liquids, well-below its oil production capacity of over 3 million bbl/d, due to production disruptions that have compromised portions of the country's oil for years. The Nigerian economy is heavily dependent on the oil sector, which accounts for over 95% of export earnings and about 40% of government revenues (EIA, 2012). Stressing its view point on the oil production disruptions in Nigeria, EIA notes the instability that prevailed in the Niger Delta caused significant shortfall in Nigeria's oil production. EIA estimates Nigeria's oil production capacity to have been close to 2.9 million barrels per day (bbl/d) at the end of 2010 but as a result of attacks on oil infrastructure, daily crude oil production ranged between 1.7 million and 2.1 million barrels (Figure 2.22). Disruptions have been attributed to direct attacks on oil infrastructure as well as pipeline vandalism and explosions resulting from bunkering activities.

In its country analysis brief for 2012, EIA envisages that planned upstream developments should increase Nigerian oil production in the medium-term but that the timing of the startups will depend heavily on the passage of the Petroleum Industry Bill (PIB) and the fiscal/regulatory terms it imposes on the oil industry. It notes further that many of the

[15] On a historical note, OPEC was founded in September 1960 by Venezuela (as lead instigator), Kuwait, Saudi Arabia, Iran and Iraq. Of the additional six countries in OPEC today [Qatar (joined in 1961), Libya (1962), Indonesia (1962), United Arab Emirate (1967), Algeria (1969) and Nigeria (1971)], Nigeria was the last to join in July 1971 (1.53 million barrels per day) during the Gowon military regime. Ecuador and Gabon joined afterwards in 1973 and 1975 respectively, but pulled out effective December 31, 1992 and January 1, 1995 respectively (Aluko, 2005).

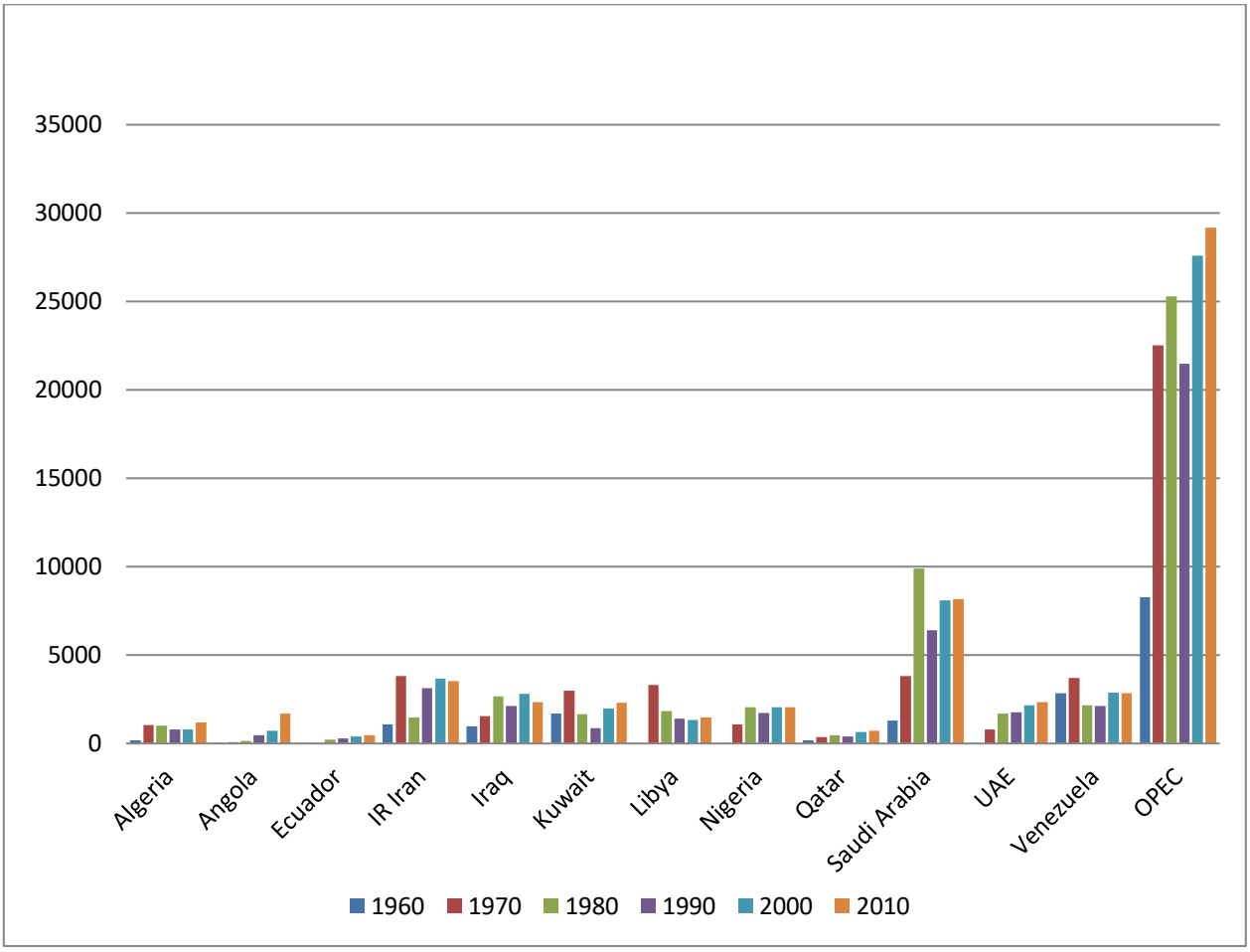
planned projects have already been delayed. Table 2.3 captures the planned/upcoming projects. In all, there are ten of such projects, namely Agbami 2; Usan; Gbaran Ubie Phase 1; Ehra North Phase 2; Bonga North; Bonga Southwest and Aparo; Egina; Bosi; Nsiko; and Uge. Their various production capacities and start-up dates are as captured in column two and three of the Table. Out of the ten projects, Chevron is to operate 2, Total – 2, Shell – 3 and ExxonMobil – 3.

Table 2. 3: Upcoming Projects in Nigeria

Project	**Capacity ('000 bbl/d)**	**Start-up**	**Operator**
Agbami 2[16]	100	2011-2014	Chevron
Usan	180	2012	Total
Gbaran Ubie Phase 1	70	2012+	Shell
Ehra North Phase 2	50	2013+	ExxonMobil
Bonga North, Northwest	50-150	2014+	Shell
Bonga Southwest and Aparo	140	2014+	Shell
Egina	150-200	2014+	Total
Bosi	135	2015	ExxonMobil
Nsiko	100	2015+	Chevron
Uge	110	2016	ExxonMobil

Source: **Author's initiative with data obtained from IEA (2010).**

[16] Expansion of existing Agbami field- drilling activities is expected to continue through 2014 (Chevron)



Source: **Author's initiative with data obtained from OPEC Bulletin (2011).**

Figure 2. 22: Daily Cumulative Crude Oil Production of OPEC Members (1,000 billion)

Since the first oil shock in 1973/1974, oil has annually produced over 90% of Nigeria's export income (Table 2.4). In 2000, Nigeria received 99.6% of its export income from oil, making it the world's most oil-dependent country. Oil production has also had profound effects on Nigeria's domestic sector (Apkan, 2009).

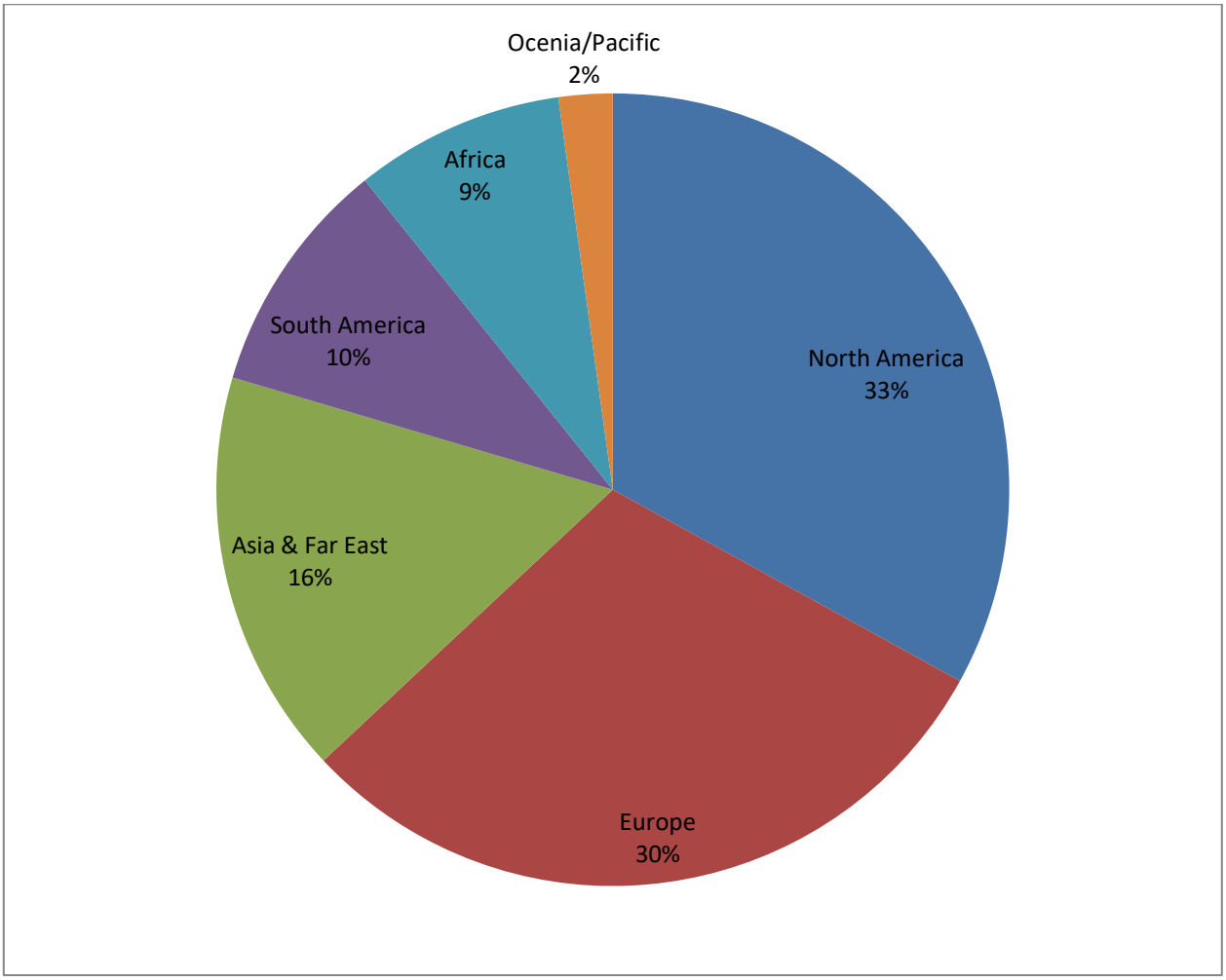
Data from EIA (2012) indicates that Nigeria exported approximately 2.2 million bbl/d of total oil and 1.8 million bbl/d of crude oil in 2010. According to the agency, Nigeria is an important oil supplier to the United States. Over 40% of Nigeria's oil production (980,000 bbl/d of crude oil, and slightly over 1 million bbl/d of total oil and products) is exported to the United States making Nigeria the fourth largest foreign oil supplier to the United States in 2010. Thus, interruptions to Nigerian oil production impacts trading patterns and refinery operations in North America and often affect world oil market prices. The NNPC (2011) allocates the percentage distribution of Nigeria's oils export as follows; North America – 271,462,697 barrels (33.02%), South America – 79,579,804 barrels (9.68%), Europe – 246,626,085 barrels (30%), Asia & Far East – 136,032,999 barrels (16.55%), Ocenia/Pacific – 18,092,657 (2.2%), and Africa 70,287,982 (8.55%) (Figure 2.23).

Table 2.4 shows that the share of oil exports in the total exports of Nigeria has been consistent in its upward movement. For instance, from a 58% share in 1970, it rose to 93% in 1975. By 1980, the share grew to 96% and even higher to 97% in 1990. The Table further reveals that 98% of total export in Nigeria in 1995 came from oil. This share was 99% in 2005 – laying more credence to the oil dependence structure of the Nigerian economy. In 2010, the share of oil exports in the total exports in Nigeria slightly came down to 98%.

Table 2. 4: Share of Oil Exports in the total Exports in Nigeria.

1970	1975	1980	1985	1990	1995	2000	2005	2010
58%	93%	96%	96%	97%	98%	99%	99%	98%

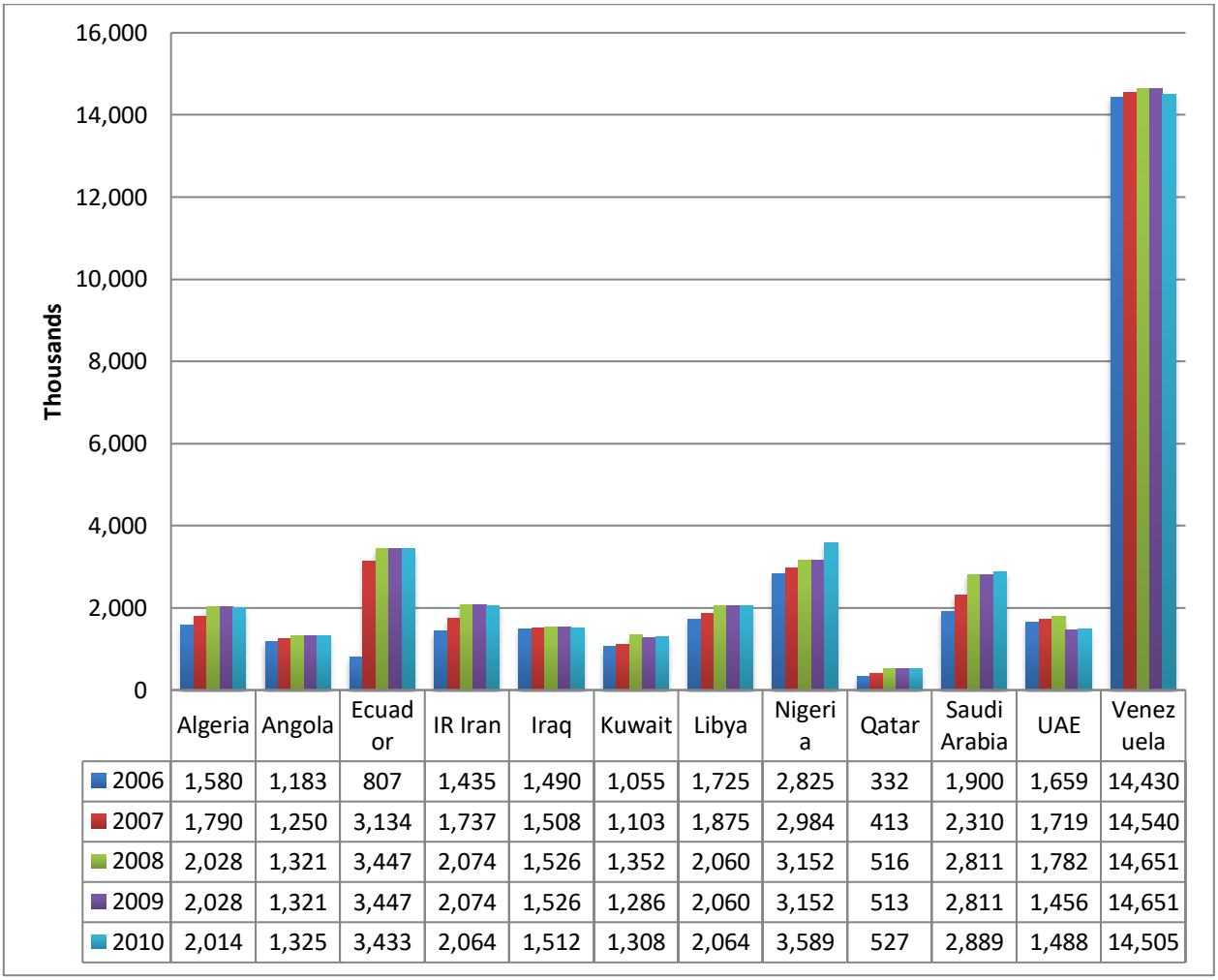
Source: NNPC (2011).



Source: **Author's initiative with data obtained from NNPC (2011).**

Figure 2. 23: Regional Distribution (%) of Nigeria's Crude Oil Export

Further, Figure 2.24 which captures the producing oil wells in OPEC member countries shows that Venezuela comes first. It is crystal clear that from 2006 to 2008, producing oil wells in Venezuela increased consistently. Between 2009 and 2010, it decreased by 1.01%. The Figure also reveals that Nigeria and Ecuador have been competing favourably. While oil producing wells in Nigeria as at 2006 stood at 2,825, that of Ecuador was 807. From 2007 to 2009, Ecuador declared more producing oil wells than Nigeria. In 2010, Nigeria came next to Venezuela while Ecuador followed. Of all the OPEC members captured in the Figure, Qatar had the least of producing oil wells.

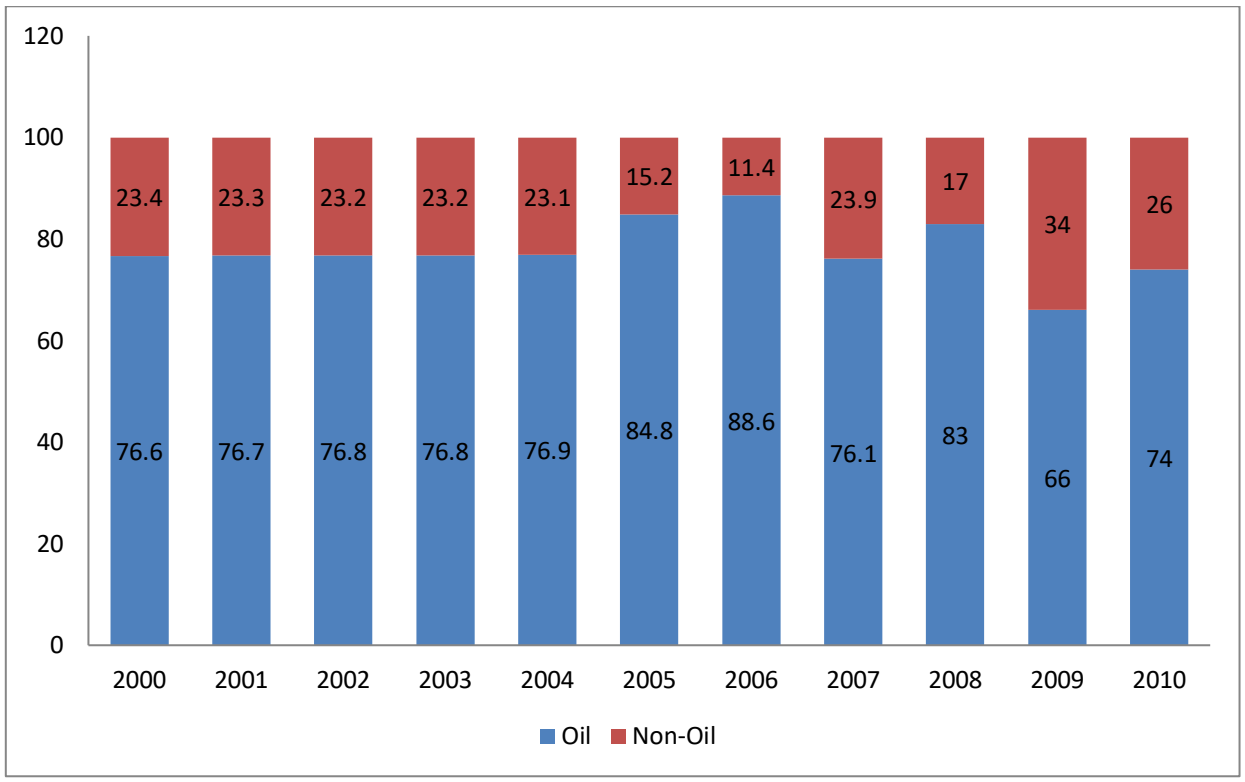


	Algeria	Angola	Ecuador	IR Iran	Iraq	Kuwait	Libya	Nigeria	Qatar	Saudi Arabia	UAE	Venezuela
2006	1,580	1,183	807	1,435	1,490	1,055	1,725	2,825	332	1,900	1,659	14,430
2007	1,790	1,250	3,134	1,737	1,508	1,103	1,875	2,984	413	2,310	1,719	14,540
2008	2,028	1,321	3,447	2,074	1,526	1,352	2,060	3,152	516	2,811	1,782	14,651
2009	2,028	1,321	3,447	2,074	1,526	1,286	2,060	3,152	513	2,811	1,456	14,651
2010	2,014	1,325	3,433	2,064	1,512	1,308	2,064	3,589	527	2,889	1,488	14,505

Source: **Author's initiative with data obtained from OPEC (2011).**

Figure 2. 24: Producing Oil Wells in OPEC Members

Oil has contributed enormously to the Nigeria's public finance. For instance, the joint venture operated by the Shell Petroleum Development Company of Nigeria Limited (SPDC) contributed about $36 billion to the government between 2005 and 2009 (Shell Companies in Nigeria, 2010). Consistently, for more than 30 years, oil has been contributing an average of 70% to the total government revenue. Therefore, poverty reduction projects, the development plans, and even the attainment of the Millennium Development Goals (MDGs) in Nigeria may perhaps be hard to stem in the absence of oil revenue (Figure 2.25). The Figure reveals that oil revenue as percentage of the total revenue increased consistently from the year 2000 to 2005 before it witnessed an insignificant drop in 2006. It steeped further in 2007 and later rose again in 2008. Observably, of all the years analysed in the Figure, oil revenue as a percentage of the total revenue ranked lowest in 2009. This situation could be attributed to the effects of the activities of the Niger Delta militants. In 2010, the percentage of oil revenue to the total revenue noticeably increased again.



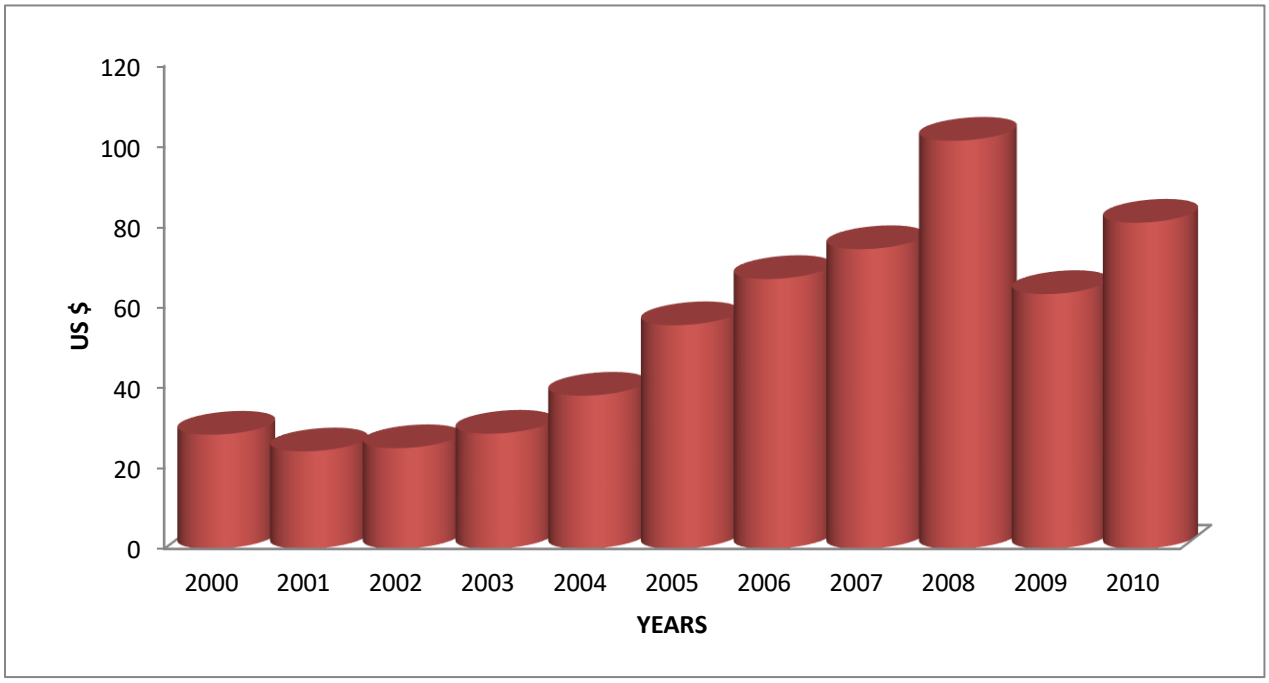
Source: **Author's initiative with data obtained from CBN (2010).**

Figure 2. 25: Oil and Non-oil Revenue as % of Total Revenue in Nigeria

Trends in prices of crude oil reveal wide swings in terms of shortage or excess supply. The behaviour of crude oil prices can be viewed from two broad perspectives: prior to 1973 and post 1973.In the first period, prices exhibited long run stability. Beyond then and in the more recent years, several factors[17] have led to the current state of the oil market, characterised by volatility and high prices (Figure 2.26). The Figure calls attention to the consistent increases that have existed in the spot crude oil prices of Nigeria. The prices rose from the year 2000 to 2008 before it was submerged in 2009. It witnessed another increase in 2010.

A major challenge for the Nigerian economy was its macroeconomic volatility driven largely by external terms of trade shocks (mainly coming from the swings witnessed in the oil prices) and the country's large reliance on oil export earnings. By some clearly stated world bank measures, Nigeria's economy ranked among the most volatile in the world between 1960 to 2000 (World Bank, 2003).

[17] Among these factors are rise in demand in emerging economies, especially in China and India, Decline in the spare capacity of major producing countries, Decline in global investment in the industry and Lack of expansion in refinery activities.



Source: **Author's initiative with data obtained from OPEC (2011).**

Figure 2. 26: Spot Crude Oil Prices for Nigeria.

Basically, the "curse of oil wealth" (the Dutch disease effects) derives from its deindustrialisation impact and overall effect on macroeconomic disequilibrium linked up to the appreciation of real exchange rate associated with oil export boom. Typically, oil resource boom has two effects. On the positive side, an increase in real national income and significant balance of payment surplus were consequences of large oil export earnings. On the negative side, the output and factor incomes of non-oil sectors especially the traded goods sector such as agricultural export and manufacturing fell substantially (Iwayemi, 2001).

The ''resource curse'' effect of oil resource dependence can manifest itself in several ways. The presence of oil raises expectations and dramatically increases public spending based on unrealistic revenue projections, encourages rent-seeking, fans inflation, hampers growth, leads to decline in non-oil sectors such as agriculture and manufacturing, thereby replacing more stable and sustainable revenue streams, and exacerbating the problem of transparency, accountability and corruption. There also exists the problem of increasing the nation's debt stock. Before the oil boom, Nigerian debt stock was very low. Between 1979 and 1998, for instance, the nation's debt stock[18] exploded from $2 billion to $30 billion (Ogunleye, 2008).

Nigeria's over reliance on oil for export earnings and government revenue has hurt the economy in several ways. First, oil income has increased volatility in economic growth, inflation, and the exchange rate. Compounding this volatility is the instability in government revenues, which often led to shift in government policies and services. Second, there is strong, though not conclusive, evidence of Dutch disease in Nigeria - that is, that oil export earnings have created a chronic tendency towards exchange rate overvaluation, crowding out manufacturing and especially agriculture[19] (in 2003 a sharp rise in oil production contributed to the decline in the share of agriculture as a percentage of GDP - from 29 % in 2003 to 16 % in 2004). Third, the oil industry is not labor-intensive and employs few unskilled workers. Fourth, oil revenues have fostered

[18]In fact, it got to a point that it became difficult to know exactly the nation's total debt stock.

[19] Ellman (1981) observes that as a result of the exploitation of large deposits of natural gas in the North Sea in the Netherlands, the textile and clothing industries almost vanished and others such as metal manufacturing, mechanical engineering, vehicles, ships and construction industries declined

inequality and a rent-seeking political economy, undermining transparency and accountability and leading to conflict, often violent, over the allocation of oil revenues (Ross, 2005).

In Nigeria (and in most other countries), the appreciation of the exchange rate artificially cheapens import, and makes the local sourcing of imported inputs unattractive (Iwayemi; 2001). A persistent currency overvaluation leads to loss of international competitiveness in the non-booming traded sector. For instance, from 1972 to 1986, the exchange rate in Nigeria mirrored movement in oil prices and Naira remained overvalued as a result of huge increases in foreign exchange earnings.

2.5: Oil revenue management in Nigeria

There is no arena more glaring in the lackluster performance and sometimes poor and fraudlent Nigeria's leadership over the years than in the management of our oil wealth (Aluko, 2005). Oil mineral exploration and exploitation should bring in huge resources to enhance sustainable development in a country. But in Nigeria, like in most other net oil exporting countries, they have become serious inhibition to growth and development, given the obvious neglect of the provision of the basic requirements of life, traversing several decades have made people worse off. There is a plethora of literature on the challenges associated with managing oil windfalls in resource-rich countries. Existing studies on Nigeria's experience with oil booms have also documented the macroeconomic implications of the Dutch disease (Bienen, 1983; Ogun, 1990; Egwaikhide, 2003; Subramanian and Sala-i-Martin, 2003). As stated earlier, Nigeria discovered oil in 1956 and began to export it in 1958. Since then, oil has become the dominant factor in Nigeria's total revenue. The influx of massive revenues during periods of abnormally high oil prices, creates enormous challenges for policymakers in Nigeria.

Studies have shown that the output as well as government revenue and expenditure of oil-abundant countries are usually associated with high volatility arising from highly volatile commodity prices combined with undiversified revenue and export bases. Put differently, commodity prices and revenues from natural resources tend to be volatile, and which often translate to macroeconomic instability and a highly volatile real exchange rate. Volatility in oil revenue can be seen as a tax on investment. Investment requires

irreversible decisions because capital, once installed, cannot be readily moved to other sectors. Highly volatile relative prices discourage the irreversible commitments to specific sectors that capital investment implies (Van Wijnbergen, 1985). Aghion, *et al* (2006) have empirically demonstrated that high volatility slows down productivity growth by a substantial margin in countries with a relatively underdeveloped financial sector. There is substantial evidence that countries that earn a large part of their revenue from resource rent, have more wobbling economies than non-resource based countries (Hausmann and Rigobon, 2002).

Using 1970 as a benchmark, Nigeria gained an extra $390 billion in oil-related fiscal revenue between 1971 and 2005 or 4.5 times 2005 gross domestic product (GDP), expressed in constant 2000 dollars. The sizable oil windfall, of course, presented net wealth and thus additional spending room, but it also has complicated macroeconomic management and led to an excessive dependency on oil - a highly volatile source of income (Budina and Wijnbergen, 2008).

Van Wijnbergen (1984) contends that temporary oil revenues and, critically, misguided spending policies with its associated temporary spending boom, underscore the need for industrial diversification. Countries following a permanent income rule, sharing the oil wealth with future generations and smoothening out expenditure into the far future, do not need to worry about bleak a near future without oil wealth and with depressed economic activity, therefore have no need to worry about future declines in exchange rates. In such circumstances, there is no clear-cut case in favour of intensified diversification policies after an increase in oil wealth.

Ushie et al (2012) note that massive inflow of revenue in Nigeria fuels greed and jostling for resources, both of which serve as the bedrock for crises, conflicts and violence that have come to epitomise most resource-rich countries. They assert that the negative impacts of resource abundance include: a decline in the competitiveness of other economic sectors (caused by appreciation of the real exchange rate); volatility of revenues from the natural resource sector, due to exposure to global commodity market swings; government mismanagement of resource revenues; as well as weak, ineffectual and

corrupt institutions. All of these, no doubt, epitomise Nigeria. For instance, as far back as 1983, while commenting on the poor management of the oil revenue in Nigerian, a literary icon - late professor Chinua Achebe observed as follows;

> *The countless billions that a generous providence poured into our national coffers in the last ten years (1972 - 1982) would have been enough to lunch this nation into the middle-rank of developed nations and transform the lives of our poor and needy. But what have we done with it? Stolen and salted away by people in power and their accomplices. Squandered in uncontrolled importation of all kinds of useless consumer merchandise from every corner of the globe. Embezzled through inflated contracts to an increasing army of party loyalists who have neither the desire nor the competence to execute their contracts. Consumed in the escalating salaries of a grossly over-staffed and unproductive public service. And so on ad infinitum (Achebe, 1983, p.4).*

Soludo (2006) calls for the amendment of relevant sections of the 1999 Nigerian Constitution, particularly section 162, in order to effectively manage the nation's earnings from oil and ensure macroeconomic stability in the economy. He faults the demand by some state governors that the foreign reserves, including the excess crude earnings, be shared among the three tiers of government. He asserts that unless the 1999 Constitution is urgently amended, the management of excess crude and the earnings from "a depletable oil resource" would continue to pose a serious challenge to monetary and fiscal authorities. He presumed the core question and issue Nigeria faces as a nation is what to do with earnings from a depletable resource like oil. Thus, he raises the following attention demanding questions: 'Should Nigeria save part of the oil wealth for the future?' "Does this wealth also belong to future generation of Nigerians?" "What does Nigeria spend the money on?" "Should Nigeria spend it on consumption or to build long-term capacity?" According to Soludo (Ibid), the current constitution states earnings from oil must be shared among the three tiers of government. This, to him is not right for the system.

In a convocation lecture titled "the wealth and poverty of a nation - who will restore the dignity of Nigeria?" delivered at the University of Nigeria Nsukka, Ezekwesili[20] (2013) opines that she remains resolute in her demand for full disclosure and accountability by the Federal Government of Nigeria on the poor management of oil revenues, especially the Excess Crude Account (ECA) and the Foreign Reserve Account (FRA). She also demanded for a full disclosure of oil revenues earned under the administration of Dr. Goodluck Jonathan. She has earlier asserted that the $67 billion which the former President Obasanjo government left in the Foreign Reserve and the Excess Crude account was brazenly misappropriated by those who succeeded him. According to Ezekwesili, the trend of Nigeria's population in poverty since 1980 to 2010, for example, suggests the more we earned from oil, the more the population of poor citizens: 17.1 million in 1980, 34.5 million in 1985, 39.2 million in 1992, 67.1 million in 1996, 68.7 million in 2004 and 112.47 million in 2010. According to her, this sadly means that Nigerians are children of a nation blessed with abundance of ironies.

Ezekwesili explained why every other economic sector in Nigeria has suffered the effect of the oil enclave economy. According to her, oil has unleashed shocks and volatility of revenues on our economy due to exposure to global commodity market swing, proliferated "weak, ineffectual, unstable and systemically corrupt institutions and bureaucracies" that have helped misappropriate or plunder public resources. Nations with abundance of natural resources especially in Africa, Latin America and part of South Asia have experienced the fueling of official corruption and "violent competition for the resource by the citizens of the nation". In her words;

> *While there may not be concurrence on the causes of Nigeria's colossal underperformance, most of our citizens however agree that poor governance and the more visible symptom of corruption have had virulent impact in arresting the development of Nigeria. The poor in our land have paid the highest possible price for being born into the world's best example of a paradox. The common wonderment of these poor citizens – whether east, west, north and south- is "why would more than half the population of a country that earned nearly one trillion dollars in oil revenue since the Oloibori discovery of crude oil; continue to wallow in*

[20] Dr. Obiageli Ezekwesili is former Minister of Education in Nigeria during President Olusegun Obasanjo's government.

> *poverty?" Well, economic evidence shows that the answer which we must all ponder deeply is that oil wealth entrenched corruption and mismanagement of resources in government and warped the incentive for value added work, creativity and innovation in our public, private sectors and wider society. This being the case, the larger population of our people is deprived of the opportunity to overcome poverty and this is what economists call the "resource curse". The oil revenue induced choices made by our ruling elite over the five decades of political independence cursed several of our citizens to intergenerational poverty! (Ezekwesili, 2013, p. 3).*

Soludo (2006) also contends that an effective and efficient management of the oil revenue and foreign reserves had become imperative to ensure a stable naira exchange regime. His position is that the state governors asking for the sharing of the excess crude had always been spending their share of the Federation Account (FA) on consumption rather than investing same on infrastructure as being proposed. According to, "it is not easy to spend excess crude wisely". The argument by the governors has been that they need this money for infrastructural development, to ensure the provision of dividends of democracy to their people. He went on to stress that it is difficult to find more than five or six states that do not spend 75% of what they get from the FA on consumption. The contention that once the money is shared it will go into infrastructure development has not been proved (Soludo, 2006).

A report by the Centre for the Study of the Economies of Africa (CSEA) in collaboration with the Department for International Development (DfID) declared that oversight over the management of oil revenue accounts in Nigeria is weak. The report also faulted the current system of paying all oil export proceeds directly into a JP Morgan dollar-denominated account in New York, United States of America. It also stated that the system, which allowed the NNPC excessive control over oil export receipt was considered unconstitutional as it encouraged housing oil remittances outside of the FA (ThisDay Newspaper, 06 March 2013).

At the moment, revenue allocation in Nigeria is based on a sharing formula which cedes 52.68% to the Federal Government; 26.72% to the states, 20.6% to local governments and

13% goes to the oil-producing states. The 13% derivation was introduced in 1999, as part of measures aimed at redressing historic grievances of the oil-producing states[21] of the Niger Delta. However, recently, the chairman of the Revenue Mobilisation Allocation and Fiscal Commission (RMAFC) disclosed that every state in Nigeria is entitled to derivation revenue from their natural resources if properly harnessed for economic development. According to him, the law has guaranteed the disbursement of 13% derivation to all solid minerals producing States, like their oil producing counterparts.

Finally, what emerges from the above is that Nigeria's performance in terms of managing her oil revenue has been poor. Oil-money has not brought an end to poverty for the people nor enabled the economy to reverse the persistent stagnation in the non-oil economy. While the country has earned sizeable oil revenues from its natural endowment (nearly one trillion dollars – Ezekwesili, 2013), a huge gap exists between the earned revenue and the basic economic needs of majority of Nigerians.

2.6: Some major challenges of the Nigerian economy

From the foregoing, one identifies that the Nigerian economy continues to conted with a number of challenges hampering efforts at its transformation. First, the economy has not achieved the basic structural changes needed to commence on the part of sustainable growth and development. NPC (2011) notes that aside disarticulated and narrow productive base, sectoral linkages in the economy are weak. NPC maintains that primary production, comprising agriculture, mining and quarrying inclusive of oil and gas, dominates national output while the manufacturing sector's role in the economy is small in terms of share of gross output, contribution to growth, foreign exchange earnings, government revenues and employment generation.

Fiscal dominance (fiscal policy challenges) which characterises the Nigerian macroeconomic setting has often made it difficult for the monetary authority to win the battle against inflation. As the CBN mops up funds from the economy as a measure toward controlling inflation, an upward pressure is triggered on the cost of money as interest rates would soar, making it tough for investors in the real sector to get the

[21]Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers.

funding they needed. The contention is that fiscal policy fustrates the impact of monetary policy.

The Nigerian economy also faces immense challenges in terms of non-functional infrastructure. The deterioration in the country's infrastructural base reveals decades of poor maintenance and weak technological base. The latter is due to low Research and Development (R&D) efforts and the disconnect between research findings and the industrial sector. The private sector is likewise weak and replete with poor response record to industrial incentives.

The growing rate of insecurity in Nigeria has adversely and significantly affected the country's economy. For instance, before the Federal Government's Amnesty Programme designed for militants in the Niger Delta region, the oil production and the number of barrels produced per day, drastically declined. This was largely because of kidnapping and often taking oil wokers as hostage in the region. This was inimical to the revenue that accrues to the government from oil as well as the implementation of government's policies and programmes. This ugly trend denied Nigerians the dividend of democracy as the government claimed being incapacitated to provide social services to the people.

More so, the Boko Haram crisis, a major threat to security in the country in recent time, has killed many business people while displacing others and ruining businesses. As noted in the Business Day newspaper of 14th February, 2012, at the Mile 12 Market in Lagos, drop-off point for food items that enter homes in cosmopolitan Lagos and some parts of the south west Nigeria, supply of foodstuff like tomatoes, onions, pepper and yam, of which Nigeria is world number one producer, has dropped tremendously. These are serious pointers to the fact that Nigerians need to prepare for an impending food crisis that will be concomitant with high prices in the coming months as food supplies from the north, which account for a huge percentage of food consumed nationwide, are steadily declining as a result of the Boko Haram menace. Manufacturers have openly decried the emergence of terrorism in the north, noting that they are unable to cope with the obviously shrinking market size.The threat by Niger Delta militants to move the direction of the Boko Haram is not helping matters.

Some Nigerians are of the view that political instability and bad governance, most especially in the 1990s contributed enormously to the decline in Nigeria's economic fortunes. To them, military rule in Nigeria, as in most other countries with prolonged military rule, led to poor social-economic development. The popular believe that the dawn of a civilian government after almost three decades of military rule should present to Nigeria the opportunity to tackle its socio-economic development problems and embark on economic restoration is still far from being realised.

Though the economy experienced appreciable GDP growth rates, averaging over 6.5% per annum between 2006 and 2010, this growth did not generate corresponding employment nor result in reduction of poverty. Besides, growth rates of the non-oil output remain unsatisfactory. Concomitantly, there has been gradual decline in the level of competitiveness of the Nigerian economy to the extent that the country has become one of the least competitive economies in Africa. The narrow base of government revenue and the near monolithic nature of exports were additional challenges which confronted the economy (NPC, 2011). The global financial crisis between 2008 and 2009 impacted negatively on some macroeconomic aggregates in the economy, compounding the management of the Nigerian economy.

The effectiveness with which the above identified challenges are addressed, especially the narrow nature of government revenue, foreign exchange earnings and the issue of depletion of the external reserves, necessitated by the downturn in crude oil fortunes in the international oil market, will certainly define the extent of progress the Nigerian economy would attain in the foreseeable future.

2.7: Summary and conclusion of the background to the study

Nigeria qualifies to be the world record holder in the rank of countries blessed with abundant natural resources that tend to have poor human development scores. As a result of wasteful spending, Nigeria has dismal human development indicators, inconsistent with the scale of its earnings. For instance, the performance of Nigeria’s electricity sector since independence was not impressive. Per capita electricity consumption in Nigeria shows

that well-conceived plans, properly implemented would be needed to remedy the electricity crises. As at 2010, the per capita electricity consumption in Nigeria stood at136kWh and only 50.6% of the total population had access to electricity.

It was observed that Nigeria recorded its highest inflation rate from 1990 to 1994 when the average inflation rate stood at an all high value of 42.7%. From 2005 to 2010, it was found that the annual average inflation rate shrunk to 11.3%. Notably, to make the macroeconomic environment of Nigeria attractive to investors, inflation rate must be brought down to a single digit. Further, the characterisation of the trend of exchange rate in the economy indicates an upward trending which by implication means that value of Naira in the international market is being corroded.

The problem of unemployment was equally considered. It was noted the problem has been around for long, defying all attempt to stem it. It was observed that unemployment rate which oscillated between 2.8% and 4.7% from 2000 to 2004, grew sharply to 11.9% in 2005 and later rose to 21.10% in 2010. The submission, the threat to law and order arising from the huge level of unemployment in Nigeria is an ill-wind that will not blow anyone any good. It was noted that economic growth in Nigeria has not been accompanied by significant employment creation.

Further, it was revealed that Nigeria recorded positive growth rates in its Real Gross Domestic Product (RGDP) in the early 1970s. Between 1981 and 1985, the RGDP dropped by the magnitude of 6.35%, from 2001 to 2005, growth rate on average became 2.74% and rose to an all high value of 6.68% between 2006 to 2010. It was also declared that the telecommunications remained the fastest growing sector of the economy, at least, from 2008 to 2010.

The sectoral performances analysis carried out in this study shows that primary agricultural produce constituted Nigeria's main exports in the first decade of independence. It was revealed that while the crude oil subsector has been growing, the agricultural sector has steadily remained below its pre-1970 values. Nigeria's manufacturing industry has suffered neglect since the dependence on the petroleum sector

in the 1970s. The manufacturing sector composition of the RGDP stood at 4.19% in 2010. The services sector emerged to become a vibrant sector whose significance over time has increased in the economy. The sector accounted for 17.5% of the RGDP in 2010. The growth rate of the services sector was underpinned by increased activities in domestic trade and the telecommunications sector. In Nigeria, the building and construction industry has witnessed slow growth, with a meager 1.93% contribution to the RGDP in 2010. It contributed a meagre 1.93% of the RGDP in 2010.

The dawn of the oil industry in Nigeria was traced back to 1908, when a German entity - Nigerian Bitumen Corporation (NBC) commenced exploration activities in the Araromi area, West of Nigeria. In 1956, oil was discovered in commercial quantity at Oloibiri in the present day Bayelsa State by the Shell-BP after series of concerted efforts that include the investment of millions of Naira. The discovery opened up the Nigerian oil industry because it attracted major Western oil companies to join the exploration efforts, onshore and in other areas.

Nigeria is oil resource abundant, with about 37.2 billion barrels of proven oil reserves as at January 2011 and was among the top ten countries that produced over 63% of the world oil production in 2011. From 1975 to 2010, oil dominated exports from Nigeria, contributing more than 90% of the total export over the period.

Iwayemi (2001) reveals that oil resource boom has two effects, on the positive side, an increase in real national income and significant balance of payment surplus are consequences of large oil export earnings. On the negative side, the output and factor incomes of non-oil sectors, especially the traded goods sector such as agricultural export and manufacturing fall substantially. Some other scholars hold the view that the ‘‘resource curse’’ effect of oil abundance can manifest in several other ways.

Notably, a plethora of academic literature exist on the challenges associated with managing oil windfalls in resource-rich countries. Several of these studies have demonstrated that oil-abundant countries’ output as well as government revenue and expenditure experienced high volatility due to fluctuating commodity prices concomitant

with undiversified revenue and export bases. Indeed, Soludo (2006) asserts that unless the 1999 Constitution is urgently amended, the management of excess crude and the earnings from "a depletable oil resource" would continue to pose a serious challenge to monetary and fiscal authorities. The overriding consensus among scholars is that oil-money has not brought about the desired poverty reduction nor stimulated the non-oil economy adequately from its doldrums.

Finally, it is established that the Nigerian economy continues to grapple with challenges that have hampered efforts aimed at its transformation. These include but not limited to; fiscal dominance (fiscal policy challenges) which characterises the Nigerian macroeconomic setting, poor infrastructural facilities, growing insecurity, political instability and bad governance, and as well as non-inclusive growth.

CHAPTER THREE

LITERATURE REVIEW

This section presents related literature on the effects of natural resource abundance on the economy. In particular, it highlights the theoretical, methodological and empirical literature on the effects of resource abundance on the economy. The theoretical issues reviewed inlude; the Dutch disease theory, the linkage theories, the two-gap and three-gap models and export instability theory. Under the methodological review, the focus is on estimation issues associated with modelling the effects of resource abundance on the economy. Also, rigorous review of issues on alternative measurements of ORA were carried out. This is followed by the survey of empirical findings on the effects of natural resource abundance on the performances of different economies. The chapter concludes with an appraisal of reviewed literature.

3.1: Theoretical issues

There are disagreements among economists on whether growth and development are enhanced or hindered in economies that acquire large natural rents from their resources. These disagreements have led to theories on how such wealth can be translated to sustainable development. Prominent among these are: the Dutch disease theory, the linkage theories; the two-gap and three-gap models; and the export instability theory[22] (Ogunleye, 2008). These theories are reviewed in what follows.

3.1.1: The Dutch disease theory

The term "Dutch disease" was created by the Economist magazine (1977) to describe the process by which the discovery of natural gas in the 1960s and subsequent formation of a massive partnership between Esso, Royal Dutch Shell, and the Dutch government in 1963 to rapidly exploit and export the newly-found natural resource translated into a substantial decline in the Dutch manufacturing sector. Observably, theoretical literature on Dutch disease is extensive. Early contributors include Corden (1981, 1984), Corden and Neary (1982), Van Wijenvergen (1984), Edwards and Aoki (1983) and Haberger (1983).

[22] The last three drew heavily from Gelb (1988).

The theory explains the relationship between a large inflow of foreign capital concomitant with the appreciation of a country's real exchange rate. This increase in capital will raise the exchange rate and cause a reallocation of production resources. This will make the sector exposed to international competition less competitive. It was first observed in Holland in the 60s, when the Dutch Guilder appreciated due to the discovery of a large natural gas reserve in the North Sea (Ebrahim-Zadeh; 2003). The model has mainly been used for analysing the impact on the economy from a large discovery of natural resources, such as oil.

Corden and Neary (1982) exposition on the "core model" comprises the spending effect and the resource movement effect, which captures the mechanism of what would initially seem to be an economic boom for a nation inverts and produces a paradoxically adverse consequence. Provided below is a review of the key points of the core model as initially conceived by Corden and Neary (op. cit) and some of the refinements made to the model by other scholars.

Corden and Neary (1982) begin their analysis by dividing an open economy into three sectors of interest, namely two traded sectors and one non-traded sector. First, there is the booming export sector, abbreviated B. In the most simplistic case, the booming sector centrs on a natural resource discovery and the ensuing extraction, the symptoms of Dutch disease set in whenever "any development results in a large inflow of foreign currency, including a sharp surge in natural resource prices, foreign assistance, and foreign direct investment."

Second, the lagging export sector, denoted L, is another tradable sector often based on traditional manufacturing activity. Under the effects of the Dutch disease, Corden and Neary (op. cit) demonstrated that the lagging export sector suffers through a process termed de-industrialisation. While traditional manufacturing forms the simple base case L, the authors emphasise that "the lagging sector can be producing both non-boom exportable and importable, and it needs not consist only of manufacturing industry. In Australia and Nigeria, for example, a significant component would be producing tradable agricultural products. The term 'de-industrialisation' can thus be misleading (with a major

effect possibly being de-agriculturalisation) and should be regarded as no more than shorthand."

Third, the non-traded sector, N, consists of goods and services produced for consumption by domestic residents not exported, either in form or in practice. Typically, this includes retail trade, services for final consumers as well as building and construction.

Having defined the three market sectors, the effects of a rapid growth in national earnings from the booming sector may be considered. A boom in B results initially in raising the aggregate incomes of the factors initially dedicated to B. Corden (1984) states that this transformation in factors devoted to B can take place through any one of three ways: " there has been a once-for-all exogenous technical improvement in B, represented by a favourable shift in the production function, this improvement being confined to the country concerned; there has been a windfall discovery of new resources (that is, increase in supply of the specific factor); and B produces only for export, with no sales at home, and there has been an exogenous rise in the price of its product in the world market relative to the price of imports."

As B booms and the factors there experience a sharp rise in income, two processes are set in motion and ultimately, they manifest as Dutch disease. The first process is the *spending effect*. Under conditions of fixed exchange rates, the inflow of foreign exchange to cover the increase in exports from B would result in increased exchange of foreign currency for domestic currency, the supply of domestic money supply would increase, and the resulting increase in domestic demand would provide upward pressure on domestic prices. Through this straightforward chain of events, a boom in B would produce an appreciation in the *real* exchange rate, "the price of non-tradable goods and services relative to tradable goods and services." Kulkarni (2006) elaborates on the real exchange rate appreciation effect by defining the following relationship:

$$RER = ER (P^* / P) \qquad (3.1)$$

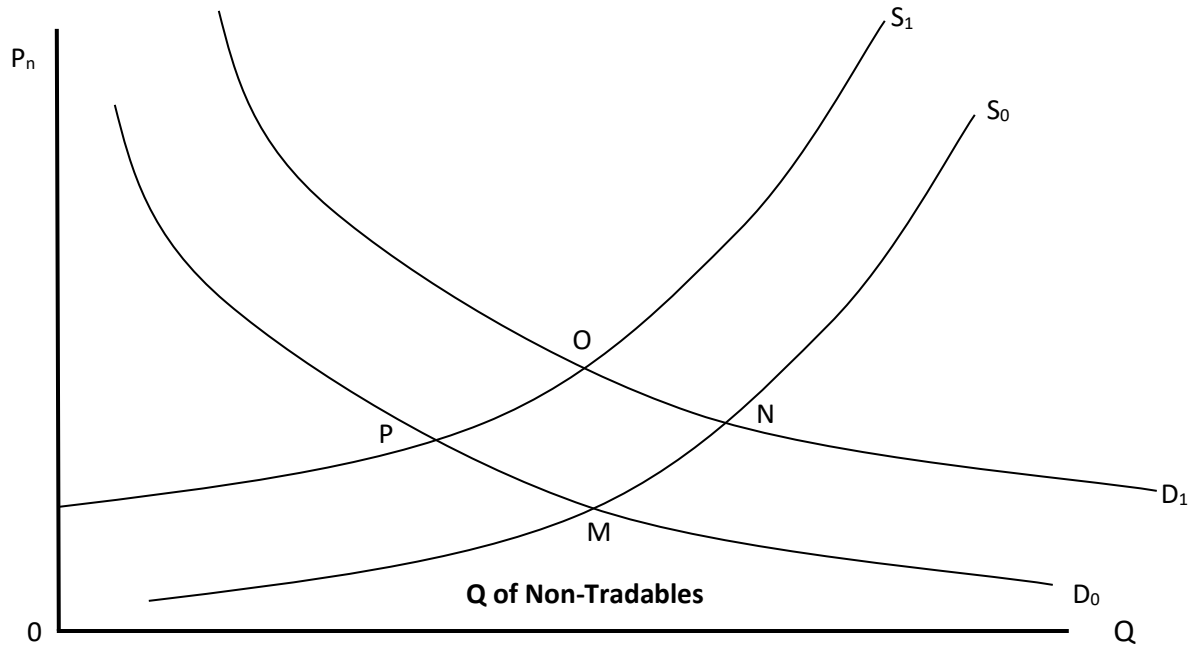
In the equation, RER is the real exchange rate, ER is the observed exchange rate between two countries, P* is the foreign country's price level, and P is the domestic price level. From another perspective, an increase in demand by domestic consumers for goods and services in N may result in the "cost of those goods and services [rising] relative to tradables. This is called an appreciation of the real exchange rate." Kulkarni (op. cit) further explicates this effect under fixed exchange rates by conjecturing that "domestic inflation is in excess of foreign inflation which causes exporters' profits to decline especially if domestic wages and the prices of domestic imports rise faster than the price of exported goods. Hence, as domestic price level increases faster than the foreign price level, the real exchange rate decreases even if the nominal exchange rate stays the same."

An economy operating under a system of flexible exchange rates will also see an appreciation of the domestic currency as the increase in foreign currency inflow drives up the domestic money supply. This, as the IMF (2003) puts it, "implies an appreciation in the real exchange rate, in this case through a rise in the nominal exchange rate rather than in domestic prices."

Under both systems of exchange rate determination, the end effect is the same: an appreciation in the real exchange rate (real appreciation) as the price of N rises in relation to the prices of the tradable sectors. This causes a shift of resources from B and L into N while concurrently deflecting demand from N to B and L. The end result shows a weakening of the competitiveness of the export sectors and a particular shrinkage in the traditional export sector.

Figure 3.1, graphically explicates the spending effect as conceived by Corden and Neary (1982). In this plot, movement along the vertical axis represents real appreciation of the domestic currency as the price of N rises relative to the price of L. The demand curve is the demand for N at various Pn when total expenditure equals total income, and the supply curve represents the supply of N at various Pn. The intersection of D_0 and S_0 at point M represents the initial condition. A rise in total income produces a rightward shift in the demand curve to D_1, required to maintain total expenditure equal to total income.

At point N, the Pn is higher than at point M, and an appreciation of the real exchange rate occurs.



Source: Adopted from Ruehle and Kulkarni (2009).

Figure 3. 1: The Price of N Relative to the Price of L (Pn) versus the Quality of N.

The second process by which the symptoms of Dutch disease are transmitted by the initial expansion in B is the *resource movement effect*. The increase in domestic demand for domestic non-traded goods causes a shift of resources, including capital and labour, into the non-traded goods sector. Further, the booming sector continues to flourish and attracts capital and labour. These resource transfers come at the expense of the lagging export sector, which is already underperforming due to the unfavourable real exchange rate appreciation. The redirection of resources away from L to B and N further undermines and shrivels the production of L. This process constitutes the general case for the *resource movement effect* (Ruehle and Kulkarni, 2009).

Corden (1984) discusses the effect of the demand for labour among the three sectors to further specify the application of the resource movement effect to the core model. An increase in B commands a rise in the labour demanded by B. This labour must come to B at the expense of N and L. Corden (Ibid) notes that the transfer of labour from L to B is *direct de-industrialisation*, as the process of shifting labour resources away from the lagging manufacturing sector operates independent of the market for non-tradables and does not necessarily rely upon an appreciation of the real exchange rate.

In addition, Figure 3.1, aids in explaining the concept of *indirect de-industrialisation*. The boom in B draws labour out of N, attracting resource movement to the booming sector. This resource shift moves the supply curve from S_0 to S_1, and results in additional real appreciation over that induced by the spending effect. The appreciation of currency compromises the competitiveness for L and results in labour flow from L to N, enhancing the effect of de-industrialisation induced by the spending effect.

The transfer of labour from L to N is termed *indirect de-industrialisation* due to the process linkage with the real exchange rate. Further, Corden and Neary (1982) point out that, while the spending effect tends to increase the production from N, the resource movement effect reduces the production of N. Thus, depending on the magnitude of these effects, the ultimate production from N may be higher or lower than when it started.

Lawler (1987) notes that "the shortrun and longrun effects of a resource sector discovery on relative prices and the sectoral distribution of output depends on the domestic private sector's reaction to the implied increase in its real wealth." The Dutch disease can also be explained through an examination of the effects of a resource discovery or price increase on the domestic money supply. An increase in exports of B causes an increase in "broadly defined" money supply through the inflow of foreign reserves. This is expressed algebraically as:

$$MS = D + R \quad (3.2)$$

Where: MS is the money supply in the country, D represents the domestically derived money supply, and R is the foreign reserves. Increases in D or R will produce an increase in the money supply. Kulkarni (2006) explains that this "increase in money supply becomes the main cause of inflation in the economy that has experienced the increased export price." This cause can be traced back to the 1960s and the Dutch disease event. During this period, as the IMF reports, "the Netherlands experienced a vast increase in its wealth after discovering large natural gas deposits in the North Sea. Unexpectedly, this ostensibly positive development had serious repercussions on important segments of the country's economy, as the Dutch Guilder became stronger, making Dutch non-oil exports less competitive." Since the original description of the events that produced de-industrialisation following a resource discovery, economists have found evidence for the symptoms of Dutch disease in numerous countries. Historical examples of the application of Dutch disease theoretical frameworks include the examination of the "impact of the flow of American treasures into sixteenth-century, Spain and gold discoveries in Australia in the 1850s".

Contemporary examples of Dutch disease frequently involve the discovery of new oil reserves within a country or in countries already exporting oil when the price of oil rises rapidly. Ample examples of this emerged in OPEC countries during the 1970s appreciation in oil price "and oil exports rose at the expense of the agricultural and manufacturing sectors." The rising price of diamonds, threw Sierra Leone into a fit of Dutch disease. Further, agricultural booms can lead to Dutch disease, "higher coffee

prices in the late 1970s (after frost destroyed Brazil's coffee crops) triggered a boom in coffee sectors in producers like Colombia at the expense of the traditional export sector as spending and resources were reallocated to the nontraded goods sector " (Ruehle and Kulkarni, 2009).

Using the framework of the Dutch disease model, Sachs and Warner (1995b) contend that when an economy experiences a resource boom (either a terms-of-trade improvement or a resource discovery), the manufacturing sector tends to shrink and the non-traded goods sector tends to expand. The shrinkage of the manufacturing sector according to them, is dubbed the "disease". They claim that there is nothing harmful about the decline in manufacturing if *the neoclassical, competitive conditions prevail in the economies*.

The foregoing suggests that the boom from natural resource exports could damage a nation's productive economic sectors. Experiences have shown that this is not a general truth. Some real life examples cast serious doubt on the paradigm of a general Dutch disease (Brunnschweiler and Bulte, 2008). They argue that a high dependency on resource exports correlates with bad policies and the effects in question, are not caused by the large degree of resource exportation. The causation according to them goes in the opposite direction: conflicts and bad policies created the heavy dependence on exports of natural resources. They further argue that when a country's chaos and economic policies scare off foreign investors and send local entrepreneurs abroad to look for better opportunities, the economy becomes skewed. Factories may close and businesses may flee, but petroleum and precious metals remain for the taking. Resource extraction becomes the "default sector" that still functions after other industries have come to a halt.

These recent issues in the literature therefore suggest that in explaining what could damage a nation's productive economic sector, other factors other than the popular Dutch disease need to be examined. This is thus the focus of the next section.

3.1.2: Growth, two-gap[23], and three-gap models

The neoclassical growth theory characterises output growth as a process of expanding a production possibility set, the frontier of which is set by the quantity (rather than the quality) of factors of production and by the efficiency of their allocation across activities. In the simplest formulation, growth is constrained by increases in the labour force and capital formation, hence by domestic savings.

The two-gap model is an open economy Harrod-Domar model developed by Mckinnon (1964) and Chenery and Strout (1966) to show how a shortage of foreign exchange can reduce economic growth by constraining imports and savings. It assumes without explaining how the shortage arises, nonetheless it suggests foreign aid or capital inflows can have a multiplier effect on growth and investment. The model contends that if labour and other domestic inputs are abundant, imports would be an important complementary factor of production and, when export revenues cannot easily be increased, foreign exchange becomes a second binding constraint on growth. A consensus that emerges among several scholars who argued against the two-gap model is that foreign aid can impede rather than facilitate development in the recipient countries (Bruton, 1969; Griffin and Enos, 1970; Voivodas, 1973; Findlay, 1973; and Mosley, 1980).

Further elaboration of two-gap model results into the three-gap model, in which development may also be constrained by a shortage of fiscal revenue. For this to happen, public funds must play a critical role, for example, in the process of capital formation; ensuring access to foreign exchange; or relaxing bottlenecks to growth-and there must be constraints on the ability to tax.

Not much more needs to be said about these theories in the present context, except to observe that rent-intensive activities help relax simultaneously all three types of constraint: domestic savings, foreign exchange, and fiscal revenues. To the extent that

[23] The central idea of the two-gap analysis is that foreign aid can serve as a means of breaking bottlenecks inhibiting development, thereby permitting fuller utilisation of all resources and a continuation of development in an economy. It came to be following about 40 years curiosity of some economists who began to map the linkages between foreign aid and economic growth for developing countries. Gradually, their analysis became more sophisticated and came down to the two-gap model (Iqbal and Zahid, 1998).

rents are taxed away and invested, rather than consumed, these theories predict a very favourable effect of windfalls on growth, especially if the domestic labour force is not a tightly binding constraint.

3.1.3: Export instability theories

This facet of analysis bears on the question of whether adverse effects from the variability of oil income are likely to offset the benefits of temporarily high income. Typically, exports of developing countries are more concentrated than those of developed countries and consist largely of primary agricultural and mineral commodities. The former, it is commonly argued, is price-inelastic in demand and, because of harvest fluctuations, are also subject to supply shocks which often induce large price swings. Mineral commodities are price-inelastic in demand and supply, with demand being very sensitive to economic activity in consuming regions. Cyclical demand fluctuations will tend to induce large price and revenue shifts.

There is far less agreement, however, on the significance of such conclusions, and consequently little accord on whether it would be desirable to try and stabilise commodity markets, even if it were possible to overcome the political difficulties involved in such an effort. There is also the perennial problem of how to identify the equilibrium trend about which stabilisation should occur. Newbery and Stiglitz (1981) regard the microeconomic arguments for stabilisation, which center on the aversion of producers to risk, considered quantitatively insignificant.

There are also macroeconomic arguments in favour of stable export revenues. These call to mind the well-recognised asymmetry of adjustment in response to fluctuations in demand. When domestic demand increases, supply is likely to hit capacity constraints. Inflation, real exchange rate appreciation, and rising imports then clear markets. But when demand decreases, unemployment is likely to rise either because of downward wage rigidity or because of sticky prices, with firms temporarily off their longrun supply curves. Thus, demand fluctuations or intermediate price shocks raise average imports and reduce average capacity use, output, and income. If savings and investment fall with income, this will have an adverse impact on growth.

If changes in oil revenue manifested primarily as changes in public investment, a further growth argument for stability follows. There are costs in terms of quality-not easily measurable but apparently considerable-associated with very large shifts in the rhythm of investment. On the one hand, rapid growth of public spending is liable to reduce the quality of capital formation and raise costs, because of more hasty planning, transport bottlenecks and the need to use progressively more costly (or lower quality) factors at higher growth rates. On the other hand, cutbacks mean costly postponement or cancellation, with partly completed ventures yielding no output. Even if they are later completed, delay would have reduced their rate of return.

More so, some policies and government programmes put in place during the boom years may prove difficult to reverse as oil income falls. For example, restrictions on dismissing civil servants may induce a ratchet effect[24] in the public wage bill. It may be politically difficult to cut investments in the energy sector, even though declines in the world oil market reduce their profitability. Ratchet effects worsen the allocation of resources, and if sufficiently sustained, they may prevent the re-attainment of the pre-boom situation for a long time after the end of the windfall.

Cremer and Salehi-Isfahani (1980) proposed a third theory based on the concept of "target revenue", which would result in a backward-bending competitive oil supply curve. The higher world oil prices were, the lower the production levels a country needed to attain its revenue target. A shock to the system could then result in a jump from a low-price to a high-price equilibrium. Such an explanation points to a potentially volatile market with rapid price decline triggered by competition from new producers, which would increase the elasticity of OPEC's demand curve.

A fourth theory is that the oil shock simply resulted into the cartelisation of the oil market; this allowed OPEC to institutionalise the sharp spot price increases that followed several significant political events threatening supplies. In this context, the path of oil prices

[24] This is an effect that occurs when a price or wage increases as a result of temporary pressure and fails to fall back when the pressure is removed.

would be set by the cohesiveness of the cartel. Some argued that OPEC would collapse fairly quickly like other cartels; but some, pointing to distinctive characteristics of oil production and of producing countries, contended that OPEC would be sustained indefinitely.

Theories of oil-price setting have continued to evolve. Adelman (1986) departs from the proposition that oil exporters tend to operate with short horizons and high discount rates because their wealth portfolios are concentrated in a volatile oil sector rather than diversified. These high discount rates cause pricing decisions to be made on the basis of shortrun, inelastic demand schedules for oil rather than the more elastic longrun schedule; this leads to a policy of "take the money and run" and to an inherently unstable oil market.

Thus, neither the price increases were widely anticipated nor was the oil glut of the 1980s. Nor were the policy responses of major consuming countries predicted-responses that significantly changed global scenarios between the first and second oil shocks. The stochastic nature of the windfalls and reversals and the inadequacy of predictions not only of oil prices but of worldwide inflation, interest and exchange rates, and other commodity markets must be borne in mind when accounting for the effects of the oil shocks.

From the foregoing, one realises that the export instability theory mainly focuses on the fluctuations (shocks) in export prices and revenue. It turns weak when it comes to tracing the effect of the fluctuations on the other sectors of the economy. This is unlike the Dutch disease theory that unravels how a booming sector hampers growth in an economy through its effects on the non-booming sectoral economic activities. More so, the political dimension of the export instability theory goes beyond the scope this study and as such, could not serve as the theoretical underpinning of the empirical models of this study.

3.1.4: The linkage theory

It has been observed that growth, particularly in its early stages, is likely to rely on a number of staple industries rather than just one. The "staple thesis," popular before the 1960s, attempted to show how a country's development could be shaped by a succession of primary export products. To answer the crucial questions of how, and under what

circumstances, “one thing would lead to another” - specifically, from a sequence of staples based on natural resources to activities in which income would be generated by producible factors of production - a more structured theory was required. This led to the familiar but often misinterpreted concept of linkages (Gelb 1988).

Although linkage theory, and especially attempts to quantify it, is commonly associated with input-output analysis, in its original form, it emphasises the dynamic stimulus to entrepreneurship rather than a static framework of existing interrelations. Unlike the growth, two-gap, and “booming sector” theories, it stresses that “development depends not so much on finding optimal combinations for given resources and factors of production as on calling forth and enlisting for development purposes resources and abilities that are hidden, scattered or badly utilised” (Hirschman, 1958). According to this theory, in a given social, political, and economic context certain characteristics of the leading activity are conducive to its providing such stimulus. The effects of the interaction between the leading sector and other sectors are divided into production, consumption, and fiscal linkages.

Hirschman (1981) distinguishes between the stimuli provided to those engaged in the leading activity itself (“inside” linkage) and the stimuli offered to others (“outside” linkage). In contrast to other theories, linkage theory de-emphasises comparative advantage and international trade and does not single out a few “fixed factors” as the main impediments to growth.

For investments intended to produce commercially marketed (usually industrial) output, the problem is obvious. Governments are no more and probably less likely to pick “winners” than those whose livelihoods depend on the outcome. But infrastructural investment, too, has its useful limits. Infrastructural capital is usually created slowly and incrementally, and has normally been provided in response to demand emanating from other productive activities rather than in anticipation of demand in the hope of stimulating production. The task of usefully deploying windfall gains is arguably easier for the poorest countries because a wide range of physical infrastructure and human capital endowments is seriously deficient.

More so, fluctuating fiscal revenues are likely to cause market asymmetries[25] in public decision-making. Investment programmes started during a boom are hard to reverse; employees once hired are hard to dismiss. Asymmetric response weakens the effectiveness of fiscal linkage by lowering the average quality of public spending.

Finally, the submission of the theory that "the task of usefully deploying windfall gains is easier for the poorest countries because a wide range of physical infrastructure and human capital endowments is seriously deficient" has not come true in the case of Nigeria. The reverse still holds strongly.

3.2: Methodological literature review

In modern economic literature, different methodologies have been applied to trace the impact of natural resource abundance on the macroeconomy. For ease of appreciation, the review of literatures relating to methodology focused on the definition and measurement of relevant variables and also on the estimation issues associated with modelling the effects of resource abundance on an economy. These subsections are presented next.

3.2.1: Alternative definitions and measurement of resource abundance

An essential issue in the resource curse literature relates to the measurement of natural resources. In fact, much of the debate on the existence of the resource curse revolves around this measurement issue. Existing literature has shown that empirical findings on the resource curse are extremely sensitive to the choice of resource measures. Since specialisation in minerals and fuels is often associated with greater economic distortions (Auty, 2000, 2001), it is appropriate to focus more directly on measures of these resources. In this regard, more direct and conceptually appealing indicators of resource abundance have been compiled and published by the World Bank (1997, 2005). These are based on the net present value of the stream of rents. Total national wealth is divided into three main components: produced assets, human resources and natural capital. The

[25] Market asymmetry arises in situations of decisions in transactions where one party has more or better information than the other. This results in an imbalance of power in transactions between parties involved which can sometimes cause the transactions to go wrong. When this happens there is no more fair or equal opportunity and monopolisation becomes a threat (Lofgren *et al*., 2002).

measure of natural capital is based on agricultural land, pasture lands, forests, protected areas, metals and minerals, as well as coal, oil and natural gas. Estimates for the value of subsoil assets (metals, minerals, coal, oil and natural gas) are derived by taking present values of the total rents over the projected life of the resource deposit.

In an earlier study[26], the share of primary commodity exports in GDP (or in total exports) was used to proxy for natural resource abundance. According to Stijns (2005) there are three main concerns raised by this measure of resource abundance. First, a resource-rich country may export few natural resources at the same time that its manufacturing sector exports embody intensively its natural resources. Second, as Wright (2001) argues, "if countries fail to build upon their resource base productively, then measures of 'resource dependence' (such as the share of resources in exports) may serve primarily as proxies for development failure, for any number of reasons that may have little to do with the character of the resources themselves". Third, the role played by resource abundance for economic growth depends critically, and in a somewhat complicated way, on the type of growth model adopted. Stijns (2005) therefore asserts that three options offer themselves to the researcher for measuring natural resource abundance, namely natural resource exports, production and reserves. He further argues that there is a high degree of correlation between production and reserves data for oil, coal, gas, and minerals.

Herb (2005) proposes a more theoretically appealing measure of ORA that captures the impact of oil on government revenue: the ratio of revenues from petroleum and minerals to total government revenue. However, Haber and Menaldo (2007) opine that existing indicators may not satisfactorily capture the "fiscal impact of oil" on an economy. For example, the ratio of fuel exports to GDP, one of the more commonly used measures in the literature, does not properly encapsulate the effect of oil on government revenues.

A related measure conceived by Herb (2005) is the ratio of net oil exports to GDP, where net oil exports are defined as follows:

[(fuel exports/merchandise exports) – (fuel imports/merchandise imports)]

[26] See the study titled natural resource abundance and economic growth by Sachs and Warner (1995)

Herb's (op. cit) measures have recently gained attention in the political science literature, but have not yet made their way into the mainstream economics literature on the resource curse (Bond and Malik, 2008). A different way of characterising resource-dependent countries is to consider dummy variables based on different resource specialisations. Isham *et al*. (2005) propose several export classifications based on a country's natural resource base.

An export-based measure called the "export concentration index" was developed by UNCTAD. This is a modified version of a Herfindahl-Hirschmann index, defined as:

$$EXCON = \frac{\sqrt{\sum_{j=1}^{N}\left(E_j / E\right)^2 - \sqrt{\frac{1}{N}}}}{1-\sqrt{\left(1/N\right)}} \qquad (3.3)$$

Where: exports are disaggregated into N products indexed by j, E is the total value of exports, and Ej is the value of exports of product j. EXCON has been normalised to lie in the range between 0 to 1, where large values of the index reflect high concentration of exports in a narrow range of products.

Bond and Malik (2008) note that the commodity exports measure as adopted by Sachs and Warner (1995) is a crude proxy and does not directly measure resource wealth. For instance (according to them) not all resource rich societies have a high proportion of primary commodity exports. Besides, it may represent other influences: the share of primary commodities in GDP can be driven by policy rather than resource dependence *per se*.

Two measures based on production data for minerals have received attention in the literature, these are the share of mineral production in GNP and the share of mining in GDP. Brunnschweiler and Bulte (2008) observe that mineral indicators are marred by lack of consistent quality of data on mineral production, absence of weights to value different minerals and possible endogeneity concerns (raised by the influence of technology and

economic development on mineral production). According to them, amongst the different types of natural resources, oil stands out for its distinct effects on political economy.

The wealth data, though more closely tied to the notion of resource abundance, raise some identification problems in empirical work. For instance, when natural capital as a share of total wealth is used as a measure of resource abundance, a negative correlation might result if the denominator - total wealth - is positively correlated with the dependent variable, growth of RGDP per capita or the investment rate. Using suitable instruments for the natural capital share may be a solution, but good instruments are hard to find. The use of natural wealth per capita may therefore be more appropriate in this context. Studies using this indicator tend to find a positive effect of natural resources on economic growth (Brunnschweiler and Bulte, 2008). It is useful to note that natural wealth per capita correlates quite highly with per capita income (Bond and Malik, 2008).

Markus (2010) argues that the commonly used nominal measure of natural resource dependence - the share of exports of primary products in GNP - understates in growth regressions the negative link between natural resource dependence and per capita GDP growth. He shows that using the purchasing power parity (PPP) adjusted measure yields an economically much larger negative relationship between per capita GDP growth and natural resource dependence than what has been suggested by the nominal measure. On Nigeria and Colombia, Perry *et al* (2011) used "net exports per capita" and "oil price" as measures of oil resource abundance.

From the foregoing and to get as close as possible to the concept of 'abundance,' the Herb (2005)[27] measure of ORA was adopted in the empirical analysis of this study. The reasons for this are two-fold: the measure aptly capture the Nigerian situation where a great chunk of the government fiscal actions is derived from the activities in the oil sector; and it enables us capture the "fiscal impact of oil" on the Nigerian economy.

[27] The ratio of revenues from oil to total government revenues.

3.2.2: Review of estimation techniques

The estimation procedures found in the literature can be broadly classified into five. They are; the traditional Ordinary Least Squares (OLS) as found in the studies of Olofin and Iyaniwura (1983), Ding and Field (2004), Egert and Leonard (2007), Bond and Malik (2008), Hussain *et al* (2009), and Perry *et al* (2011); the Two-Stage Least Squares (2-SLS) procedure (Bond and Malik, 2008); the Vector Error Correction Method (VECM) as in Ogunleye (2008); the Standard Vector Autoregressive Procedure (Perry *et al*, 2011); and the Generalised Method of Moments-Instrumental Variable (GMM-IV) as in Lederman and Maloney (2002).

Olofin and Iyaniwura (1983) used the CEAR (MACIII) macro model that consists of 25 stochastic equations and four identities to investigate the transition from an oil-based economy to a stage characterised by greater diversification of exports and more balanced sectoral growth. For the purpose of evaluating the model's performance, the authors carried out a historical dynamic simulation over the model's estimation period. In addition, they find answer to three related questions, namely how well do the endogenous variables track the historical data series? What is the model's predictive potential? And, how well does the model simulate turning points in the endogenous variables? To address the issue of predictive ability, the authors obtain the Theil's inequality coefficient for all the simulated variables. According to them, it is desirable that these coefficients be close to zero if the model is to be capable of good predictive performance. The bias proportion of the simulation error, which indicates the extent to which the average values of the simulated and actual data series deviate from one another, was also carried out in the study. Finally, the authors obtained the variance proportion of the simulation error which shows the ability of the model to replicate the degree of variability in the endogenous variables. Again, they opine that it is desirable that these values be close to zero, if the model is to have the capability of tracking points sufficiently well. The OLS estimation technique was used in analysing the data for the study.

Benedictow *et al* (2009) develop a macroeconometric model of the Russian economy containing 13 estimated equations - covering major national account variables, government expenditures and revenues, interest rates, prices and the labour market - and a

number of identities. The model is tailored to analyse effects of changes in the oil price and economic policy variables, as well as to make economic forecasts. The model has nice statistical properties and tracks history well over the estimation period, which runs from 1995Q1 to 2008Q1. The stochastic Monte Carlo simulation was used to provide a measure of uncertainty in the results, by adding error bounds of plus/minus two standard deviations to the predictions. Model simulation indicates that the Russian economy is vulnerable to large fluctuations in the oil price. The ordinary least squares (OLS) was used to estimate equilibrium correction models. A notable weakness of the study is that the rudimentary treatment given to one of the target variables (monetary supply) inevitably means that forecasts generated by the models downplay the significance of structural rigidities in the economy in determining the final outcome of policy measures. More so, another estimation issue confronted in the study is the paucity of data.

Andersen *et al* (2004) present a medium-sized macroeconomic model of the Lithuanian economy using econometrics on a limited number of quarterly observations. The model is a standard demand-driven macroeconomic sectoral model in the tradition of the European national models and includes 205 equations. Approximately, half of the equations are identities and definitions. A central element in the model is a 12-sector input/output table of the Lithuanian economy facilitating analyses of structural changes. The general formulation of equations is the error correction model (ECM). The equations are estimated with Least Square single equation method. The authors acknowledged that changing data sources and structural changes in the estimation period, made it challenging to estimate some of the equations. Notably, there are indications that the model may be guilty of the Lucas critique[28]. Because Lucas (1976) observes that if the parameters of models are not structural, not policy-invariant, they would necessarily change whenever policy (the rules of the game) was changed. As such, policy conclusions based on those models would therefore potentially be misleading.

Singh (2005) maintains that the design of macro-models for the purposes of derivation of macroeconomic stabilisation policies and obtaining forecasts is an important area of

[28] This is named Robert Lucas' work on macroeconomic policymaking. He argues that it is naïve to try to predict the effects of a change in economic policy entirely on the basis of relationships observed in historical data, especially highly aggregated historical data.

theoretical and empirical economic research. This is because such a stance presents an ideal blend of the essential theoretical ingredients of the contemporary macroeconomic paradigms with specific structural features of the country under reference. It is against this background that Singh (2005) built a macro-model for the Indian economy. The basic premises of the model are that in the Indian environment, monetary sector changes are reflections of changes in the fiscal and external sectors. The model, notably, is a much aggregated representation of the Indian economy. There are five blocks of equations relating to output and investment; government revenue and expenditure; money; prices; and external trade. The model covers two distinct phases of the Indian economy - highly regulated and deregulated. The model consists of 17 equations, of which ten are stochastic and seven are identities. Using an error-correction framework, Singh (op. cit) estimated the parameters using annual time series data between 1985 to 1986 and 2001 to 2002. Individual equations were estimated in a cointegration framework. In addition, the model captures inter-linkages of the economy in a simultaneous framework. Nonetheless, the models suffer from the problem of dualistic[29] nature of the Indian economy which limits their relevance and also challenges the policy conclusions that can be drawn.

Murshed (1999) presents a shortrun theoretical macroeconomic model of a small open economy endowed with a natural resource exporting sector. The model comprised three sectors on the real side, two of which are traded goods and one a non-traded commodity. A monetary sector is also incorporated. The first traded good is denoted by R, for the natural resources -based sector whose output is entirely exogenous and purely for export. R represents the value of exports from this sector in domestic currency units. Following Sachs (1996), Sachs and Warner (1999) and other treatments of Dutch disease models, as in Neary and Wijinbergen (1986), Murshed (1999) treated the value of output in the resource-based sector exogenously. According to him, R could also include foreign aid and other forms of unrequited transfers such as worker remittance from abroad.

In the model, M indexes the other traded sector, both consumed domestically and exported. It is basically a labour-intensive manufactured good. In addition, there are

[29] This is the existence of side by side, a sisable traditional sector characterised by informal and unquantifiable data and a modern sector quantifiable.

consumption imports, C_F which compete with M in domestic consumption. M is produced utilizing labour only, in order to capture the part played by labour-intensive manufactured goods for export and domestic consumption[30]. The price of M, P_T, is normalised at unity, and is in any case given in a small open economy. Following Sachs (1996) M is described as:

$$M = \theta L_M \tag{3.4}$$

L_M represents labour employed in the m sector and θ stands for the marginal value product of labour in that sector. The non-traded goods sector is represented by N, the production of which requires capital, labour and an imported intermediate input (T). It therefore needs some foreign technological input, the capital-intensive sector by definition. In a sense, the output of the N sector is more "sophisticated" than in the other sectors, but perhaps that is precisely why it is non-traded. Note that the manufacturing could lie within the M and N[31] sectors, and the "real-life" counterpart of the non-traded sector is not restricted to public and private services only. Murshed (1999) represents the output of the N sector in a general reduced form, as:

$$P_N N = P_N N\left(P_N, E\right) \tag{3.5}$$

P_N represents the price of non-traded. The supply of N increases with P_N but declines as the nominal exchange rate depreciates (E increases) as this makes the intermediate input more expensive. As far as the domestic value added of the N sector is concerned, this is obtained by subtracting the value of the intermediate input:

$$\left(P_N - \lambda\right) N\left(P_N, E\right) = P^D{}_N N \tag{3.6}$$

[30] See Sachs (1996).

[31] In summary, the output of the N sector could include government and private services, as well as some shielded but sophisticated manufacturing. For the sake of analytical convenience, fixed proportions characterised the use of the intermediate input from abroad in the N sector. See Findlay and Rodriquez (1977) for a discussion of production functions where an imported input enters in a "Leontief" fashion.

Where: $\lambda = ET, as P_T = 1, P^D{}_N$ measures domestic value added in the N sector.

Turning to consumption or the demand side, in the manufactured traded goods sector, this is composed of domestic demand (C_M) and foreign or export demand (X_M):

$$C_M\left(P_N, Y, E\right) + X_M\left(E\right) = M \tag{3.7}$$

Domestic demand for the output of the M sector depends positively on the price of the non-traded good, P_N as well as income, Y. It is also positively related to the exchange rate, a rise in E represents *devaluation*, an increase in the cost of obtaining imported substitutes. Export demand is positively related to the nominal exchange rate. Equation (3.7) represents equilibrium in the M sector and can be interpreted as demand, on the left-hand side equaling supply on the right-hand side. In the non-traded goods sector, equilibrium supply equals demand is represented by:

$$C_N\left(P_N, Y\right) + I_N\left(r\right) = \left(P_N - \lambda\right) N\left(P_N, E\right) \tag{3.8}$$

Domestic consumption of non-tradables is negatively related to its own price, positively linked to income. I_N stands for investment, that is the savings will lead to capital formation in that sector, and will be negatively related to the interest rate (r).

Equations (3.7) and (3.8) can be viewed as the balance or equilibrium relations for the traded (non-natural resources) and non-traded goods sectors respectively in the sense that supply equals demand. Murshed (1999) specifies the concept of national income, Y or GDP. This consists of domestic value-added in all three productive sectors, N, M and R, less imports. Thus:

$$Y = \left(P_N - \lambda\right) N\left(P_N, E\right) + M + R - EC_F\left(E, Y\right) \tag{3.9}$$

The strength of Murshed's model as a unique tool, especially for policy formulations drops when the need for a wide variety of investigations, particularly in relation to model

selection, diagnostic tests and time series properties of the data is considered. These issues are aptly considered in the present study.

Ding and Field (2004) using the OLS estimation technique, explored whether natural resource abundance leads, other things being equal, to slower growth rates. They estimated three models, namely one-equation, a two-equation, and a three-equation. Their single equation model is of the following form:

$$\Delta \text{ GDP} = f(\text{GDP}_0, \text{IR}, \text{OP}, \text{RL}, \text{TT}, \text{RE}, \text{RD}) \quad (3.10)$$

Where:

ΔGDP is average annual growth in per capita GDP from 1970 to 1990,

GDP_0 is initial GDP,

IR is investment rate,

OP is the degree to which the economy is open to world markets,

RL is the presence of the "rule of law" in the country,

TT is changes in terms of trade,

RD is resource dependence, and

RE is resource endowment.

Ding and Field (2004) used the Sachs and Warner (1995) country data on all other variables, but introduced capital stock data from a recent World Bank effort to estimate natural, human, and produced capital figures for countries of the world. The natural resource assets in the World Bank data set are built up from estimates of agricultural land, pasture land, forests, protected areas, metals and materials, and coal, oil and natural gas. They value the produced assets using a Perpetual Inventory Model (PIM) based on data for investment and life tables of assets. According to them, human capital was measured as a residual.

Sachs and Warner (2001) used as a measure of natural resources scarcity, primary exports as a proportion of GDP. Their multivariate models include contemporaneous economic type variables (initial GDP, commodity price trends, investment) and contextual or

institutional type variables (the degree of openness of the economy, the presence of the "rule of law"). They measure the relative price level across countries by taking the ratio of two measures of GDP. The numerator is GDP in US dollars measured by using local current prices and the nominal US dollar exchange rate (in symbols Y*P/E). The denominator is the same GDP evaluated at international prices (Y*P/$). These international prices are averages across many countries of prices for certain goods, and therefore do not vary by country. The ratio of these two is typically a number (a fraction) that gives the country's price level relative to a global average of prices. The number is equivalent to what is also referred to as ratio of the country's PPP exchange rate to its nominal exchange rate.[32]

Egert and Leonard (2007) using the dynamic OLS and the bounds testing approaches, explored the evidence that would establish that resource abundance poses a threat to the Kazakh economy. Assessing the mechanism by which fluctuations in the price of oil can damage non-oil manufacturing - and thus long-term growth prospects in an economy that relies heavily on oil production - their estimation reveals that non-oil manufacturing has so far been spared the perverse effects of oil price increase from 1996 to 2005.

Bond and Malik (2008) presented a cross-country empirical evidence on the role of natural resources in explaining longrun differences in private investment as a share of GDP in a sample of 72 developing countries. Adopting the OLS and the 2-SLS estimation techniques, the empirical results of their study suggest important differences between oil and non-oil resources. According to them, while revenue from oil exports tends to increase private (and public) investment, there is also a robust negative effect from a measure of export concentration. After controlling for these two aspects of export structure, they reveal that there is little additional information in other measures of resource abundance or in other suggested investment determinants, such as measures of the quality of institutions, political instability or macroeconomic volatility. The study gathers its strength by considering the importance of using an appropriate measure of resource abundance. On the other hand, unlike Lal and Myint (1996) and Collier and

[32] These issues are explained in more detail in Summers and Heston (1991).

Gunning (1999), Bond and Malik (2008) did not answer the more serious question of how resource abundance affects efficiency and productivity of investment.

Albert (2008) employed the gravity trade model to econometrically test the effects of Botswana's main exports' products on the manufacturing, mining and agriculture sectors. The estimation indicates that, diamond exports, instead of hurting the country's exports, boosted exports from manufacturing, mining and agricultural sectors. In the study, the overriding consideration for the choice of methodology was not revealed.

Ogunleye (2008) adopted the Vector Error-Correction (VEC) methodology in examining the longrun impact of the huge oil wealth accruing to Nigeria on its economic development. The shortrun adjustment coefficient, derived from estimating the coefficient

disequilibrium in the independent variable is being corrected in each shortrun period. However, the superiority of the VEC methodology over all other methods adopted in similar studies in the literature was not made known by the author.

In order to empirically analyse the relationship between natural resources and economic growth, Hussain *et al* (2009) use the RGDP to proxy economic growth. For the explanatory variables, three types of variables are used to check the impact of natural resources on economic growth in the context of Pakistan. These are; exports related to agriculture, fuel and minerals as percentage of GDP, taken as proxy for natural resource abundance. The study followed the method of Sachs and Warner (1995) for resource dependence measures (for example share of resource exports in GDP) as the proxies for resource abundance. Another variable used as explanatory relates to investment in human capital. The authors assert that human capital is an important factor of economic growth. Expenditures on education as percentage of GDP and on health as percentage of GDP are used as explanatory variables to check the impact of investment in human capital on economic growth. The third type consists of the set of variables having controlling effect on economic growth. These variables are rate of inflation, trade openness and investment as percentage of GDP which shows the efficiency of government. The models of the study are presented in equations 3.11 and 3.12 as follows:

$$Log\left(GDP\right)=\beta_0+\beta_1\left(NRX/GDP\right)+\beta_2\left(INF\right)+\beta_3\left(OPEN\right)+\beta_4\left(INV/GDP\right)+\beta_5\left(LF\right)+\beta_6\left(PG\right)+\mu 1i \quad (3.11)$$

$$Log\left(GDP\right)=\beta_0+\beta_1\left(NRX/GDP\right)+\beta_2\left(EDU/GDP\right)+\beta_3\left(H/GDP\right)+\beta_4\left(INF\right)+\beta_5\left(OPEN\right)+\beta_6\left(INV/GDP\right)+\beta_7\left(LF\right)+\beta_8\left(PG\right)+\mu 2i^{23} \quad (3.12)$$

OLS estimation was used to analyse the data. All variables were estimated at their respective orders. R-square in both models implies that the total variation in the dependent variable is due to explanatory variables. There is no change in the goodness fit of the second model after including human capital variables. Moreover, both models are good fit at 1% level of significance. The problem of autocorrelation was solved with the help of different techniques of autoregressive and moving average. Checks for robustness of estimates was carried out to avoid misleading results.

Perry *et al* (2011) compared the macroeconomics and regional effects of oil abundance (or dependence) in Colombia and Nigeria and how they have managed it (both in terms of sectoral and macroeconomics policies and institutions). They examined the evolution of oil sector institutions, and the effects of change in oil production and prices on macroeconomic performance. They tested also the institutional hypothesis that states that better institutions mitigate the possible negative effects of resource abundance. Varieties of techniques are employed in testing this hypothesis. First, the study estimated the effects of using a cross country model of oil and non-oil producing countries between 1980 and 2005. After that, their analysis then focus on individual estimations in their countries of interest. They used the OLS estimations to estimate the effects of institutional quality. Then structural vector autoregressive (SVAR) methodology was adopted to identify for both countries the presence of Dutch diseases phenomenon. The study fails to show convincingly how it accounted for the stringent assumptions (at least the assumptions of homogeneous variance in the residuals and normally distributed residuals) required for the use of OLS. The OLS estimation procedure breaks down if these assumptions are not met.

Lederman and Maloney (2002) having taken the Sachs and Warner (1995a, 1997, 1999) model specification as given aimed at providing answers to following three questions: Is the negative effect of natural resource exports (as a share of GDP) as reported in Sachs and Warner (1995a, 1997, 1999) sensitive to the time period used in the analysis? Is this result sensitive to unknown omitted variables? Is this result sensitive to endogeneity problems that afflict the traditional cross-sectional growth regressions? The authors assert that the natural resource exports effect as found in Sachs and Warner (op. cit) is probably due to unaccounted for country specific effects and endogeneity issue. Sachs and Warner (1995, 1997) estimated the following stylized model:

$$\dot{y} = Iny_t - Iny_{t-z} = \gamma Iny_{t-z} + \beta' X_{i,t} + \alpha NRX_{i,t-z} + \varepsilon_{i,t} \qquad (3.13)$$

Where the left-hand side or dependent variable is the growth rate of GDP per capita (actually, the GDP per economically active population). This growth rate is basically the differences of the natural logarithms of income per capita between the final year 't' and the initial year '$t-z$'. To provide answer to the issues they set out to achieve, Lederman and Maloney (2002) amended the Sachs and Warner (1995a, 1997, 1999) model to include time-invariant country effects as follows:

$$\dot{y}_t = Iny_{i,t} - Iny_{i,t-z} = \gamma Iny_{i,t-z} + \beta' X_{i,t} + \alpha NRX_{i,t-z} + \eta_i + \varepsilon_{i,t} \qquad (3.14)$$

The η_i represents country-specific effect. The authors maintain that one way of getting rid of unobserved country-effects is to first differenciate equation (3.14), so that it becomes:

$$\dot{y}_t - \dot{y}_{t-1} = \gamma(Iny_{i,t-1} - Iny_{t-2}) + \beta'(X_{i,t} - X_{i,t-1}) + \alpha(NRX_{i,t-1} - NRX_{i,t-2}) + (\varepsilon_{i,t} - \varepsilon_{i,t}) \qquad (3.15)$$

In the above model, the subscripts't' represent a period of time and '$t-1$' represents the previous periods (Please note that the authors omitted the 'z' subscript, which in equations (3.13) and (3.14) represent the number of years between the final year and the initial year).

Lederman and Maloney (2002) criticised the estimates of the Sachs and Warner (1995a, 1997, 1999) coefficients derived from the OLS differences estimator as in equation (3.15) on the basis that the estimator does not control for the likely endogeneity of some of the explanatory variables. To deal with the problem of the omitted country-specific effects, as well as the problems of endogeneity by construction and of reverse causality, the authors leaned on Caselli *et al.* (1996) which suggested the application of the General Method of Moments (GMM) with instrumental variables (IV) as developed by Arellano and Bond (1991).

The Arellano-Bond differences estimator relies on two moment conditions or assumptions about the correlation between the changes in the error terms and the key explanatory variables. The two moment conditions are:

$$E\left[y_{i,t-z} . (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \right] = 0 \quad \text{for } z \geq 2;\ t=3, \ldots, T \qquad (3.16)$$

$$E\left[X_{i,t-z} . (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \right] = 0 \quad \text{for } z \geq 2;\ t=3, \ldots, T \qquad (3.17)$$

These conditions simply state that the expected correlation between the differenced error term in equation (3.17) and the initial level of income lagged at least two periods is zero. Likewise, the expected correlation between the differenced error term and other lagged (potentially endogenous) explanatory variables in levels is zero. That is, the GMM-IV method proposed by Arellano-Bond uses lagged levels of potentially endogenous variables as instruments for the differences of these variables. Hence, this approach extends the differences estimator to an instrumental-variable framework where lagged values of the endogenous variables are used as instruments. Lederman and Maloney (2002) finally observe that when using the GMM-IV estimation technique, it is important to check the validity of the instruments and in doing this, they rely on Hansen's J-statistic, which tests the null hypothesis of zero correlation between the error terms and the instruments.

3.3: Empirical[33] literature review

The aim of this subsection is to provide a survey of empirical findings on the effects of natural resource abundance on the performances of economies. Empirical support for the curse of natural resources is not above contention, but it is quite strong. In a bid to trace out the relationship between resource-abundance and economic growth, many empirical growth studies tend to confirm the existence of casual evidence (examples are Sachs and Warner, 1995; Sachs and Warner, 1997; Sala-i-Martin, 1997; and Doppelhofer *et al*, 2000). However, empirical debates on the effects of natural resource abundance seem inconclusive and produce mix results. For pedagogical reasons, the views of the different authors in their respective studies for the developed and developing countries are hereby presented.

Habakkuk (1962) links high productivity in the United States to resource abundance, starting a long debate on nineteenth-century American development. Indeed, the US. became the world leader in terms of industrial production around the sametime it became the leader in the production of coal, copper, petroleum, iron ore, zinc, phosphate, molybdenum, lead, and tungsten. The United States was uniquely positioned with respect to the availability and cost of mineral resources; at least, as importantly, the range of available minerals was far wider than in any other country.

Sachs and Warner (1995, 1999) identify natural resource abundance with traded manufacturing activities. They suggest a familiar mechanism: positive wealth shocks from the natural resource sector (along with consumer preferences that translate this into higher demand for non-traded goods) creates excess demand for non-traded products and drives up non-traded prices, including particularly non-traded input costs and wages. This in turn squeezes profits in traded activities such as manufacturing that uses those non-traded products as inputs yet sell their products on international markets at relatively fixed international prices. The decline in manufacturing then has ramifications that grind the growth process to a halt. Correspondingly, Barbier (1999) shows that many low-income and lower middle-income economies highly resource-dependent experienced low or stagnant growth rates. This study is not robust to changes in the measure of natural-

[33] A theory that is not verifiable by appeal to empirical evidence may not be admissible as a part of scientific inquiry (Milton Friedman; 1953).

resource abundance from trade-flows to reserves or production. Murshed (1999) observes that Sachs and Warner (1999) ignored monetary factors and the role of the nominal exchange rate in their model.

David and Wright (1997) question the idea that resource abundance only reflects a country's exogenous geological mineral endowment. They argue that, during the second half of the nineteenth century and the first half of the twentieth century, the United States exploited its mineral endowment much more intensively than other countries, and that this intense exploitation applied to a very wide range of minerals. Their point is that the United States was not destined by geology to be resource abundant but rather that this was an "endogenous" or "socially constructed" condition. They attribute the fast economic growth rates that characterised the US. minerals economy to strong positive feedbacks, even in the exploitation of depletable resources.

Gallup and Sachs (1998) regress levels of per capita income on non-conventional explanatory variables. They find that levels of Per Capita Income (PCI) across countries in 1995 are positively related to deposits of some natural resources. This finding implies that measures of mineral reserves included in a cross-country regression partly capture the usual disadvantage of being a technological frontrunner. In other words, natural resources are highly correlated with original GDP per worker, a variable traditionally included to capture conditional convergence effects in empirical applications of the neoclassical growth models. This correlation tends to lead to an underestimation of the advantageous role natural resources play for growth, even when controlling for initial PCI.

Murshed (1999) presents a shortrun theoretical macroeconomic model that differentiates economic development in East Asia with Latin America. According to him, Latin America, when compared with East Asia exhibits a pattern of growth associated with relative natural-resource abundance. He aggregated the economy into three sectors, two of which involved traded goods and one non-traded commodity. The monetary sector was incorporated into his model. In the Latin American case, the empirical result shows that devaluation might be contractionary, and a resource boom could lead to the rise of the non-traded sector at the expense of the traded good. The result for the East Asia reveals

that resource booms might even expand the traded sector, and devaluation may be expansionary. Two policy implications emerged from the study, namely a policy-induced devaluation or policies to prevent exchange rate appreciation should accompany a resource boom and second, policies of tax non-traded goods aimed at fostering traded goods production may also be considered under some circumstances.

Mitchener and McLean (1999, 2003) studied convergence in the US regional growth from 1880 to 1980. Their results suggest that in 1880, states obtained an advantage in productivity from the mining industry independent of the other influences. They find that the independent influence of mineral abundance on state productivity was strongest at the end of the nineteenth century. They argue that in frontier states, where labour and capital are often in scarce supply, a large initial endowment of resources will improve opportunities for economic agents to acquire scarce factors quickly. Resource abundance allowed these states to grow extensively and to acquire more capital and labour so that the resource base could be further exploited. Bernard and Jones (1996) suggest that the resource sector may be important in explaining productivity differences across states as late as the 1980s.

Wright (2001) analyses the reasons behind American technological leadership in manufactured goods at the turn of the twentieth century. The outstanding characteristic of American manufacturing exports, Wright (Ibid) concludes, was their intensity in non-reproducible natural resources. In fact, the resource intensity of US. manufactured goods had been rising during the half-century preceding the Great Depression.

Using a cross-section analysis of 87 countries, with a variety of specifications, Sachs and Warner (2001) show that there is a positive relationship (69%) between the log of the relative price level during any year of the 1970s (represented as Log (PLEVEL79) and natural resource intensity in 1970 (as captured in equation 3.18), after controlling for the income effect. The regression below as reported in Sachs and Warner (2001) is for the year 1979, but the general result also holds for all years from 1970 to 1980.

$$Log\left(PLEVEL79\right) = 3.6 + 0.27\log\left(RGDP79\right) + 0.69SXPR70 \qquad (3.18)$$

$$(13.6) \qquad (3.5)$$

$R^2 = 66\%$

According to them, the equation further shows that natural resource intensive economies did indeed tend to have high price levels. This effect obtains after controlling for the average cross-country relationship between price levels and PCI (income in all economies is measured after excluding natural resources). This provides some evidence that one of the consequences of resource abundance in the 1970s was that other businesses in resource-abundant countries had to try to compete with higher than normal price levels. To the extent that they used domestic inputs and sold products on international markets their competitiveness suffered.

Larsen (2004) notes that Norway was able to avoid the effects of Dutch disease after the discovery and extraction of oil in the early 1970s, and highlights the policies behind the success. He argues that the factor movement effect was dampened through income coordination: a highly centralized wage formation system made it possible to make the manufacturing sector the wage-leader (based on productivity increases). This made it possible to limit wage increases to all sectors from an expanding resource sector. The spending effect, in turn, was curbed because the government shielded the economy by fiscal discipline and investing abroad (through the creation of a petroleum fund). The spillover-loss effect was limited because losses were substituted for by gains in the highly technological off shore oil extraction sector, which requires more capital than on-land oil extraction. Moreover, social norms, transparent democracy, proper monitoring, effective judicial system, and the wage negotiation system reduced rent seeking behaviour, limiting the typical negative effects associated to the resource curse.

Hussain *et al* (2009) empirically explored the contribution of natural resources to economic growth for Pakistan between 1975 and 2006. They were able to substantiate adverse nexus between exports-related natural resources as a ratio of GDP and economic growth. Their results are very much similar with existing literature available on the

subject. According to the results, NRX/GDP[34] is statistically significant at 10% but negatively related to Log (GDP), which confirms it has some impact on economic growth. INF[35] and INV/GDP are positively related to GDP and significant at 1% level each. OPEN has insignificant but positive relationship with economic growth. LF and PG also have positive and significant contribution to economic growth. The study also reveals that inadequate attention has been paid to human resource development in Pakistan throughout their sample period. The study therefore concludes that natural capital can play an important role to boost the economic growth and to accelerate the pace of development.

Using a single-equation model to explain growth, Ding and Field (2004) find the negative impact of resource endowment on economic growth. For the two-equation model they find resource dependence is first determined by resource endowment and other factors mentioned above. The result of the three-equation model shows that, human capital is linked recursively through its impacts on resource dependence. In this model, they also find that the impacts of natural resources on growth have disappeared.

[34] NRX/GDP is exports related to natural resources as percentage of GDP, Log (GDP) is log of real Gross Domestic product.
[35] INF is rate of inflation, INV/GDP is total investment as percentage of GDP, OPEN is trade openness, LF is total labour force and PG, population growth rate.

Table 3. 1: Results from the One-equation Model of Ding and Field (2004)

Intercept	18.41 1.97 <.0001***	RL: Rule of law	.54 .11 <.0001***
GDP_0: Initial GDP	-2.31 .24 <.0001***	TT: Prices	.18 .05 .0019***
IR: Investment	.45 .28 .1193	RE: Endowment	.06 .02 .0007***
OP: Open	1.07 .37 .0059***	RD: Natural capital share of total capital	-15.56 2.30 <.0001***

Note: The first number is the coefficient, the second is the standard error and the third is p value.

, ** and * indicate significant at 10%, 5% and 1% levels, respectively.*

Source: Extracted from Ding and Field (2004) (pg 13).

Moradi (2007) analyses the effects of ORA on two major macroeconomic variables, namely economic growth and income distribution, in Iran, using the data that spans 1968 to 2005. With an adjusted R^2 value of 0.989, the results of the study confirm that the overall long run effect of oil abundance on GDP is positive and significant but the value of the estimated coefficient (0.008) is too small. This according to him may support the hypothesis that oil abundance is not a blessing for Iran. The long run relationship result is presented below as follows:

$$Y_t = -2.40 + 0.66Kt + 0.10Et + 0.08ORt - 0.13TB81^{30} - 0.11TB88 \qquad (3.19)$$

(-10.77) (10.97) (2.34) (2.74) (-2.62) (-2.47)

The cointegration results shows that the variables are cointegrated and significant at the 5% level. Thus, these results suggest that a long run and stable relationship exists among the variables. Further, the results indicate that the coefficients of oil revenue, human capital and physical capital (K) variables have positive and significant long run impact on the GDP at the 5% level. In addition, the estimated equation shows that the coefficient of ECM_{t-1} is 0.626 and highly significant, thus suggesting that deviation from the long run GDP path is corrected by around 63% over the following year. This means the adjustment takes place quickly.

Ismail (2010) built a static model to test for the existence of Dutch disease using microeconomic data, as opposed to most other studies. He used annual data from 1977 to 2004 in 90 countries. Due to data paucity, he focused only on the manufacturing sector. He finds that a permanent oil shock resulted in manufacturing production reduction. According to him, these effects seem to be stronger in economies with more open capital accounts. The relative factor price of labour increases with respect to capital. Consequently, capital intensity increases in the oil shock, which is consistent with his labor-intensive non-tradable sector model. Finally, he finds sectors with higher capital intensity are affected relatively less by these types of shocks. The study did not aptly capture the differences that exist across the selected countries.

3.4: Conclusion from the literature review

As stated earlier, the literature review carried out in this study cuts across three main issues; theoretical, methodological and empirical. The major focus of the review is to shed light on the role of ORA on the economic performance of countries. Typically, the review indicates that much has been done in examining the issue. Nonetheless, it is imperative to note that every existing study is just a work of human creation, an unfinished business. In other words, every effort should be seen as a stage in a process. These caveats lay credence to the following gaps identified in the literature which this present study intends to bridge. The gaps include:

i. It was noted in the literature that most previous studies examining the role of ORA on the economic performance of countries employed the single-equation (direct) approach that ignores the possibility of simultaneity bias. In this study, this was taken care of by adopting the macro-econometric modelling approach which involves the use of econometric recursive algorithm to solve and obtain parameters for policy simulations/forecasts.

ii. Measurement issues concerning ORA still persist in the literature. Some studies paid little or no attention to them. Some even used measures that do not describe the nature of their economy. In this study, this gap was bridged by adopting a more structurally and theoretical appealing measure of oil resource abundance; the ratio of revenue from oil to total government revenue.

iii. In the literature also revealed that studies that have incorporated the building and construction as well as services sectors while examining the effects of ORA on the economy are quite scanty. In the case of Nigeria, Soludo (1995) submits that these sectors are still in their infancy, whereas Olofin and Iyaniwura contend that attempted incorporating them complained of data constrains and as such they covered only a very shortterm between 1960 and 1978, calling into question the consistency of their estimates. In this study, the two sectors are aptly captured over 39 years period of analysis.

iv. The Nigerian literature on the effects of ORA on sectoral performance is not yet robust. There is the obvious need to establish innovative ties and robust bridges between the two. Sound empirical analysis rooted in both good economic theory and structural dispositions was used to overcome this problem.

Table 3. 2: Summary of some reviewed literature.

Authors & Year	Title/Study Area	Methodology + variables	Findings
Sachs and Warner (1995b).	Natural resource abundance and economic growth. sample of 97 developing countries.	Endogenous growth model (overlapping generations). Variables: Traded manufacturing sector; A non-trade sector; and Natural resource sector	Documented a statistically significant, inverse, and robust association between natural resource intensity and growth over the past twenty years.
Ogunleye (2008).	Natural resource abundance in Nigeria: from dependence to development.	Vector Error-Correction (VEC). Variables: Per capita GDP; Household consumption; Infrastructural development (electricity); Agricultural output growth rate; and Manufacturing output growth rate.	The result suggest a significant positive longrun impact of per capita oil revenue on per capital h/h consumption electricity generation & negative relationship established for: (i) GDP (ii) Agric (iii) Manufacturing.
Egert and Leonard (2007).	Dutch disease Scare in Kazakhstan: is it real?	The dynamic OLS and the bounds testing approaches Variables: Oil prices; Exchange rate (real and nominal); Public consumption; Openness; Terms of trade; and Net foreign assets	They found that non-oil manufacturing has so far been spared the perverse effects of oil price increase from 1996 to 2005.
Odularu (2008)	Crude oil and the Nigerian economic performance (1970-2005)	Ordinary Least Square Variables: Labour; Capital; Real GDP; Domestic crude oil consumption; and Crude oil export in Nigeria.	The study reveals that crude oil consumption and export have contributed to the improvement of the Nigerian economy.
Sachs and Warner (1999)	The big push, natural resource booms and growth: seven Latin American countries	Dynamic growth model.	They present evidence from seven Latin American countries that natural resource booms are sometimes accompanied by declining percapita GDP.
Perry *et al* (2011)	Oil and institution "tale of two cities": Nigeria and	Variety of techniques – cross country model, OLS, and SVAR.	All estimates show a much higher dependence of economic

	Colombia.	Variables: Economic growth; Non-oil exports; Fiscal expenditure; Real exchange Rate; Oil production; Oil price; and Oil exports.	performance on oil abundance in Nigeria than in Colombia.
Ding and Field (2004)	Natural resource abundance and economic growth (Cross country analysis)	OLS Variables: GDP; The average annual growth in the export to import price ratio; investment rate; Openness; Rule of law; Resource dependence; and Resource endowment.	Using a singleequation model to explain growth, they find the negative impact of resource endowment but a significant positive effect of natural resource endowment. For the two-equation model they find that resource dependence is first determined by resource endowment and other factors. The result of the three-equation model shows that, human capital is linked recursively through its impacts on resource dependence. In this model, they also find that the impacts of natural resources on growth have disappeared.
Moradi (2007)	Oil resource abundance, economic growth and income distribution in iran	Cointegration and error Correction Econometric approach (ARDL framework) Variables: Real GDP; Real physical capital; Human capital; Real oil revenue; and Dummy.	The effect of oil revenue on economic growth and income distribution is not very strong, supporting the hypothesis that oil abundance is not a blessing for Iran.
Sachs and Warner (2001)	Natural resources and economic development the curse of natural resources (A study for 87 countries)	Panel/OLS Analysis Variables Log GDP, Natural resource abundance, OPEN, Log investment, Rule of law, Terms of trade change, and Growth, 1960 -1969.	The study shows that there is little direct evidence that omitted geographical or climate variables explain the curse, or that there is a bias resulting from some other

			unobserved growth deterrent. The study also shows evidence that resource-abundant countries tended to be high-price economies and that, partly as a consequence, these countries tended to miss-out on export-led growth.
Hussain *et al* (2009)	Natural resource abundance and economic growth in Pakistan.	OLS Variables: Log (GDP) is log of real Gross Domestic Product; NRX/GDP is exports related to natural resources as percentage of GDP; EDU/GDP is expenditures on education as percentage of GDP; H/GDP is expenditures on health as percentage of GDP; INF is rate of inflation (percentage change in consumer price index); OPEN is trade openness (measured by exports +imports/GDP); INV/GDP is total investment as percentage of GDP; LF is total labour force; and PG is growth rate of population.	NRX/GDP is statistically significant at 10 % but negatively relate to Log (GDP) which confirms that it has some impact on economic growth. INF and INV/GDP are positively related to GDP and significant at 1 % level each. OPEN has insignificant but positive relationship with economic growth. LF and PG has also positive and significant contribution towards economic growth. The study also revealed that inadequate attention has been paid to human resource development in Pakistan throughout their sample period

Source: Author's compilation from several studies.

CHAPTER FOUR

THEORETICAL FRAMEWORK AND METHODOLOGY

This chapter focuses on the theoretical framework and methodology used in this study. As presented and justified in section 4.1, the theoretical framework adopted is the Dutch disease framework developed by Corden and Neary (1982). The models of this study are specified in this chapter. Also, contained in this chapter is a flow chart that reinforces the theoretical framework and the major linkages in the model blocks. Estimation procedure, data requirement and sources conclude this chapter.

4.1: Theoretical framework

There exist a large number of studies that analyse the effects of resource boom on the macro economy (Cairnes, 1859; Gregory, 1976; Snape, 1977; Porter, 1978; Forsyth and Kay, 1980; Ellman, 1981; Corden and Neary, 1982; Forsyth and Nicholas, 1983; Corden, 1984). Cairnes (1859) recognised that the gold discoveries in Australia in the 1850s had Dutch disease effects on some Australian industries. Forsyth and Nicholas (1983) interpreted the consequences on Spanish industry of the inflow of American treasure in the sixteenth century in Dutch disease terms.

Leaning on the theoretical literature review, this study adopts the Dutch disease framework developed by Corden and Neary (1982). The basis for the choice of this theoretical framework is three-fold. First, the framework is capable of illuminating many historical episodes where there have been sectoral boom, with adverse or favourable effects on other sectors. Second, it provides a systematic analysis of some aspects of structural changes in a small open economy. Lastly, the framework is suitable in countries where the proceeds from resource abundance accrue directly to the government.

In presenting the core model, Corden and Neary (1982) basically examined the spending effects and the resource movement effect from a resource boom. In their analysis, three sectors exist; the booming (B), lagging (L) and non-tradeable sector (N). The first two produced tradeables sold at given world prices. Output is produced within each sector

through a combination of inter-sectorally mobile labour and also through another factor specific to each of the sectors.

According to the framework, a boom in B has the initial effect of raising aggregate incomes of the factors initially employed there. This boom can be thought of as happening in one of three ways. First, there has been a once-for-all exogenous technical improvement in B, represented by a favourable shift in the production function. Second, there has been a windfall discovery of new resources. Third, B produces only for export, with no sales at home, and there has been an exogenous rise in the price of its product on the world market relative to the price of imports. In this study, it is assumed that the first two scenarios apply most to Nigeria.

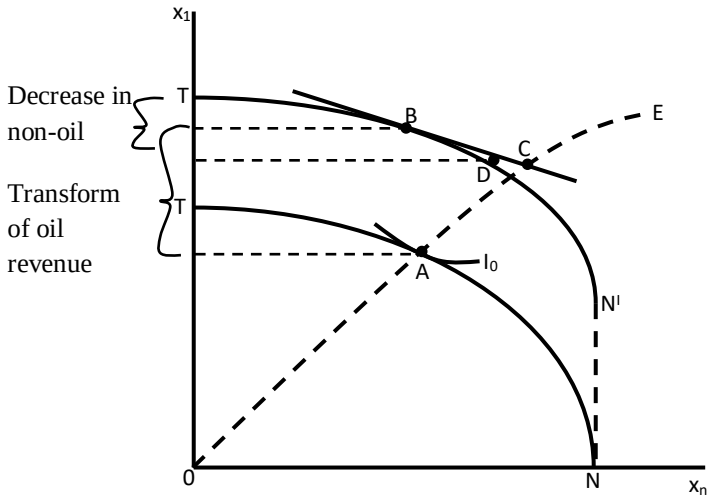
If some part of the extra income in B is spent, whether directly by factor owners or indirectly through being collected in taxes and then spent by the government, and provided the income elasticity of demand for N is positive, the price of N relative to the prices of tradeables must rise. This is a *real appreciation*. It will draw resources out of B and L into N, as well as shifting demand away from N towards B and L (Figure 4.1). What is being described here is the *spending effect*. In terms of the resource movement effect, the marginal productivity of labour rises in B as a result of the boom so that, at a constant wage in terms of tradeables, the demand for labour in B rises, and this induces a movement of labour out of L and N. As a result, output in L and N contracts (Fardmanesh, 1991; and Nyatepe-Coo, 1994). However, if the booming sector does not participate in the competition for factors of production, then according to Fardmanesh (1991) the resource-movement effect is non-existent. This is the case in Nigeria where the oil sector employs only a small percentage of the Nigeria's labour force.

It is also theoretically possible that the resource-movement effect results from the increasing use of physical capital resources in the oil industry. Rather than wages being bidden up, perhaps the price of capital would rise, making it prohibitively expensive for producers of non-booming goods to compete for it. This, in turn, would cause these sectors to contract. However, many studies suggest that much of the physical capital used in the oil industry are imported from the Western nations, and consequently, the oil

industry does not directly compete with the other sectors of the economy for capital. Therefore, the oil sector is basically an *enclave* industry which means that it is isolated from the rest of the economy.

In addition, if unemployed resources exist in the economy, it is possible that the booming sector could draw upon these unutilised factors of production to facilitate its expansion. Rather than drawing resources from the manufacturing or the agricultural sector, the oil industry could put to work the unemployed resources. This would minimise or perhaps entirely eliminate the resource-movement effect (Rudd, 1996).

The graphical equivalence of the foregoing theoretical issues was presented in a framework developed by Neary and Van Wijnbergen (1986). In doing this, Neary and Van Wijnbergen (Ibid) combine the energy sector and the manufacturing traded goods to form a general traded goods category, x_t, on the y-axis, and x_n on the x-axis to represent the non-traded goods sector (Figure 4.1).



Source: **Adopted from Rudd (1996).**

Figure 4. 1: The Effects of Resource Boom on the Traded Goods Sector and the Non-traded goods sector.

Before the boom, equilibrium was at point A, the intersection of the highest attainable indifference curve l_0 with TN, the Production Possibilities Frontier (PPF). The slope of the line tangent to point A is the real exchange rate or the relative price line. The "transfer" of income caused by the boom produces a parallel upward shift of the PPF; this is represented by the new PPF, T'N'. Therefore, assuming initially that the slope of the relative price line remains unchanged after the boom, point B emerges (where there is no increase in x_n, only an increase in x_t by the amount of the transfer of income). With production and domestic real income determined at point B, desired consumption must lie along a price line tangential to point B. Since relative prices are unchanged, it must take place at point C, where the price line intersects the income-consumption curve (represented by broken lines OAE). As a result, there is an excess demand for non-tradables (mainly services) represented by the horizontal difference between points B and C. This drives up the relative price of non-tradables (represented by an increase in the slope of the price line) until a new equilibrium is reached at point D.

Since the price of non-tradables has risen, it has become more profitable to produce these non-tradables, which consequently will lead to an outflow of labour, capital, and other factors of production from the now, relatively less-profitable manufacturing (including agriculture) sector. Manufacturers of traded goods now have less incentive to produce these goods since they are relatively less profitable. So, at the new equilibrium point D, domestic welfare has risen (society is on a higher indifference curve), but at the expense of a production reallocation. The output of the non-traded good has risen, whereas that of manufacturing (including agriculture) has fallen.

4.2: Methodology

4.2.1: Formulation of the model

There are at least three reasons for constructing economic models: to improve our understanding of economic processes, make predictions, and analyse the effects of the economic policy and changes in such a policy (Adenikinju and Aminu, 2009). The empirical model of this study is formulated using the above theoretical framework. The model includes measures of investment and output in four activity sectors (agriculture, manufacturing, services and building and construction) as the dependent variable and presents explanatory variables that attempt to capture the impact of ORA in the four sectors. The variations in the investment and output of the sectors are hypothesised to be a function of ORA plus the control variables[36]. This is algebraically expressed as:

$$INV_i = f(ORA, \text{control variables}) \quad (4.1)$$

$$OPT_i = f(ORA, \text{control variables}) \quad (4.2)$$

Where
INV = Investment
OPT = Output
$_i$ = 1, …, 4

The dependent variables represent the variations in investment and output levels in the sectors. This study recognises the eclectic nature of the Nigerian economy and therefore, mimicked economic theory and structural peculiarities of the system in specifying the models. The model of this study consists of 21 equations, comprising 17 stochastic and 4 identities. There are 21 endogenous and 26 exogenous variables in the model. The model is partitioned into five distinct blocks, namely the supply, demand, external, government and monetary blocks.

[36] The rationale for theory-driven models is questionable from the perspective that economics is a discipline dominated by persistent controversies. Modelling strategies that ignore testing of controversial issues or preclude tests by imposing the received theory restrictions a priori, do not help resolve the ambiguities in the existing body of economic theory (Jansen, 2000).

4.2.2: The supply block model

This block models the impact of ORA on agricultural output, manufacturing output, services output and finally, the building and construction output. Four dependent variables feature in the output models, they are; AGY - agricultural output, MANY - manufacturing output, SVY - services output, and BCY - building and construction output. In this study, the measure of ORA is the ratio of oil revenue to total government revenue. The rationales for this choice have already been provided earlier. The variable (ORA) features in investment and output models.

It is necessary to consider possible alternative explanations for the changes in the investment and output levels of the sectors of interest. It is possible that some other factors, other than ORA have led to these changes. Therefore, it is imperative to account for these other explanations using the control variables.

Following Olofin and Iyaniwura (1983) and Rudd (1996) the RGDP is included in the models of investment and output to capture the effects of developmental trends in the investment and output changes witnessed in the sectors of interest. It makes economic sense to expect that RGDP will relate positively with the dependent variables. Based on some empirical evidence (Keynes; 1931, Hutchinson; 1994), it is appropriate to include Money Supply (MS) as one of the control variables needed to account for other possible fluctuations in investment in the sectors of interest. Other things being equal, a positive relationship is expected between this variable and the dependent variables.

Following similar studies by Olofin and Iyaniwura (1983), Rudd (1996) and Perry *et al* (2011), it is imperative to include the Real Exchange Rate (REXR) as one of the control variables in the supply and demand block models. Perry *et al* (2011) justify the inclusion of this variable particularly in a model that seeks to explain the effects of ORA on the macroeconomic performance by noting that REXR captures the potential Dutch disease effects that arise from oil abundance. Like in previous studies, a positive association is expected between the REXR and the dependent variables in the supply block.

Rainfall is simply defined as the amount of precipitation that occurs when water vapour in the atmosphere condenses into droplets that can no longer be suspended in the air. The level of rainfall can be measured using instruments such as rain gauges and tipping buckets that can be used to determine how much precipitation has fallen within a period of time. Rainfall affects the overall growth prospects, primarily through its impact on the agricultural sector which in turn affects industry as a supply factor in agro-based industries, and through demand factor especially for demand of industrial goods (Sastry *et al*., 2003). A lot of empirical studies have acknowledged the importance of rainfall in explaining variations in agricultural outputs in Nigeria. Among these studies are Afangideh (2008), Igwe and Esonwune (2011), Tunde *et al* (2011), and Ayinde *et al* (2011). Following these studies, it was considered logical to include the total annual rainfall as one of the control variables that could assist in explaining part of the total variations in agricultural output in Nigeria. A positive relationship is expected between agricultural outputs and total annual rainfall (measured in millimeters) in Nigeria.

Model of Agricultural Output

Agricultural output is likely to be influenced by ORA, RGDP, environmental factors like rainfall, real lending rate, money supply, the real exchange rate, agricultural investment. The model that contains these factors is presented thus;

$$AGY_t = \eta_0 + \eta_1 ORA_t + \eta_2 RGDP_t + \eta_3 ATRFALL_t + \eta_4 RLR_t + \eta_5 MS + \eta_6 REXR_t + \eta_7 \mathrm{AGI}_t + \eta_8 AGY_{t-1} + \varepsilon_{1t} \quad (4.3)$$

Where:

ORA	=	Oil resource abundance
RGDP	=	Real gross domestic product
ATRFALL	=	Average total annual rainfall in Nigeria
RLR	=	Real lending rate
MS	=	Money supply
REXR	=	Real exchange rate
AGI	=	Agricultural investment
t	=	time trend
ε[37]	=	The stochastic error term
AGY_{t-1}	=	The one year lag of the dependent variable

[37] The last term in each stochastic equation is the error term.

Model of Manufacturing Output

Urban population has been included in the model to account for the consumption of manufacturing outputs (Du Toit, 1999). Akanbi and Beddies (2008) argue that capacity utilisation has an important effect on the manufacturing sector. Marcellino and Mizon (2000) are of the view that outputs from the agricultural sector are intermediate goods to the manufacturing firms.

$$MANY_t = \nu_0 + \nu_1 ORA_t + \nu_2 MS_t + \nu_3 RGDP_t + \nu_4 REXR + \nu_5 MANI_t + \nu_6 UPOP_t + \nu_7 CAPTUL_t + \nu_8 RLR_t + \nu_9 AGY_t + \nu_{10} MANY_{t-1} + \varepsilon_{2t} \quad (4.4)$$

Where:

MANY	=	Manufacturing sector output
UPOP	=	Urban population
MANI	=	Manufacturing sector investment
CAPUTL	=	Capacity utilisation rate

All other variables remain as earlier defined.

Model of Services Output

Akanbi and Beddies (2008) argue strongly that manufacturing output is one of the intermediate goods used by the services sector. Olofin (1977) supports the inclusion of urban population in a model of this kind.

$$SVY_t = \phi_0 + \phi_1 ORA_t + \phi_2 RGDP_t + \phi_3 MS_t + \phi_4 REXR + \phi_5 SVI_t + \phi_6 RLR_t + \phi_7 MANY_t + \phi_8 SVY_{t-1} + \varepsilon_{3t} \quad (4.5)$$

Where:

SVY	=	Output in the services sector
SVI	=	Investment in the services sector

All other variables remain as earlier defined.

Model of Building and Construction Output

Similar factors determine output in this sector and in the services sector except that agricultural and manufacturing outputs are included in the model (Alemayehu *et al*, 2004).[38]

$$BCY = \varpi_0 + \varpi_1 ORA_t + \varpi_2 RGDP + \varpi_3 MS_t + \varpi_4 REXR + \varpi_5 BCI_t + \varpi_6 RLR_t + \varpi_7 MANY_t + \varpi_8 AGY_t + \varpi_9 BCY_{t-1} + \varepsilon_{4t} \quad (4.6)$$

Where:
BCY = Output in the building and construction sector
All other variables remain as earlier defined.

4.2.3: The demand block

In the demand block equations, four dependent variables featured, namely Agricultural Investment (AGI), Manufacturing Sector Investment (MANI), Investment in the Services sector (SVI), and Investment in the Building and Construction sector (BCI). Nyatepe-Coo (1994) in an empirical model of this kind, notes that it is important to model these variables carefully. The variables are at the heart of the investment model. In the strict sense of it, the effects of the oil resources abundance variable on these variables met the first objective of this study.

In the IS-LM model, interest rates[39] are considered the unique determinants of investment. In fact, interest rates play three distinct functions; they influence the discounted value of net benefits over time, they determine the cost of loans from banks and the required rate of return for the owners and financing institutions, and they set the economic climate for financial and real markets. The Keynesian theory of investment states that interest rate has unambiguous negative influence on investment. Fluctuations in output exert a strong influence on investment behaviour (Ercan, 1990).

[38] In a model for the non-agricultural sector of the Ethiopian economy, Alemayehu *et al* (2004) included the variables.
[39] A high interest should trigger a low investment, since the present value of benefits will be low.

The price level has been included in the sectoral investment models to capture the effect of price on investment. A higher price level is interpreted as a signal to macroeconomic distortions. It leads to a higher expected price level. Notably, such expectations result into a reduction in investment. The demand block conceived in this study has four equations that relate the effect of ORA to investment in the four sectors of interest.

Model of Agricultural Investment

Investment in agriculture is modelled here to be influenced by ORA, RGDP, real interest rate, the price level, real exchange rate, and import of consumer goods. The model is stated in what follows:

$$AGI_t = \delta_0 + \delta_1 ORA_t + \delta_2 RGDP_t + \delta_3 RIR_t + \delta_4 P_t + \delta_5 REXR_t + \delta_6 AGI_{t-1} + \delta_7 IMCG_t + \varepsilon_{5t} \quad (4.7)$$

Where:

AGI	=	Agricultural investment
ORA	=	Oil resource abundance
RGDP	=	Real gross domestic product
RIR	=	Real interest rate
REXR	=	Real exchange rate
P	=	Price level
IMCG	=	Import of consumer goods

Model of Manufacturing Investment

$$MANI_t = \beta_0 + \beta_1 ORA_t + \beta_2 RGDP_t + \beta_3 RIR_t + \beta_4 REXR_t + \beta_5 P_t + \beta_6 MANI_{t-1} + \beta_7 IMRCG_t + \beta_8 MANEXP_t + \varepsilon_{6t} \quad (4.8)$$

Where:

MANI = Manufacturing sector investment

Other variables remain as earlier defined.

Model of Services Investment

$$SVI_t = \psi_0 + \psi_1 ORA_t + \psi_2 SVI_{t-1} + \psi_3 RIR_t + \psi_4 REXR_t + \psi_5 P_t + \psi_6 RGDP_t + \varepsilon_{7t} \quad (4.9)$$

Where:

SVI = Investment in the services sector

All other variables remain as earlier defined.

Model of Building and Construction Investment

$$BCI_t = \theta_0 + \theta_1 ORA_t + \theta_2 BCI_{t-1} + \theta_3 REXR_t + \theta_4 P_t + \theta_5 RGDP_t + \theta_6 RIR_t + \varepsilon_{8t} \quad (4.10)$$

Where:
BCI = Investment in the Building and Construction sector
All other variables remain as earlier defined.

Total Investment in Non-Oil (TINO)

Total Investment in Non-Oil sector (TINO) becomes an identity made up of Investment in Agriculture (AGI_t), Investment in Manufacturing ($MANI_t$), Investment in Services (SVI_t) and Investment in Building and Construction (BCI_t). This is mathematically expressed as;

$$TINO_t = AGI_t + MANI_t + SVI_t + BCI_t \quad (4.11)$$

Equivalently, the model for the Total Output in Non-Oil sector (TYNO) is presented as:

$$TYNO_t = AGY_t + MANY_t + SVY_t + BCY_t \quad (4.12)$$

4.2.4: The external block

The two-gap programming model developed by Mckinnon (1964) and Chenery and Strout (1966) stresses the importance of foreign trade in the development process of any nation. Both exports and imports of developing countries are subject to periodic fluctuations in the world market, and revenue from this source tends to oscillate accordingly.

Models of exports

Leaning on the Soludo (1995) export disaggregation framework and given the paucity of data, exports are disaggregated into three goods: oil, primary commodities (mainly agricultural commodities) and manufactures. Oil exports account for over 90% of Nigeria's total export receipts, thus substantiating the claim that Nigeria is essentially a “one legged” economy.

Typically, the models followed the export demand and supply framework. On the demand side of the framework, a measure of foreign income is considered to be an important variable. It captures the trade-weighted average income of the exporting country's major trading partners. Foreign income relates positively with exports through the higher export demand channel. A depreciation of local currency makes domestic goods cheaper compared to the foreign goods, which will boost export. Another important variable featuring on the demand side of the framework is the real exchange rate. According to Perry *et al* (2011), this variable captures the Dutch disease effect of ORA in the economy.

Meanwhile, the supply side recognises the price of exports in relation to the domestic goods prices as the determinants of the real non-oil exports (Adeniyi, 2008). What follows next is the equations for exports in Nigeria with:

(i) Primary commodities export (mainly agricultural commodities);

(ii) Manufacturers export; and lastly, the

(iii) Oil exports

The equation for real export which conforms to theory and structure of the Nigerian economy is specified as:

$$PCEXP_t = \alpha_0 + \alpha_1 FINC_t + \alpha_2 REXR_t + \alpha_3 PEXP_t + \alpha_4 PCEXP_{t-1} + \varepsilon_{9t} \quad (4.13)$$

Where:

PCEXP = Primary Commodities Exports

FINC = Foreign Income

PEXP = Price of Exports

All other variables remain as earlier defined.

The equation for manufactures' export follows the same pattern as the primary commodity exports, it is specified as:

$$MANEXP_t = \partial_0 + \partial_1 FINC_t + \partial_2 REXR_t + \partial_3 PEXP_t + \varepsilon_{10t} \quad (4.14)$$

Where:

MANEXP = Manufacturers' export and all other variables remain as defined earlier.

Next, is the model for oil exports. It follows a similar intuition except that the price of export variable is replaced with a variable that captures oil price fluctuations. This is necessary as it is plausible to believe that shocks from oil price resulting from demand and supply changes in the international oil market impact directly on the export earnings of Nigeria and hence, oil revenues to the government. Thus, the oil export equation is expressed as:

$$OILEXP_t = \varpi_0 + \varpi_1 REXR_t + \varpi_2 ROILP_t + \varpi_3 OILEXP_{t-1} + \varepsilon_{11t} \quad (4.15)$$

Where:
OILEXP = Oil export
ROILP = Measure of oil price changes
All other variables remain as earlier defined.

Total Export (TEXP) in the economy which is an identity is expressed as:

$$TEXP_t = PCEXP_t + MANEXP_t + OILEXP_t \quad (4.16)$$

Models for imports

The import demand function specified below follows the traditional import specification which states that import demand depends on income and the real exchange rate. The real exchange rate serves as the measure of the real cost of import. The position of the traditional function is that an increase in income increases import demand whereas an increase in the real exchange rate (real depreciation) results into expenditure switching from imports to domestic goods, thus, import demand reduces. This is what experts refer to as "the relative price effect on import". Foreign exchange earnings is also an explanatory variable in the equation. Hemphill (1974) notes that imports of the developing countries are constrained by low foreign exchange whereas Egwaikhide

(1999) shows that positive relationship exists between imports and foreign exchange. The Two-Gap model reviewed earlier recognises low foreign exchange as one of the constraints to the developing economies. It is argued that these economies require foreign exchange to import raw materials, intermediate goods and capital goods needed in their domestic production. In a model for the import of raw materials and capital goods, Soludo (1995) included capacity utilization rate as one of the explanatory variables. According to him, estimating separate equations for raw materials and capital goods reflect the fact that local manufacturing firms depend heavily on imported capital goods and that the utilisation rate of domestic industrial capacities depends on the adequacy of imported raw materials. The import equations are thus specified as follows starting with that of import of consumer goods;

$$IMCG_t = \tau_0 + \tau_1 REXR_t + \tau_2 IMCG_{t-1} + \partial_3 FEXE + \partial_4 RGDP_t + \varepsilon_{12t} \quad (4.17)$$

Where:

IMCG	=	Import of consumer goods
RLR	=	Real lending rate
FEXE	=	Foreign exchange earnings

Other variables remain as earlier defined.

In almost a similar fashion, the import of raw materials and capital goods are specified as:

$$IMRMCG_t : \partial_0 + \partial_1 RGDP_t + \partial_2 REXR_t + \partial_3 IMRMCG_{t-1} + \partial_4 FEXE + \partial_5 CAPUTL_t + \varepsilon_{13t} \quad (4.18)$$

Where:

IMRMCG	=	Import of raw materials and capital goods
CAPUTL	=	Capacity utilisation rate.

All other variables remain as earlier defined.

Total import (TIMP) is then defined as:

$$TIMP_t = IMCG_t + IMRMCG_t \quad (4.19)$$

4.2.5: The monetary block

In this block, the equations specified involve those determining the demand and or supply of money stock, and the exchange rate. With the realistic assumption that the government faces exogenous budget constraint, the version of the model that endogenises money supply was experimented. So, the equation specified is that of money demand[40].

The Demand for Money Model

Keynes (1936) developed a theory of money demand, known as the *liquidity preference theory*. His ideas formed the basis for the liquidity preference framework. Keynes believe there were three motives[41] to holding money, namely transactions motive, precautionary motive and speculative motive. Keynes also modelled money demand as the demand for the real quantity of money (real balances) or M/P. In other words, if prices double, you must hold twice the amount of M to buy the same amount of goods and services, but your real balances stay the same. So people chose a certain amount of real balances, based on the interest rate and income as algebraically presented as:

$$M / P = f(i, Y) \tag{4.20}$$

Friedman (1976) developed a model for money demand based on the general theory of asset demand. Money demand, like the demand for any other asset, should be a function of wealth and the returns of other assets relative to money. His money demand function is as follows:

[40] Note that at equilibrium, money demand equals money supply, thus, MD = MS

[41] •Transactions motive. Money is a medium of exchange, and people hold money to buy goods and services. So as income rises, people have more transactions and people will hold more money

•Precautionary motive. People hold money for emergencies (cash for a tow truck, savings for unexpected job loss). Since this also depends on the amount of transactions people expect to make, money demand is again expected to rise with income.

•Speculative motive. Money is also a way for people to store wealth. Keynes assumed that people stored wealth with either money or bonds. When interest rates are high, rate would then be expected to fall and bond prices would be expected to rise. So, bonds are more attractive than money when interest rates are high. When interest rates are low, they then would be expected to rise in the future and thus bond prices would be expected to fall. Money is more attractive than bonds when interest rates are low. Under the speculative motive, money demand is negatively related to the interest rate.

$$\left[M^d / P \right] = f(Y_p, r_b - r_m, r_e - r_m, \pi_e - r_m) \qquad (4.21)$$

where

Yp = permanent income (the expected longrun average of current and future income)

rb = the expected return on bonds

rm = the expected return on money

re = the expected return on stocks

Money demand is positively related to permanent income. Meanwhile, given permanent income is a longrun average, it is more stable than current income, so it will not be the source of a lot of fluctuation in money demand. The inclusion of permanent income into the money demand function is what makes Friedman's (Ibid) money demand function much more stable than Keynes.

In this study, the money demand for money balances follows the standard money demand function. It is specified to be a function of real income (GNP) and price variables. It is conventional to specify money demand function to depend on real income and nominal interest rate, where the nominal interest rate measures the opportunity cost[42] of holding money. It is argued that because of the underdeveloped financial markets in developing countries and the high inflationary levels, agents try to hedge against inflation by investing in physical assets rather than holding money (Soludo, 1995). Thus, inflation and the nominal interest rate variables are included in the demand for money function. The inflationary term is expected to be negatively related to the demand for money. The ORA variable enters the function indirectly through the budget constraint (the real income). The lagged value of desired money stock has been included to enable the model capture the partial stock adjustment process. The equation is presented thus:

[42] Disequilibrium effects in the money market affect primarily the interest rate and prices, and through these channels affect employment and output, financial flows, etc. The major channel through which monetary policy instruments affect the domestic economy is the cost-of-capital effect. Monetary policy is assumed to affect directly the short-term interest rate and indirectly through a term-structure-of-interest rate relationship to affect the long-term rate. The interest rate variable appears in the investment equation, thus permitting the IS-LM type linkage between the financial and real sectors (Soludo, 1995).

$$MD_t = \alpha_0 + \alpha_1 GNP_t + \alpha_2 NIR_t + \alpha_3 MD_{t-1} + \alpha_4 CPI_t + \varepsilon_{14t} \quad (4.22)$$

Where:

MD	=	Desired money stock
GNP	=	Gross national product
NIR	=	Nominal short-term Interest Rate
CPI	=	Consumer price index

The real exchange rate equation

The real exchange rate model takes into account the effects of the nominal exchange rate, inconsistent macroeconomic policies and more generally the structure of a developing country like Nigeria. Literature on equilibrium real exchange rate reveals that it is only determined by real factors (Dornbusch, 1973; Edwards, 1989; Rodriguez, 1989; and Montiel, 1999). Edwards (1989) recognises terms of trade, level and composition of government consumption as a ratio of GDP, control on capital flows, exchange and trade controls, technological progress and capital accumulation as a ratio of GDP as the factors that determine the real exchange rate[43].

In addition, Elbadawi (1994), Parikh (1997) and Mungule (2004) are among studies on the developing countries that have recognised the importance of introducing variable that captures the effect of inconsistent macroeconomic policies in the real exchange rate model. Among the variables justified in the literature are the inconsistent monetary policy variables. Edwards (1989) shows that the inconsistent monetary policy variables trigger higher inflation, thus appreciating the real exchange rate. According to Korsu (2008), the role of inflation in the dynamics of the real exchange rate is essential. He faults previous studies that included the nominal exchange rate as a regressor in models built to ascertain the determinants of the dynamics of the shortrun real exchange rate without controlling for the effect of inflation. He posits that a nominal depreciation is more often than not inflationary in the developing countries given that their import is dominated by capital goods, raw materials and staple food. Put more elegantly, a nominal depreciation depreciates the real exchange rate, *ceteris paribus* but its inflationary effect appreciates the real when the *ceteris paribus* assumption does not hold; thus, nominal exchange rate

[43] A similar model has earlier been used by Mungule (2004) for Zambia.

has direct and indirect effects on the real exchange rate. This study captures the two effects. The empirical model explaining the dynamics of the real exchange rate (REXR) is specified as follows:

$$REXR_t = \lambda_0 + \lambda_1 NEXR_t + \lambda_2 OPEN_t + \lambda_3 TOT_t + \lambda_4 P_t + \lambda_5 (Yg)_t + \lambda_6 (G/GDP)_t + \lambda_7 REXR_{t-1} + \varepsilon_{15t} \quad (4.23)$$

Where;

NEXR	=	Nominal Exchange Rate
OPEN	=	Measure of openness in the economy
TOT	=	Terms of Trade
P	=	Price level
Yg	=	Growth of RGDP (the traditional variable used to proxy technological progress, Edwards, 1989)
G/GDP	=	Ratio of Government Consumption to GDP

4.2.6: The fiscal/government block

Activities of the Federal Government (revenue and expenditure) are considered in this block. The models that would have captured the state and local governments are ignored base on the lack of comprehensive and up-to-date data. In any case, given Nigeria's fiscal structure, the Federal Government's fiscal activities capture, for all practical purposes, Nigeria's public finance. The state and local governments depend on the Federal Government's statutory allocation for over 80% of their revenues (Soludo, 1995). Two major equations of interest to this block are the government revenue equation and the government expenditure equation.

Model of government revenue

In Nigeria, the Total Federally Collected Revenue (TFCR) typically has two components; the oil revenue (accounting for over 75% of total revenue) and the non-oil revenue. Oil sources, typically, include the Petroleum Profit Tax (PPT) and royalties of the oil companies and are represented in equation 4.24 as Effective Petroleum Profit Tax (EPPT)[44]. The non-oil sources include Company Income Tax (CIT), customs and excise duties, Value Added Tax (VAT) and Personal Income Tax (PIT). Given the difficulty experienced in obtaining the PIT data, Non-Oil Tax (NOT) was formed based on the CIT,

[44] This is derived by deducting inflationary from the nominal tax (PPT).

VAT and customs and excise duties and they are presented in the equation as Effective Non-Oil Tax (ENOT). Hinrichs (1965) posits that openness (OPEN) is a major determinant of government revenue. The real earnings from all other domestic goods and services are represented in the equation by the RGDP. The flow of financial aid to the government in the model of revenue sources was ignored essentially because of its little contribution as a revenue source. Equation for the TFCR sources is thus specified as:

$$TFCR_t = \gamma_0 + \gamma_1 RGDP_t + \gamma_2 OPEN_t + \gamma_3 EPPT_t + \gamma_4 ENOT + \varepsilon_{16t} \quad (4.24)$$

Where:

RGDP = Real Gross Domestic Product
OPEN= Trade Openness
EPPT = Effective Petroleum Profit Tax
ENOT = Effective Non-Oil Tax

The model of government expenditure

Using panel data for 123 non-OECD countries from 1970 to 1998, Sturm (2001) tested various hypotheses that may explain the development of government capital spending[45]. He classifies the hypotheses into three classes; structural, economic and political. The results of his study reveal that politico-institutional variables, like ideology, political cohesion, political stability and political business cycles do not seem to be important when explaining government capital formation in less-developed economies. On the other hand, he finds economic variables like economic growth, public deficits/debt, and openness of an economy are significantly related to public capital spending.

Thus, in equation 4.25, the hypothesis "capital spending increases during periods of increased economic growth" is tested. Also tested is the hypothesis "high levels of budget deficits and/or government debt may lead to restrictive fiscal policy measures". Large debt interest payments crowd out other government spending categories. Countries might have offset increases in debt interest payments by winding back public capital spending (Sturm, 2001). Oxley and Martin (1991) posit that this pattern reflects the political reality

[45] The interest on capital expenditure here draws from the fact that the effect of ORA on an economy could be viewed through its effect on capital expenditure.

that “it is easier to cut back or postpone investment spending than it is to cut current expenditures”. Very often it is upheld that in periods of fiscal consolidation, government investment is an easy target. Roubini and Sachs (1989) argue that “in periods of restrictive fiscal policies and fiscal consolidation capital expenditures are the first to be reduced (often drastically) given that they are the least rigid component of expenditures”. Haan *et al.* (1996) report evidence in favour of this hypothesis for a large group of OECD countries in the 1980s.

Besides, the hypothesis that “more open economies often are more vulnerable to foreign competition and compete for business by offering, among other things, adequate infrastructure” is as well tested (Sturm, 2001).

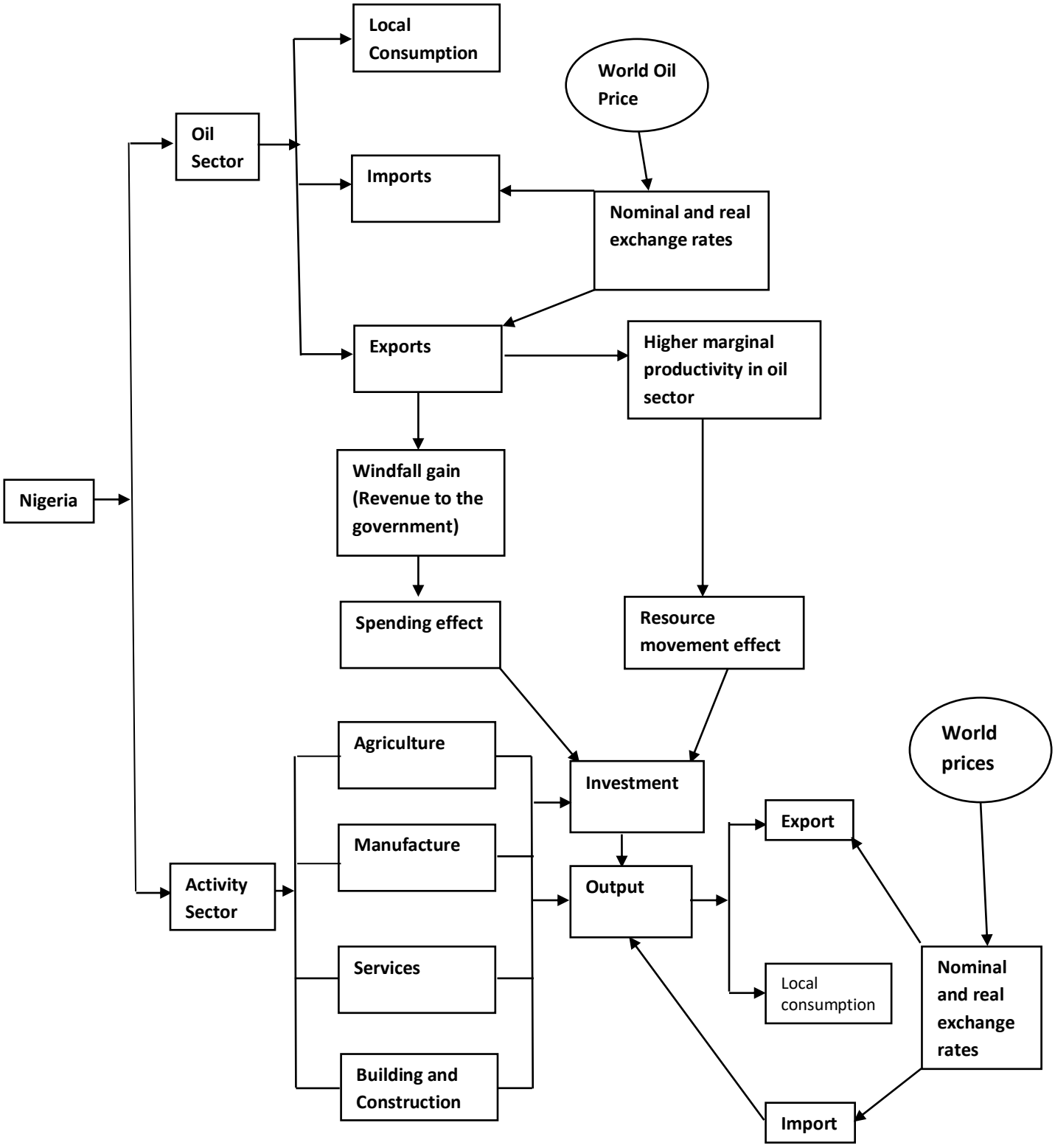
According to Olofin and Iyaniwura (1983), in modelling the recurrent expenditure of the government, total government revenue and GDP at the disposal of the government are paramount. The lagged value of government capital expenditure (GCE) is included in the equation to demonstrate the persistence spending behaviour of the government in most developing countries. The equation is specified thus:

$$GCE_t = \alpha_0 + \alpha_1 GCE_{t-1} + \alpha_2 OPEN_t + \alpha_3 RGDP_t + \alpha_4 FGDEBT + \varepsilon_{17t} \qquad (4.25)$$

Where:

GCE	=	Government Capital Expenditure
OPEN	=	Trade Openness
RGDP	=	Real Gross Domestic Product
FGDEBT	=	Federal Government Debt

Figure 4. 1: Theoretical Framework and Major Linkages in the Model Blocks.



Source: Author's initiative

List of Variables in the Macro Model and their Definitions

Table 4. 1: Exogenous Variable

1	**ATRFALL**	Average Total Rainfall in Nigeria
2	**CAPUTL**	Capacity Utilisation Rate
3	**FEXE**	Foreign Exchange Earnings
4	**FINC**	Foreign Income
5	**GGDP**	Government Consumption as a Ratio of GDP
6	**GNP**	Gross National Product
7	**NEXR**	Nominal Exchange Rate
8	**NIR**	Interest Rate (Money Market)
9	**NOR**	Non-Oil Revenue
10	**OILR**	Oil Revenue
11	**OPEN**	Measure of Openness in the Economy
12	**ORA**	Oil Resource Abundance
13	**P**	Price Level
14	**PEXP**	Price of Exports
15	**RGDP**	Real Gross Domestic Product
16	**RIR**	Real Interest Rate
17	**RLR**	Real Lending Rate
18	**ROILP**	Measure of Oil Price Changes
19	**TGDP**	Total Gross Domestic Product
20	**TOT**	Terms of Trade
21	**UPOP**	Urban Population
22	**YG**	Growth of RGDP
23	**MS**	Money Supply
24	**FGDEBT**	Federal Government Debt
25	**EPPT**	Effective Petroleum Profit Tax
26	**ENOT**	Effective Non-Oil Tax

Table 4. 2: Endogenous Variable

1	**AGI**	Agricultural Investment
2	**AGY**	Agricultural Output
3	**BCI**	Building and Construction Sector Investment
4	**BCY**	Building and Construction Sector Output
5	**GCE**	Government Capital Expenditure
6	**IMCG**	Import of Consumer Goods
7	**IMRMCG**	Import of Raw Materials and Capital Goods
8	**MANEXP**	Manufacturers Export
9	**MANI**	Manufacturing Sector Investment
10	**MANY**	Manufacturing Sector Output
11	**MD**	Desired Money Stock
12	**OILEXP**	Oil Export
13	**PCEXP**	Primary Commodity Export
14	**REXR**	Real Exchange Rate
15	**SVI**	Services Sector Investment
16	**SVY**	Services Sector Output
17	**TFCR**	Totally Federally Collected Revenue
18	**TINO**	Total Investment in the Non-Oil Sector
19	**TYNO**	Total Output in the Non-Oil Sector
20	**TEXP**	Total Exports
21	**TIMP**	Total Imports

4.2.7: Estimation method for the macroeconomic model

To avoid a spurious or nonsensical regression often associated with running of regressions with non-stationary series (Granger and Newbold, 1974; Nelson and Plosser, 1982), the time series properties of the data was investigated using the unit root test. The implications of unit roots in macroeconomic data are profound. Non-stationary data series could yield misleading results. The Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1981) and the non-parametric adjustment Phillips-Perron test (Phillips and Perron, 1988) were used in testing for stationarity in this study.

Typically, the model of this study has been estimated using the simultaneous equation techniques. Specifically, the Two Stage Least Squares (2-SLS)[46] and the Three Stage Least Squares (3-SLS) methods of estimation were adopted. The overriding consideration in making this choice is to obtain consistent estimates and address the simultaneous equation bias problem and it is often felt that the 2-SLS and 3-SLS estimators are appropriate.

Notably, the choice between alternative techniques is often not an easy one, given the tradeoffs involved in making such choices. The choice was between Ordinary Least Squares (OLS), the Indirect Least Squares[47] (ILS), 2-SLS, and the systems estimation using the 3-SLS. Some studies[48] observe that the OLS yields biased and inconsistent parameter estimates. This is because of the potential endogeneity of some regressors as they are often correlated with the error terms of the equations in which they feature as dependent variables. The ILS, another simultaneous equation estimation technique is complex to apply to a macro model with many equations since it involves explicit derivation of the reduced form model from the structural model. The 2-SLS estimator yields consistent estimates which may have larger variances than the OLS estimates. It also permits the routine use of often ignored diagnostic testing procedures for problems such as heteroscedasticity and specification error (Pesaran and Taylor, 1999). Among the

[46] For substantive applications of the 2-SLS estimator, please see Li and Harmer (1998), Oczkowski and Farrell (1998), Farrell (2000) and Oczkowski (2001), Farrell and Oczkowski (2002), and Smith, *et al.* (2002, 2003).

[47] The name Indirect Least Squares derives from the fact that structural coefficients (the object of primary inquiry in most cases) are obtained indirectly from the OLS estimates of the reduced-form coefficients.

[48] For more on this issue, please see Olaomi and Olubusoye (2008), and Adeniyi (2008).

major drawbacks of the - is the hypersensitivity of individual parameter estimates to any specification error within the system of equations.

4.2.8: Identification problem in simultaneous equation systems

Identification problem sheds light on whether numerical estimates of the parameters of a structural equation can be obtained from the estimated reduced-form coefficients. If this can be done, it is considered that the particular equation is *identified*[49]. If this cannot be done, then it means that the equation under consideration is *unidentified,* or *underidentified.* An identified equation may be either *exactly* (or fully or just) *identified* or *overidentified*. It is taken to be exactly identified if unique numerical values of the structural parameters can be obtained. It is assumed to be overidentified if more than one numerical value can be obtained for some of the parameters of the structural equations.

Identification problem arises because different sets of structural coefficients may be compatible with the same set of data. In strict sense, it arises if in a system of simultaneous equations containing two or more equations it is not possible to obtain numerical values of each parameter in each equation because the equations are *observationally indistinguishable* or look too much like one another. To put the matter differently, a given reduced-form equation may be compatible with different structural equations or hypotheses (models), and it may be difficult to tell which particular hypothesis (model) is been investigated. In the remaining component of this section, examples to show the nature of the identification problem is considered.

Following Gujarati (2004) the general *M* equations model in *M* endogenous, or jointly dependent, variables may be algebraically expressed as:

$$Y_{1t} = \beta_{12}Y_{2t} + \beta_{13}Y_{3t} + \cdots + \beta 1_M Y_{Mt} + \gamma_{11}X_{1t} + \gamma_{12}X_{2t} + \cdots + \gamma_{1K}X_{Kt} + u_{1t}$$

$$Y_{2t} = \beta_{21}Y_{1t} + \beta_{23}Y_{3t} + \cdots + \beta_{2M}Y_{Mt}$$

[49] This terminology comes from literature on estimating the structural parameters in systems of simultaneous equation.

$$+\gamma_{21}X_{1t} + \gamma_{22}X_{2t} + \cdots + \gamma_{2K}X_{Kt} + u_{2t}$$

$$Y_{3t} = \beta_{31}Y_{1t} + \beta_{32}Y_{2t} + \cdots + \beta_{3M}Y_{Mt}$$

$$+\gamma_{31}X_{1t} + \gamma_{32}X_{2t} + \cdots + \gamma_{3K}X_{Kt} + u_{3t}$$

. . . . . .

$$Y_{MT} = \beta_{M1}Y_{1t} + \beta_{M2}Y2t + \cdots + \beta_{M,M-1}Y_{M-1,t}$$

$$+\gamma_{M1}X_{1t} + \gamma_{M2}X_{2t} + \cdots + \gamma_{MK}X_{Kt} + u_{Mt}$$

Where $Y_1, Y_2, \ldots, Y_M = M$ endogenous or jointly dependent, variables, $X_1, X_2, \ldots, X_K = K$ are predetermined variables (one of these X variables may take a value of unity to allow for the intercept term in each equation),

$u_1, u_2, \ldots, u_M = M$ stochastic disturbances

$t = 1, 2, \ldots, T$ = total number of observations

β's = coefficients of the endogenous variables

γ's = coefficients of the predetermined variables.

To assess the identifiability of a structural equation, one may apply the technique of *reduced-form equations***,** which expresses an endogenous variable solely as a function of predetermined variables. This approach has been proven to be time-consuming and labourious. Fortunately, this time-consuming procedure can be avoided by resorting to either the *order condition* or the *rank condition* of identification. Assuming the following notations:

M = number of endogenous variables in the model

m = number of endogenous variables in a given equation

K = number of predetermined variables in the model including the intercept

k = number of predetermined variables in a given equation

Order condition of identifiability states that in a model of M simultaneous equations, in order for an equation to be identified, the number of predetermined variables excluded from the equation must not be less than the number of endogenous variables included in that equation less 1. That is, $K - k \geq m-1$. Therefore, if $K - k = m - 1$, the equation is just identified, but if $K - k > m - 1$, it is overidentified. In other words, the identification of an

equation in a model of simultaneous equations is possible if that equation excludes one or more variables present elsewhere in the model (zero restrictions criterion). Alternatively expressed, the order condition requires that in a model of M simultaneous equations, in order for an equation to be identified, it must exclude *at least* $M-1$ variables (endogenous as well as predetermined) appearing in the model. If it excludes exactly $M-1$ variables, the equation is just identified. If it excludes more than $M-1$ variables, it is overidentified.

On the other hand, the rank condition is both a necessary and sufficient condition for identification. If the rank condition is satisfied, the order condition is satisfied too, although the converse is not true. The condition states that "in a model containing M equations in M endogenous variables, an equation is identified if and only if *at least* one non-zero determinant of order $(M-1)(M-1)$ can be constructed from the coefficients of the variables (endogenous and predetermined) excluded from that particular equation but included in the other equations of the model".

Notably, in answering the question as to which condition should one use in practice: order or rank? Gujarati (2004) states that for large simultaneous equation models, applying the rank condition is a formidable task. Harvey (1990) notes that, fortunately, the order condition is usually sufficient to ensure identifiability, and although it is important to be aware of the rank condition, a failure to verify it will rarely result in disaster. Given that the order condition is not just easy to apply but sufficient to ensure identifiability, it was applied to each of the equations of the model in carrying out the system identification test. What emerged is that all the equations of the model are overidentified (Table 4. 3), thus, the 2-SLS and 3-SLS estimation methods were adopted in estimating the models.

Table 4. 4: System Identification Test

	Equation	k	m	K-k	m-1	Remark
1	Agricultural Investment	5	2	21	1	Overidentified
2	Agricultural Output	5	3	21	2	Overidentified
3	Building and Construction Sector Investment	5	1	21	0	Overidentified
4	Building and Construction Sector Output	5	4	21	3	Overidentified
5	Government Capital Expenditure	4	0	22	-1	Overidentified
6	Import of Consumer Goods	4	1	22	0	Overidentified
7	Import of Raw Materials and Capital Goods	4	1	22	0	Overidentified
8	Manufacturers Export	2	1	24	0	Overidentified
9	Manufacturing Sector Investment	5	3	21	2	Overidentified
10	Manufacturing Sector Output	6	4	20	3	Overidentified
11	Desired Money Stock	4	0	22	-1	Overidentified
12	Oil Export	2	1	24	0	Overidentified
13	Primary Commodity Export	3	1	23	0	Overidentified
14	Real Exchange Rate	7	0	19	-1	Overidentified
15	Services Sector Investment	5	1	21	0	Overidentified
16	Services Sector Output	4	4	22	4	Overidentified
17	Totally Federally Collected Revenue	4	0	22	-1	Overidentified

4.4: Data sources and transformation

The empirical analysis was conducted using aggregate annual time series data from 1970 to 2010. The publications of the CBN on the financial sector, interest rate, exchange rate, output, government finances and external trade were among the useful sources of data collection. These publications include the Annual Report and Statement of Accounts, Nigeria's Economic and Financial Indicators, and the Statistical Bulletin. Data on oil production and export were sourced from the Annual Statistical Bulletin of the Nigerian National Petroleum Corporation (NNPC). Other sources include: the IMF (International Financial Statistics), African Development Indicators and World Development Indicators.

Except for variables in rates (the real exchange rate, the interest rate, the nominal interest rate, capacity utilisation rate, lending rate), ratios (oil resource abundance, openness), and negative values (measure of oil price changes), all other variables in the behavioural equations entred in their natural logarithms such that the coeffients are interpreted as elasticities.

CHAPTER FIVE

EMPIRICAL RESULTS

Applied econometrics cannot be done mechanically; it needs understanding, intuition and skill.[50]

In general, this chapter encapsulates the results of this thesis. Specifically, it deals with the examination of the time series properties of the variables that have featured in the macro model and presentation of the results of the estimated models. It further presents the macroeconomic model validation results and simulation exercises carried out to ascertain the suitability of the model for forecast and future policy analysis.

5.1: Time series properties of model variables

5.1.1: Stationarity tests

The analysis in this thesis is based on time series data. It has become conventional for data to be scrutinised before they entre into the final model. Most economic variables evolve, grow and change over time in real and nominal terms, sometimes dramatically. Consequently, running a regression among such economic variables with the false assumption that they are stationary will result in spurious or nonsense regression (Granger and Newbold, 1974; Nelson and Plosser, 1982). Thus, any analysis, forecast and policy recommendation based on such results would be meaningless. To avoid this situation, the Augmented Dickey-Fuller (ADF) test and non-parametric adjustment Phillips-Perron test are employed to test for stationarity.

The two methods adopted for the test of stationarity produced consistent results. Building and Construction Sector Investment, Import of Consumer Goods, ORA, Measure of Oil Price Changes, Average Total Rainfall in Nigeria, Growth of RGDP, and Real Interest Rate are stationary. All other variables in the model became stationary after their first differencing. These results are presented in Tables 5.1 and 5.2.

[50] Cuthbertson *et al* (1992).

Table 5. 1: Unit Root results: Augmented Dickney-Fuller Test

Variables		Augumented Dickey-Fuller Test Statistic		Remark
		With Intercept	**With Intercept and Trend**	
Agricultural - Investment	Level	-2.8010	-2.4822	I(1)
	1st Diff.	-7.9757	-6.7597	
Agricultural Output	Level	3.7531	1.8321	I(1)
	1st Diff.	-6.2668	-6.0738	
Manufacturing Sector Investment	Level	-3.2743	-3.0537	I(1)
	1st Diff.	-8.0160	-8.1678	
Manufacturing Sector Output	Level	-3.0620	-3.1731	I(1)
	1st Diff.	-8.2974	-6.1276	
Services Sector Investment	Level	-2.7234	-2.7738	I(1)
	1st Diff.	-7.9316	-8.0042	
Services Sector Output	Level	1.2960	0.5370	I(1)
	1st Diff.	-5.4775	-5.9599	
Building and Construction Sector Investment	Level 1st Diff.	-3.2424 -7.6969	-3.0090 -7.8521	I(1)
Building and Construction Sector Output	Level 1st Diff.	-1.0366 -5.6374	-0.6405 -5.7075	I(1)
Primary Commodity Export	Level	-3.8832	-3.6766	I(1)
	1st Diff.	-4.8457	-5.0843	
Manufacturing Export	Level	1.9960	-4.5297	I(0)
Oil Export	Level	-0.8837	-2.4295	I(1)
	1st Diff.	-6.9466	-6.8605	
Import Of Consumer Goods	Level	-1.3573	-4.8558	I(0)
Import of Raw Materials and Capital Goods	Level	-6.3058	-5.5289	I(0)
Real Exchange Rate	Level	-1.3977	-3.3770	I(1)
	1st Diff.	-5.2055	-5.1365	
Total Federally Collected Revenue	Level	-0.9383	-2.5491	I(1)
	1st Diff.	-7.6479	-7.5560	
Government Recurrent Expenditure	Level	0.1136	-2.7448	I(1)
	1st Diff.	-7.7660	-7.6853	

Table 5.1: Continued: Unit Root results: Augmented Dickney-Fuller Test

Variables		Augumented Dickey-Fuller Test Statistic		Remark
		With Intercept	**With Intercept and Trend**	
Money Supply	Level	0.2625	-2.6698	I(1)
	1st Diff.	-4.3448	-4.2396	
Average Total Rainfall in Nigeria	Level	-2.5294	-4.4063	I(0)
Real Lending Rate	Level	-2.1762	-2.7808	I(1)
	1st Diff.	-6.8712	-6.9051	
Real Gross Domestic Product	Level 1st Diff.	-2.3295 -5.8298	-2.0661 -6.1308	I(1)
Oil Resource Abundance	Level	-5.1900	-4.9691	I(0)
Price of Export	Level	0.6300	-0.4025	I(1)
	1st Diff.	-5.7493	-5.9579	
Measure of Oil Price Change	Level	-6.1358	-6.2123	I(0)
Capacity Utilisation Rate	Level	-1.7771	-1.3594	I(1)
	1st Diff.	-3.7272	-3.8934	
Foreign Exchange Earnings	Level	-0.6881	-2.8038	I(1)
	1st Diff.	-5.4661	-5.3904	
Openness	Level	-2.4822	-2.1295	I(1)
	1st Diff.	-6.1505	-6.2723	
Terms of Trade	Level	-1.0745	-1.9835	I(1)
	1st Diff.	-5.1043	-5.0305	
Total Gross Domestic Product	Level	1.0922	-1.2581	I(1)
	1st Diff.	-10.354	-10.411	
Oil Revenue	Level	-1.6641	-3.0800	I(1)
	1st Diff.	-7.1131	-7.0787	
Non-Oil Revenue	Level	-0.1475	-2.7813	I(1)
	1st Diff.	-8.0721	-8.0069	
Real Interest Rate	Level	-5.4927	-5.8647	I(0)
Nominal Interest Rate	Level	-1.6105	-1.6752	I(1)
	1st Diff.	-6.9059	-6.9077	
Consumer Price Index	Level 1st Diff.	-0.9759 -3.7644	-1.3616 -3.7481	I(1)
Urban	Level	-0.1556	-2.1944	I(1)

Population	1st Diff.	-3.7903	-3.9351	
Government Consumption as a Ratio of GDP	Level 1st Diff.	-2.9034 -6.8991	-3.3797 -6.7657	I(1)
Growth of RGDP	Level	-5.3652	-4.7591	I(0)
Nominal Exchange Rate	Level 1st Diff.	-1.8664 -2.1458	-2.3057 -4.3174	I(1)
		CRITICAL VALUES		
		1%	**5%**	
Auxiliary Regression with Intercept		**-3.6105**	**-2.9399**	
Auxiliary Regression with Intercept and Trend		**-4.2119**	**-3.5298**	

Table 5. 2: Results for Phillips-Perron Stationarity Test

Variable		Phillips-Perron Test Statistic		Remark
		With Intercept	With Intercept and Trend	
Agricultural Investment	Level	-2.7088	-2.3032	I(1)
	1st Diff.	-8.0588	-9.0084	
Agricultural Output	Level	4.4728	1.7921	I(1)
	1st Diff.	-6.2702	-7.8101	
Manufacturing Sector Investment	Level	-3.1808	-2.9127	I(1)
	1st Diff.	-8.1451	-8.6518	
Manufacturing Sector Output	Level	-3.0512	-3.0768	I(1)
	1st Diff.	-8.7763	-8.6560	
Services Sector Investment	Level	-2.7516	-2.6719	I(1)
	1st Diff.	-7.9316	-7.9729	
Services Sector Output	Level	1.3188	0.5370	I(1)
	1st Diff.	-5.4947	-5.9599	
Building and Construction Sector Investment	Level 1st Diff.	-3.1697 -7.8817	-2.8926 -8.8455	I(1)
Building and Construction Sector Output	Level	-1.6963	-2.1089	I(1)
	1st Diff.	-7.7865	-7.7011	
Primary Commodity Export	Level	-7.8791	-7.3509	I(0)
Manufacturing Export	Level	-2.4207	-4.5217	I(0)
Oil Export	Level	-0.8852	-2.4390	I(1)
	1st Diff.	-7.0536	-6.9546	
Import Of Consumer Goods	Level	-3.3851	-5.1199	I(0)
Import of Raw Materials and Capital Goods	Level	-0.4304	-1.8401	I(1)
	1st Diff.	-8.7543	-20.4082	
Real Exchange Rate	Level	-1.5063	-2.2475	I(1)
	1st Diff.	-3.8960	-3.8091	
Total Federally Collected Revenue	Level	-0.9589	-2.6685	I(1)
	1st Diff.	-7.6157	-7.5235	
Government Recurrent Expenditure	Level	0.5268	-2.7448	I(1)
	1st Diff.	-8.3907	-8.4244	

Table 5.2 Continued: Results for Phillips-Perron Stationarity Test

Money Supply	**Level**	**0.1837**	**-1.8938**	**I(1)**
	1st Diff.	-4.3539	-4.2472	
Average Total Rainfall In Nigeria	Level	-2.3531	-4.4033	I(0)
Real Lending Rate	Level	-2.0493	-3.0172	I(1)
	1st Diff.	-8.4558	-8.3535	
Real Gross Domestic Product	Level 1st Diff.	-5.4371 -5.8455	-1.8966 -6.9165	I(1)
Oil Resource Abundance	Level	-5.7687	-5.9272	I(0)
Foreign Income	Level	0.0890	-2.0159	I(1)
	1st Diff.	-11.1030	-14.731	
Price of Export	Level 1st Diff.	0.5846 -5.7930	-0.5891 -5.9592	I(1)
Measure of Oil Price Change	Level	-6.1358	-6.2107	I(0)
Capacity Utilization Rate	Level	-1.5433	-1.0395	I(1)
	1st Diff.	-3.8005	-3.9531	
Foreign Exchange Earnings	Level	-0.7290	-2.6685	I(1)
	1st Diff.	-6.0963	-5.9707	
Openness	Level	-2.4696	-2.2715	I(1)
	1st Diff.	-6.1506	-6.2731	
Terms of Trade	Level	-1.0283	-2.3074	I(1)
	1st Diff.	-5.3730	-5.2919	
Total Gross Domestic Product	Level	-0.4500	-4.0625	I(1)
	1st Diff.	-10.387	-10.411	
Oil Revenue	Level	-1.7553	-3.1983	I(1)
	1st Diff.	-7.1844	-7.1377	
Non-Oil Revenue	Level	0.3519	-2.7029	I(1)
	1st Diff.	-8.9385	-9.2395	
Real Interest Rate	Level	-5.5044	-5.8822	I(0)
Nominal Interest Rate	Level	-1.5866	-1.7762	I(1)
	1st Diff.	-6.9093	-6.9258	
Consumer Price Index	Level	-0.5367	-1.4699	I(1)
	1st Diff.	-3.7581	-3.7230	
Urban Population	Level 1st Diff.	0.3999 -3.7903	-2.2676 -4.041826	I(1)
Gross National Product	Level 1st Diff.	0.4764 -6.7454	-1.2882 -7.1823	I(1)
Government Consumption as a Ratio of GDP	Level 1st Diff.	-2.9034 -7.6778	-3.3843 -7.4712	I(1)

Growth of RGDP	Level	-5.3862	-5.7440	I(0)
Nominal Exchange Rate	Level 1st Diff.	-1.6539 -4.3553	-1.9493 -4.3299	I(1)
		CRITICAL VALUES		
		1%	**5%**	
Auxiliary Regression with Intercept		**-3.6105**	**-2.9399**	
Auxiliary Regression with Intercept and Trend		**-4.2119**	**-3.5298**	

5.2: The macroeconomic model results

5.2.1: Estimation issues

The unit root test conducted shows that some of the variables only became stationary after their first differencing. Next, the coefficients of the stochastic equations of the macroeconomic model was estimated. This exercise is a precursor to the use of the dynamic simulation experiments in tracking the impact of the exogenous variables in the system. Existing literature shows that oftentimes, some explanatory variables are normally correlated with the disturbance terms of the equations in which they appear. The justification for this is that these explanatory (right-hand-side) variables appear in other equations as dependent variables (constituting a potential source of endogeneity problem). Under this situation, the use of the Ordinary Least Squares (OLS) estimation technique would result in a biased and inconsistent estimate of the model parameters. Thus, to overcome this challenge, the simultaneous equation techniques; the 2-SLS and the 3-SLS methods of estimation were adopted. As stated earlier in this study, the overriding consideration in making this choice is to obtain consistent estimates and address the simultaneous equation bias problem.

The 2-SLS and the 3-SLS are instrumental variables (IV) estimators. Some previous studies[51] have failed to acknowledge the difficulty associated with the choice of legitimate instruments. In this study, this difficulty have not only been acknowledged but solution was provided for it, by anchoring the choice on three outstanding issues raised in the literature. From the literature, a variable z is called an instrument or instrumental variable for the regressor x in a regression model $y = \beta x+u$, if (i) z is uncorrelated with the error u, (ii) z is correlated with the regressor x, and (iii) z is strongly correlated, rather than weakly correlated, with the regressor vector x. If an instrument fails the first condition, the instrument is an invalid instrument. If it fails the second condition the instrument is an irrelevant instrument, and the model may be unidentified if too few instruments are relevant[52]. The third condition fails when there is very low correlation between the

[51] For example Korsu (2008) and Adeniyi (2010)

[52] Further interpretation states that the first assumption excludes the instrument z from being a regressor in the model for y, since if instead, y depends on x and z and, y is regressed on x alone, then z is being absorbed into the error so that z will then be correlated with the error. The second assumption requires that there is some association between the instrument and the variable being instrumented.

instrument and the endogenous variable being instrumented, if this condition prevails, the model is assumed to be weakly identified and the instrument is called a weak instrument. Another caveat from the literature is that instruments should be at least as many as the endogenous variables in the model. Instruments were thus used to eliminate the correlation between the regressors and the disturbances.

Meanwhile, it was discovered that the 3-SLS procedure yields more efficient parameter estimates than the 2-SLS because it takes into account *cross-equation error correlations* to improve large sample efficiency, as long as "cross-equation covariances are not zero". In estimating the parameters of the system of equations, the system object was first created and then the specification of the system of equations.

Moreover, in conducting the analysis, emphasis was on the ability of the model to simulate values close to the historical data. In view of this, the conventional R^2 values or t-statistics, at the core of building a structural model of an economy, were no longer the basis for judging the performance of the model[53]. At least, in this instance, the other diagnostic tests for multiple equation models estimation become more relevant. These include the Theil's inequality coefficient and its decomposition, Mean Percentage Error (MPE) and graphical representations between actual and predicted values of the model key variables.

The results of the two estimation methods are presented in the section that follows. For the reason of consistency, only the results of the 3-SLS is discussed.

[53] For more on this issue please see Pindyck and Ruinfeld (1998).

5.2.2: The supply block results

Agricultural output function results

Table 5.4 displays the results of the estimated agricultural output function, it reveals that five out of the eight or 63% of the explanatory variables turned out significant. Three of the five significant variables, namely real lending rate (RLR), Money Supply (MS) and the one period lagged agricultural output (AGY(-1)) have a positive effect on agricultural output (AGY). Out of these three, (AGY(-1)) has the highest positive elasticity (0.51). The positive effect of RLR on AGY is quite surprising given that it does not conform to *a priori* expectation. This could be suggestive of the differential effects of the free floating and the managed lending rates. The two negative but significant variables are ORA and agricultural investment (AGI).

ORA, the variable of interest in this study has an elasticity value of -0.54, whereas the AGI has -0.08. The coefficient -0.54 indicates that in response to 1% increase in ORA, the agricultural sector output declineed by -0.54%. The negative effect of ORA on AGY is typically reflective of the Nigerian economy. It suggests the Dutch disease (resource curse) syndrome wherein the discovery of a natural resource (oil in the case of Nigeria) and its subsequent exploitation and exportation translates into substantial decline of the non-booming sectors. This empirical result further testifies to the fact that one of the main channels through which the discovery of oil has brought underdevelopment to the Nigerian economy is via the neglect of the agricultural sector. Thus, this result permits one to assert that the windfalls or jumbo revenues that accrue to the Nigerian government through the export of oil has indeed brought underdevelopment to its economy given the poor attention accorded the agricultural sector. Thus, this study joins some other previous studies[54] in confirming the presence of resource curse hypothesis in Nigeria. The insignificant variables within the function are the average total rainfall in Nigeria (ATRFALL), real gross domestic product (RGDP) and the real exchange rate (REXR). In the case of RGDP, contradicting results emerged.

[54] Barbier (1999) shows that many low-income and lower middle-income economies that are highly resource dependent experienced low or stagnant growth rates. Hussain *et al* (2009 substantiate adverse nexus between exports related natural resources as ratio of GDP and economic growth. Ding and Field (2004) find a negative impact of resource endowment on economic growth.

Table 5. 3: The Agricultural Output Function Result

Variables	2-SLS		3-SLS	
	Coefficient	t-statistic	Coefficient	t-statistic
C	5.6136	2.9676	5.9396	4.7101
ORA	-0.5631	-1.7784	-0.5370	-2.1991
RGDP	-0.0161	-0.3606	0.0072	0.2051
ATRFALL	0.0064	0.0575	0.0703	1.3500
RLR	0.0095	1.3121	0.0114	1.7862
MS	0.1106	2.2651	0.0810	2.4339
REXR	0.0003	0.9201	0.0002	0.9797
AGI	-0.0764	-2.4938	-0.0837	-3.9805
AGY(-1)	0.4861	2.5875	0.5144	3.9856
Adj R^2	0.91		0.88	

The manufacturing sector output function results

The results of this function are presented in Table 5.5. The results show that ORA has a positive but insignificant effect[55] (0.59) on the manufacturing sector output (MANY) - indicating that for a 1% increase in ORA, MANY improved by 0.59%. This suggest that ORA has not significantly affected the manufacturing sector of the economy, this corroborates Olofin and Iyaniwura (1983). Other variables with positive sign are; the real exchange rate (REXR), investment in the manufacturing sector (MANI), urban population (UPOP), the agricultural sector output (AGY) and finally, the lagged value of the manufacturing sector output (MANY(-1)). Among these variables, UPOP (elasticity value of 0.51), AGY (0.62) and MANY(-1) (0.28) turned out significant effects. It is good to note that in this function, UPOP serves as our proxy for demand. Again, the effect of the UPOP on MANY concurs with Olofin and Iyaniwura (1983). Another interesting issue noted in the results is that AGY significantly and positively affects MANY, thus, representing the inter-linkages of the different sectors of economy. In addition, another interesting outcome of this function is the negative but insignificant effect of RLR on MANY. The negative aspect of this effect conforms to theory and by extension to *a priori* expectation.

[55] Sachs and Warner (1995, 1999), identify natural resource abundance with decline in traded manufacturing activities. Ismail (2010) finds that a permanent oil shock resulted in manufacturing production reductions. Murshed (1999) reveals that resource booms might expand the traded sector.

Table 5. 4: The Manufacturing Output Function Result

Variables	2-SLS		3-SLS	
	Coefficient	t-statistic	Coefficient	t-statistic
C	-3.7368	-1.1325	-3.8294	-1.4375
ORA	0.6679	1.5350	0.5853	1.5852
MS	0.0012	0.0144	-0.0016	-0.0250
RGDP	-0.0122	-0.1597	0.0063	0.1011
REXR	0.0005	1.1617	0.0005	1.4263
MANI	0.0192	0.5969	0.0363	1.4083
UPOP	0.4776	1.9967	0.5091	2.6418
RLR	-0.0057	-0.6030	-0.0094	-1.2335
AGY	0.5895	2.0367	0.6194	2.6803
MANY(-1)	0.3723	2.2103	0.2770	2.0812
Adj R^2	0.60		0.57	

The services output function results

The services output (SVY) function results as shown in Table 5.6 indicates that another sector through which the ORA has negatively affected the Nigerian economy is the services sector. As the Table reveals, ORA has a negative but insignificant effect (-0.27) on the SVY. This suggests that a 1% increase in ORA will trigger a -0.27 % drop in the services sector output. The insignificant effect could be attributed to the phenomenal growth witnessed in the services sector, at least, since the liberalisation of the telecommunication industry in 2001. By intuition, one would believe that this phenomenal growth would have counteracted the effect of the ORA on SVY. A salient lesson that seems to have emerged here is that more focus on ORA retards the SVY. Also, in the function, the RGDP, investment in the service sector (SVI) and RLR came out negative. On the other hand, MS, REXR, MANY (significant effect) and the one period lag of services sector output (SVY(-1)) (significant effect) have positive effect on the services sector output. The elasticity of SVY to these variables are; 0.08 - MS, 0.44 - MANY and 0.68 - SVY(-1).

Table 5. 5: The Services Output Function Result

Variables	2-SLS		3-SLS	
	Coefficient	t-statistic	Coefficient	t-statistics
C	0.5491	0.5267	0.5661	0.7488
ORA	-0.0876	-0.2616	-0.2724	-1.0048
RGDP	-0.0976	-2.3705	-0.0749	-2.1528
MS	0.0892	3.2886	0.0796	3.5626
REXR	0.0001	0.2896	2.3205	0.0859
SVI	-0.0388	-2.3762	-0.0425	-3.5294
RLR	-0.0034	-0.4551	-0.0044	-0.7468
MANY	0.4349	3.0374	0.4286	4.3352
SVY(-1)	0.6619	6.6784	0.6754	9.5631
Adj R^2	0.89		0.89	

Building and construction output function results

Table 5.7 which captures the results of the building and construction output (BCY) function reveals a positive and significant effect (0.50) of ORA on BCY. The result makes it clear that ORA has contributed significantly to the growth or expansion of BCY. The elasticity of the BCY to ORA is 0.49. A further implication of this result is that a significant chunk of the revenue emanating from Nigeria's oil resource would have found its way to the building and construction sector. Thus, expanding ORA does not hurt BCY. Four variables, namely RGDP, MS, REXR and RLR emerged with negative signs. Out of these, only MS has a significant effect on BCY. The negative sign of the MS is quite surprising as it is unexpected. Economic theory supports the view that increased MS should translate into increased output in the economy – other things being equal. Thus, this result does not conform to economic theory. A plausible reason for this could be that as money is been supplied into the economy, the expenditure of the government on some other pressing or unexpected items keeps expanding thus, resulting in crowding out or reduction in the expenditure on the building and construction sector. The negative and significant effect of RLR is in line with economic theory. Simply put, rational investors in the sector invest less in the face of rising lending rate.

Digging further, it was noticed that the MANY, AGY and the one period lag of building and construction output (BCY(-1)) turned output positive. AGY has a very high significant effect, 1.43 on BCY. The effect of MANY though positive is not significant. Again, these relationships portray the inter-linkages of the different sectors of the economy.

Table 5. 6: The Building and Construction Output Function Result

Variables	2-SLS		3-SLS	
	Coefficient	t-statistic	Coefficient	t-statistic
C	-12.2165	-2.8999	-12.1135	-5.0533
ORA	1.3194	1.9714	0.4967	1.9862
RGDP	-0.0933	-0.9760	-0.0804	-1.1527
MS	-0.2514	-2.2440	-0.2356	-3.5563
REXR	-0.0009	-1.3350	-0.0009	-1.8731
BCI	0.0715	1.4951	0.0880	3.2174
RLR	-0.0211	-1.4895	-0.0209	-2.1726
MANY	0.3546	1.1919	0.2850	1.6091
AGY	1.4784	3.3407	1.4285	5.8715
BCY(-1)	0.5933	5.3971	0.6671	10.6003
Adj R^2	0.89		0.89	

5.2.3. The demand block results

Agricultural investment function results

The result of the estimated agricultural investment function is presented in Table 5.8. The results show the negative effect of ORA on the Nigerian economy through the agricultural sector (now Agricultural Sector Investment (AGI)) persists. The magnitude of the sensitivity of the AGI to a 1% change in ORA is a whopping value of -4.27. This is another major finding of this study - determining empirically the extent to which the ORA has hampered the growth of the Nigerian economy via its harmful effect on AGI. The story being developed here is that the AGI shrinks as the Nigerian government receives jumbo revenue from the oil resource in the country. This is the core of the Dutch disease theory. The Table also reveals that the effect of the RGDP on AGI is positive and non-significant. The RGDP elasticity of AGI (0.22) implies that a 1% increase in the RGDP will result in a 0.22% increase in AGI - other things being equal. It is also interesting to note that Real Interest Rate (RIR) turned out almost significant and with a negative sign. This result, in line with Afangideh (2008) conforms to standard economic theory. The implication is that the investors in the agricultural sector like every other rational investor would go for less loan when the real interest rate is high. The significant nature of this variable requires the urgent attention of the monetary authorities as a reversal of the situation would not only contribute to diversifying the Nigeria economy but also go a long way in creating the much needed jobs for the many Nigerians who are unemployed.

In addition, it was realised that the price level (P) contrary to *a priori* expectation has a positive and insignificant effect on the AGI. Another variable that turned out positive though not significant is the lag of the agricultural sector investment (AGI(-1)). This positive relationship implies persistence in investment in the sector. The REXR has a positive but insignificant effect on AGI. Finally, import of consumer goods (IMCG) turned out a negative effect. This effect is quite interesting given that it provides another valid channel through which the agricultural sector has suffered retrogression. The empirical result shows that a 1% import of consumer goods into the Nigerian economy diminishes AGI by 0.58%.

Table 5. 7: The Agricultural Investment Function Result

Variables	2-SLS		3-SLS	
	Coefficient	**t-statistic**	**Coefficient**	**t-statistic**
C	18.8435	2.5695	24.9289	4.3780
ORA	-5.5287	-1.4826	-4.2728	-1.5477
RGDP	0.0309	0.1031	0.2267	0.9089
RIR	-0.0545	-1.9535	-0.0414	-2.0271
P	0.3807	1.5559	0.2853	1.4655
REXR	0.0009	0.4241	-0.0008	-0.4868
AGI(-1)	0.6097	4.2851	0.4651	4.2277
IMCG	-0.5852	-1.3202	-0.3184	-3.1220
Adj R^2	0.64		0.52	

The manufacturing investment function results

The results of this function as presented in Table 5.9 show that three variables significantly determine manufacturing investment (MANI) in Nigeria. These variables are; the RGDP, the import of raw materials and capital goods (IMRMCG) and finally, the AGI. Unexpectedly, the RGDP has a negative sign. A reason for this might be that the budgetary allocation for investment in the sector is not being properly managed. In addition, over dependence on imported ready made goods as against the patronage of made in Nigerian goods may be another window of explanation. The results further reveal that the degree of ORA sensitivity of MANI is 5.2%. This magnitude of sensitivity is nearly statistically significant at 5% level. This result seems to lay credence that ORA insignificantly brings expansion to the MANI. The positive sign of the RIR as captured in Table 5.10 is not in line with theory. Nonetheless, it is a good pointer to the possible constraints that investors face in seeking for fund elsewhere in times of rising RIR. In the face of this situation, investment cannot be at optimum as only the investors who can cope with the rising RIR go for loan.

Another remarkable discovery made from the estimation of the MANI function is the realisation of the fact that IMRMCG positively and significantly affects the MANI in Nigeria. The result indicates that a 1% increase in IMRMCG will result in 2.3% expansion of the investment base of the manufacturing sector. In addition, it was noticed from the results that the price level has a negative but insignificant effect on MANI. This negative sign conforms to *a priori expectation*. It simply implies that high cost of investment materials retards the growth of MANI. The elasticity of the manufacturing sector investment to the price level is -0.34.

Further, the lag of the manufacturing sector investment (MANI(-1)) has a positive but insignificant effect on MANI. AGI is another significant determinant of the size of MANI in Nigeria. As shown in the Table, the degree of responsiveness of MANI to AGI is empirically determined to be 1.42%. This again is suggestive of the inter-linkages of the different sectors of the economy. In a bid to experiment further on the other possible factors that explain the changes witnessed in MANI, manufacturers export was included as one of the explanatory variables. This experiment came with a revelation which suggest

that for Nigeria to expand its manufacturing investment base, it should endeavour to export more of its manufactured products.

Table 5. 8: The Manufacturing Investment Function Result

Variables	2-SLS		3-LS	
	Coefficient	t-statistic	Coefficient	t-statistic
C	-32.9208	-1.4657	-38.1690	-2.5671
ORA	8.6570	2.3196	5.1552	1.8910
RGDP	-0.6664	-1.9344	-0.6998	-2.5918
RIR	0.0512	2.2437	0.0201	1.3178
REXR	-0.0011	-0.4344	0.0012	0.5852
IMRMCG	1.9009	1.4061	2.2820	2.5616
P	-0.5421	-1.3016	-0.3435	-1.2023
MANI(-1)	0.2082	1.2932	0.2067	1.7372
AGI	1.3088	3.9016	1.4191	6.0524
MANEXP	0.1866	0.5627	0.1560	0.6931
Adj R^2	0.56		0.50	

The services investment function results

The result of the services investment (SVI) function is presented in Table 5.10. As it was in the case of the SVY, ORA emerged with a negative sign and it is not significant. This no doubt makes a sound case for consistence of purpose in the results of this study. What has been made clear from this result is that ORA has the potentials of retarding the growth of the Nigerian economy via the SVI channel. The elasticity of the SVI to ORA is -1.07%.

The positive and highly significant effect of the lag of the services sector investment (SVI(-1)), 0.62, brings to focus the persistency of investment in the sector. Again, the RIR, contrary to theory turned out positive but not significant. The explanations already provided in similar instances holds here with equal force. The REXR and the price level have negative signs and are not significant. The negative sign (-0.30) of the price level reinforces a theoretical stand point that less investment would be made in the face of upward trending cost of investment materials. The RGDP has a positive but insignificant effect on the services sector investment.

Table 5. 9: The Services Sector Investment Function Result

Variables	2-SLS		3-SLS	
	Coefficient	t-statistic	Coefficient	t-statistic
C	7.1562	1.6678	8.7354	2.3436
ORA	0.8927	0.2606	-1.0730	-0.3751
SVI(-1)	0.6949	5.7573	0.6189	6.1816
RIR	0.0037	0.1596	0.0003	0.0167
REXR	-0.0020	-0.7917	-0.0037	-1.6775
P	-0.1570	-0.5878	-0.3046	-1.3432
RGDP	-0.0754	-0.2234	0.0975	0.3264
Ajd R^2	0.51		0.49	

Building and construction investment function results

Table 5.11 shows the estimated results of the building and construction investment (BCI) function. The results reveal that ORA has a positive but insignificant effect on BCI. The positive sign suggests that expansion in oil resource could spur growth in the economy via the BCI channel. Specifically, the degree of responsiveness of BCI to a 1% change in ORA is 0.15%.

Also from Table 5.11, one observes that the MANI positively and significantly affected BCI. The magnitude of the sensitivity is 1.09. Again, the interconnectedness of the sectors of the economy is reaffirmed. In addition, it is noticed that the REXR has positive but insignificant effect on BCI. The results further show that the price level is not a significant determinant of the size of BCI. The price level contrary to *a priori* expectation turned out positive, indicating the possibility of investment in the building and construction sector increasing in the face of rising cost of investment. A plausible reason for this could be the fundamental importance attached to investment in the sector. Building no doubt is a necessity to human existence. The Table also reveals that the RGDP though insignificant, it positively affects BCI. Finally, the RIR afirms the *a priori* expectation. Though it is insignificant, it has a negative sign, implying a contraction of the investment base of the building and construction sector in the face of rising RIR.

Table 5. 10: The Building and Construction Investment Function Result

Variables	2-SLS		3-SLS	
	Coefficient	t-statistic	Coefficient	t-statistic
C	-0.0860	-0.0631	-0.5422	-0.4738
ORA	0.3459	0.3170	0.1501	0.1695
BCI(-1)	-0.0497	-0.8225	-0.1026	-2.1300
MANI	1.0239	14.9153	1.0895	2.3046
REXR	0.0009	1.1500	0.0010	1.4747
P	0.0363	0.4398	0.0341	0.4936
RGDP	0.0084	0.0786	0.0351	0.3813
RIR	-0.0013	-0.1729	-0.0034	-0.5852
Adj R^2	0.95		0.94	

5.2.4. The results for the external sector block

The primary commodities export function results

The primary commodity export (PCEXP) function results as presents in Table 5.12 show that foreign income (FINC) is insignificant in the function. This suggests that FINC is not a vital factor in the determination of PCEXP in Nigeria. According to Soludo (1995), Nigeria is a negligible supplier of primarily commodities to the world commodity market. Thus, PCEXP come from many other countries. Given this scenario, it is not surprising to find that an increase in FINC does not translate into increased demand for Nigeria's primary commodities from abroad (similar results were found by Korsu, 2008 and Adeniyi, 2010). Two factors are found to be significant in the determination of PCEXP, namely REXR and the price of export (PEXP).

The REXR turned out negative implying that an increase in it (appreciation of the real exchange rate and a depreciation of the real value of dollar) decreases PCEXP in Nigeria. An appreciation of the naira makes our domestic commodities expensive to foreigners given that the relative price of foreign goods falls. On the other hand, a decrease in the real exchange rate (depreciation of the naira), as the negative sign suggests would bring about a boost in the export of primary commodities of Nigeria. This is because it becomes attractive for foreigners to import from Nigeria given that the relative price of similar foreign products would have gone up. The second significant factor which is PEXP has a positive effect (0.82), implying that Nigeria exports more of its primary commodities at higher prices. This conforms to the standard economic theory which states that sellers are willing to sell more at higher prices.

Table 5. 11: The Primary Commodities Export Function Result

Variables	2-SLS		3-SLS	
	Coefficient	t-statistic	Coefficient	t-statistic
C	19.5476	51.9105	19.4405	57.3766
FINC	0.0001	1.6339	2.0913	1.8865
REXR	-0.0007	-2.0654	-0.0007	-2.1224
PEXP	0.8008	9.7695	0.8223	11.2468
Adj R^2	0.81		0.80	

Manufacturers export function results

The results for this function are shown in Table 5.13. The results reveal that FINC negatively but significantly affected Manufacturers Export (MANEXP) in Nigeria. Drawing from the explanation already given on the effect of FINC on PCEXP, it is stated here that the result suggests that FINC is not a factor to be neglected when seeking for the determinants of the size of MANEXP in Nigeria. The negative sign implies that even when FINC increases, MANEXP falls. Though this is not theoretical, it might find some justification on the ground that Nigeria is a weak competitor internationally when it comes to the exportation of manufactured goods. The elasticity of MANEXP to FINC as shown in Table 5.10 is -2.3%.

Like in the case of PCEXP function, the REXR has a negative sign. The explanation provided for the negative sign of REXR in the case of PCEXP also holds here. Unlike in that function, the result here suggests that the REXR is an insignificant factor in the MANEXP in Nigeria. The sensitivity of MANEXP to the REXR is -0.001. Finally, the results further reveal that PEXP insignificantly and positively affect MANEXP at an elasticity value of 0.27.

Table 5. 12: The Manufacturers Export Function Result

Variables	2-SLS		3-SLS	
	Coefficient	t-statistic	Coefficient	t-statistic
C	1.2584	1.0361	1.7596	1.6867
FINC	-2.1712	-5.4394	-2.3112	-6.8662
REXR	-0.0007	-0.6752	-0.0008	-1.0200
PEXP	0.0036	1.6589	0.2679	1.2025
Adj R^2	0.61		0.61	

Oil export function results

The results for the Oil Export (OILEXP) function presented in Table 5.14 reveal that all the three variables (REXR, measure of oil price changes (ROILP) and lagged oil export (OILEXP(-1)) that entered the function are significant determinants of OILEXP in Nigeria. Again, REXR has a negative sign implying that its increase (that is the appreciation of the value of naira) exerts a decreasing pressure on OILEXP - other things being equal. ROILP has a positive sign, 0.005, implying that OILEXP increases as oil price rises. The sign of OILEXP(-1) is also positive, suggesting that OILEXP in Nigeria has been a persistent economic activity.

Table 5. 13: The Oil Export Function Result

Variables	2-SLS		3-SLS	
	Coefficient	t-statistic	Coefficient	t-statistic
C	1.2924	3.2872	1.1709	3.1836
REXR	-0.0016	-3.0843	-0.0014	-3.0136
OILP	0.0046	4.1963	0.0047	5.1004
OILEXP(-1)	0.9314	35.5794	0.9394	38.3532
Adj R^2	0.98		0.98	

Import of consumer goods function results

The results that relate to the Import of Consumer Goods (IMCG) are captured in Table 5.15. All the four variables in the function - RGDP, REXR, foreign exchange earnings (FEXE), and the lag of import of consumer goods (IMCG(-1)) - have positive signs, implying that IMCG in Nigeria move in the same direction with them. Two out of these variables; REXR and FEXE have significant effect on IMCG. The elasticity of IMCG to REXR and FEXE are; 0.002% and 0.24% respectively. IMCG(-1) and RGDP, though positive, are insignificant. As stated earlier, the position of the traditional import function is that an increase in income increases import demand. The result for FEXE replicates Egwaikhide (1999) that a positive relationship exists imports and FEXE in Nigeria. The positive sign of IMCG(-1) suggests that Nigeria has been persistent in its import of consumer goods.

Table 5. 14: The Import of Consumer Goods Function Result

Variables	2-SLS		3-SLS	
	Coefficient	t-statistic	Coefficient	t-statistic
C	11.7636	4.9090	10.7017	5.0275
REXR	0.0016	1.6651	0.0017	1.9443
IMCG(-1)	0.0627	0.3869	0.1415	1.0042
FEXE	0.2459	3.8302	0.2393	4.2026
RGDP	-0.1064	-0.9335	0.1077	1.0322
Adj R^2	0.46		0.46	

Import of raw materials and capital goods function results

The results in Table 5.16 is on the Import Of Raw Materials And Capital Goods (IMRMCG) function. From the Table, it is clear that RGDP under the 2-SLS positively but insignificantly affects IMRMCG. The opposite of this relationship emerged when the 3-SLS was employed. In terms of sign, the result of 2-SLS conforms to *a priori expectation* - higher income brings about rise in imports. The REXR has an almost significant (at 5%) and positive influence on IMRMCG. This simply implies that real appreciation of the naira (increase in the real exchange rate) makes it possible to import more raw materials and capital goods.

Expectedly, the lag of the import of raw materials and capital good (IMRMCG(-1)) significantly and positively (0.44) determines IMRMCG. The Table also shows that FEXE positively and significantly determine IMRMCG. As stated earlier, the effect of FEXE on IMRMCG conforms to the traditional import function. Finally, capacity utilisation rate in the domestic industries positively but insignificantly (0.25) affect the import of raw materials and capital goods. This result concurs with the standard expectation that utilisation rate (CAPUTL) of domestic industrial capacities move in the same direction with the import of raw materials.

Table 5. 15: The Import of Raw Materials and Capital Goods Function Result

Variables	2-SLS		3-SLS	
	Coefficient	t-statistic	Coefficient	t-statistic
C	3.7183	2.1899	5.5711	3.8807
RGDP	0.0204	0.3562	-0.0106	-0.2160
REXR	0.0003	0.7096	0.0007	1.9032
IMRMCG(-1)	0.5778	4.1054	0.4413	3.7352
FEXE	0.0604	2.1407	0.0984	4.3070
CAPUTL	0.2766	1.4190	0.2468	1.5455
Adj R^2	0.75		0.73	

The real exchange rate function results

The estimated results of this function are presented in Table 5.17. The Table shows that six factors, namely the nominal exchange rate (NEXR), measure of openness (OPEN) of the Nigerian economy, terms of trade (TOT), price level, government consumption as a ratio of GDP (GGDP) and the lag of the real exchange rate (REXR(-1)) significantly affect REXR in Nigeria. Out of these significant factors, OPEN and GGDP have negative effects on REXR, the elasticity of these two factors are -0.15 and -0.9 to REXR, respectively. In line with theory, the results reveal that NEXR positively, 0.007, affects REXR (Korsu, 2008). The results further show that the effects of TOT, price level, and REXR(-1)on REXR is positive. The growth of the real gross domestic product (YG) is the only variable that turned out insignificant, with a negative effect.

Table 5. 16: The Real Exchange Rate Function Result

Variables	2-SLS		3-SLS	
	Coefficient	t-statistic	Coefficient	t-statistic
C	-5.1531	-0.1943	6.6433	0.2945
NEXR	0.0064	3.2454	0.0069	4.3992
OPEN	-0.6211	-2.8072	-0.1472	-3.9478
TOT	0.9226	8.3427	1.2515	9.7561
P	0.9201	4.1185	1.7571	4.3994
YG	-0.7954	0.9320	-0.6408	-0.9892
GGDP	-0.1812	-1.9746	-0.9932	-3.2660
REXR(-1)	0.1839	2.1415	0.1773	2.5999
Adj R^2	0.96		0.96	

5.2.5: The results for the monetary sector block

The desired money stock function results

The estimated results of this function are presented in Table 5.18. The results indicate a positive but insignificant relationship between desired money stock (MD) and the gross national product (GNP). The money market interest rate has negative and insignificant effect on the desire money stock. The implication of this which agrees with theory is that MD drops as the money market interest rate rises. Unexpectedly, the results further reveal that consumer price index (CPI) does not significantly explain MD. This is quite strange given that transactionary motive is one of the fundamental motives for the demand for money. In addition, the results of the function show that MD(-1) significantly and positively determine MD. The sensitivity of MD to its lag (one period) is 0.70. This clearly shows that MD in Nigeria has been persistent.

Table 5. 17: Desired Money Stock Function Result

Variable	2-SLS		3-SLS	
	Coefficient	t-statistic	Coefficient	t-statistic
C	0.2009	0.3013	0.5005	0.8923
GNP	1.6621	0.5515	1.5913	1.0908
NIR	-0.0017	-0.2432	-1.7205	-0.0030
MD(-1)	0.7412	12.9051	0.6998	14.0020
CPI	-0.0304	-0.4542	-0.0145	-0.2587
GRE (-1)	0.2856	3.0864	0.2933	3.7386
Adj R^2	0.99		0.99	

5.2.6: The results for the fiscal sector block

Government capital expenditure function results

The results relating to the government capital expenditure (GCE) function is displayed in Table 5.19. From the Table, one finds that the one period lagged value of government capital expenditure (GCE (-1)), included in the equation to demonstrate the persistence spending behaviour of the government positively and significantly determine GCE at an elasticity of 0.81. The results also reveal that the more open a country is to the aside world, the larger the spending of the government on capital. Sturm (2001) who found a similar result claims that countries which see their shares of imports and exports increase spend more on public capital. Empirically, the degree of responsiveness of GCE to a 1% change in OPEN is 0.36.

Markedly, interesting but contradicting results emerged in the case of the RGDP and the Federal Government Debt (FGDEBT). In the case of the RGDP, 3-SLS presents a negative effect, whereas the effect that emerged from the 2-SLS is significantly positive. The magnitude of the elasticity of GCE to RGDP stood at 0.42. Finally, Table 5.19 shows that under the 2-SLS, high levels of FGDEBT may lead to restrictive fiscal policy measures and by extension a decline in capital expenditure[56]. The 3-SLS produced an opposite result. The result of the 2-SLS is in line with Roubini and Sachs (1989) and Haan *et al.* (1996) who reported evidence in favour of the hypothesis that high levels of budget deficits and/or government debt may lead to restrictive fiscal policy measures.

[56] Large debt interest payments crowd out other government spending categories. Countries might have offset increases in debt interest payments by winding back public capital spending (Sturm, 2001).

Table 5. 18: The Government Capital Expenditure Function Result

Variables	2-SLS		3-SLS	
	Coefficient	t-statistic	Coefficient	t-statistic
C	1.4377	2.3631	3.2987	3.7565
GCE(-1)	0.4461	3.2707	0.8140	12.1784
OPEN	0.7484	2.3754	0.3565	1.1455
RGDP	0.4171	3.2331	-0.2768	-2.2505
FGDEBT	-0.1082	-0.7131	0.4473	2.4515
Adj R^2	0.98		0.97	

Total federally collected revenue function results

The results of this function are captured in Table 5.20. Expectedly, the results show that total federally collected revenue (TFCR) in Nigeria is positively and significantly determined by the openness of the economy (OPEN), effective petroleum profit tax (EPPT) and effective non-oil tax (ENOT) at elasticities of 0.34, 0.47 and 1.51 respectively. The effect of OPEN on the TFCR is in accord with Hinrichs (1965) who posits that OPEN is a major determinant of government revenue. These results are typical of the Nigerian economy where the revenue that accrues to the government is broadly classified into oil and non-oil. The results also reveal that the RGDP positively but insignificantly affect TFCR in Nigeria. The elasticity of federally collected revenue to the RGDP is 0.01.

Table 5. 19: Total Federally Collected Revenue Function Result

Variables	2-SLS		3-SLS	
	Coefficient	t-statistic	Coefficient	t-statistic
C	1.6311	3.8825	1.6427	3.0021
RGDP	0.1271	1.3057	0.0143	0.2755
OPEN	0.5469	2.9666	0.4765	2.9689
EPPT	0.2567	3.0801	0.3413	5.0695
ENOT	1.3859	5.2193	1.5147	9.1917
Adj R^2	0.99		0.99	

5.3: Evaluation of the model's performance

To determine the performance of the model, an ex post simulation was carried out over the estimation period of the model. The results are discussed briefly in this section. Notably, the evaluation of the model focuses on three related questions: How well do the endogenous variables track the historical data series? What is the model's forecasting potential? How well does the model simulate turning points in the endogenous variables? The simulation statistics relevant to answering these questions are tabulated in Table 5.21. The Theil's inequality coefficients for all the simulated endogenous variables provide a measure of the ability of the model to forecast accurately. It is desirable that these indexes be close to zero, if the model is to be capable of good predictive performance. As can be seen in Table 5.21, only in the case of a single variable, the manufacturing export (MANEXP), is the coefficient greater than 0.25. It would therefore appear that virtually in every case, the simulated values track actual series very well.

The bias proportion of the simulation error which is indicative of the extent to which the average values of the simulated and actual data series deviate from one another, is shown in column 4 of Table 5.21. Again, it is desirable that these values be close to zero for good model dynamic performance. As can be observed from the Table, all the values are smaller than 0.094. The variance proportion of the simulation error, listed in column 5 of the Table, shows the ability of the model to replicate the degree of variability in the endogenous variables. It is also desirable that these values be close to zero if the model is to have the capability of tracking turning points sufficiently well. Only in two cases out of 17 or 11.8%, are these values higher than 0.2. The covariance proportion contained in column 6 measures the remaining unsystematic forecasting errors. The closer the covariance proportion is to one, the better the fit of the model. As can be seen from the Table, it is only in one instance (out of seventeen) that covariance proportion of the model went below 0.72.

The Root Mean Squared Error (RMSE) or the Root-Mean-Square Deviation (RMSD) is a frequently used measure of the differences between values predicted by a model or an estimator and the values actually observed. It is a good measure of accuracy, but only to compare different forecasting errors within a data set and not between different ones. The

RMSE is most useful when large errors are particularly undesirable. Thus, it can be used to diagnose the variation in the errors in a set of forecasts. RMSE can range from zero to infinity but lower values are better. In the case of the model of this study, it is only in three cases out of 17 or 17%, are these RMSE values up to one (see column 7 of Table 5.21).

Table 5. 20: Summary Statistics of Validation of the Macroeconomic Model

S/N	Variables	Theil's inequality	Bias proportion	Variable proportion	Covariance proportion	Root mean square error
1.	**AGI**	0.02630	0.0069	0.1311	0.9895	1.0506
2.	**AGY**	0.0075	0.0007	0.0104	0.9895	0.1457
3.	**MANI**	0.0285	0.0000	0.0089	0.9911	1.1583
4.	**MANY**	0.0113	0.0000	0.1005	0.8994	0.1803
5.	**SVI**	0.0394	0.0002	0.4600	0.5399	1.5878
6.	**SVY**	0.0109	0.0000	0.0617	0.9383	0.1928
7.	**BCI**	0.0102	0.0000	0.0025	0.9975	0.4147
8.	**BCY**	0.0165	0.0000	0.0023	0.9977	0.2348
9.	**PCEXP**	0.0064	0.0055	0.1582	0.8363	0.2980
10.	**MANEXP**	0.2509	0.0000	0.1078	0.8922	0.8465
11.	**OILEXP**	0.0190	0.0157	0.2653	0.7190	0.4567
12.	**IMCG**	0.0205	0.0006	0.0642	0.9351	0.5869
13.	**IMRMCG**	0.0082	0.0023	0.0864	0.9112	0.2215
14.	**REXR**	0.0500	0.0030	0.0013	0.9957	26.1639
15.	**TFCR**	0.0087	0.0015	0.0015	0.9970	0.2048
16.	**GCE**	0.0120	0.0002	0.0004	0.9995	0.2641
17.	**MD**	0.0077	0.0930	0.1545	0.7525	0.1836

The plot graphs of simulated values on actuals carried out for some of the endogenous variables are as shown in Figure 5.1 reveal that the simulated values match the actual closely, thus indicating a low bias in the model[57]. The percentage deviation of the baseline from the actual is presented in Table 5.22. On an average that ranged between 1971 and 90, the simulated values of agricultural investment only deviated from the actual by a low value of -0.45%. Over the same period, the simulated value of agricultural output marginally deviated from its actual by a negligible value of -0.00032%. Building and construction simulated investment and output values deviated by -0.69% and 0.13% respectively while -0.70 and -0.02 represent the average deviations witnessed in manufacturing investment and output respectively. The simulated values of the services sector investment and output respectively deviated from the actual by 0.003% and -0.07%.

Still on Table 5.22, it is interesting to focus on between 1990 to 2010 averages of the simulated values of the endogenous variables. What further emerges from the Table is that over the period mentioned here, the simulated agricultural investment value deviated positively (0.29%) but very slightly from the actual. Agricultural output averaged negatively (-0.12%) for the same period. Small values of 0.46% and -0.275% represent the average simulated values for building and construction investment and output respectively. The manufacturing sector investment and output had insignificant average deviation values of 0.47% and -0.06% respectively. In the case of the services sector, the simulated values of investment and output deviated from the actual by very low values of 0.23% and -0.15% respectively. The low deviation of the simulated values from the actual is a pointer to the good fit of the model of this study.

From the foregoing, it can be stated that the model's dynamic performance is considerably good and as such ought to be serve as an adequate framework for analysing the effects of ORA on the sectoral performance of the Nigerian economy.

[57] By simulating the model during the period for which historical data for all variables are available, a comparison of the original data series with the simulated series for each endogenous variable can provide a useful test of the validity of the model (Olubusoye and Salisu, 2012).

Figure 5. 1: Actual and Simulated Values of Some Endogenous Variables

Table 5. 21: Statistics for the Historical Simulation of Baseline Deviation from the Actual

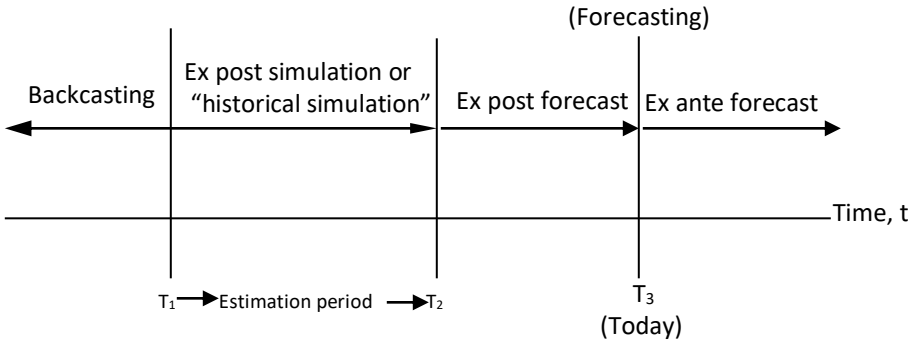
YEAR	Agricultural investment	Agricultural output	Building and construction investment	Building and construction output	Manufacturing investment	Manufacturing output	Service sector investment	Service sector output
1971-90	**-0.45190579**	**-0.00032**	**-0.69394**	**0.127125**	**-0.69954**	**-0.02356**	**0.003245**	**-0.07083**
1991	2.32275383	-0.14768	1.739629	-0.27001	1.655649	-0.13655	-0.93512	-0.03671
1992	-1.59177841	-0.22159	1.10785	-0.29458	1.1222	-0.05298	-0.86582	-0.08316
1993	0.62936246	-0.32135	0.624975	-0.4183	0.612985	-0.1027	-1.21248	-0.11509
1994	0.688327	-0.24482	1.662293	-0.66772	1.654193	-0.19713	-0.35045	-0.32991
1995	-1.5311599	-0.26647	0.804621	-0.64322	0.833031	-0.14631	0.391418	-0.44652
1996	0.33893404	-0.02138	-1.42523	-0.55733	-1.38925	0.001051	0.126221	-0.44433
1997	-0.00545183	0.017685	-0.95119	-0.36693	-1.05423	0.129907	2.535402	-0.34323
1998	1.45826121	-0.1205	0.453173	-0.32837	0.363423	0.05751	0.513939	-0.37454
1999	1.83461442	-0.27589	3.225948	-0.28674	3.167778	-0.11521	2.544618	-0.23657
2000	1.54800167	-0.18666	1.254844	-0.4051	1.278184	-0.09251	1.706696	-0.10741
2001	2.38867113	-0.36362	1.75832	-0.52	1.72134	-0.13752	2.553185	-0.10734
2002	-0.93184961	-0.40499	2.539321	-0.30192	2.533971	-0.13206	2.842173	-0.15362
2003	2.27479818	0.211377	2.219979	-0.48598	2.221549	-0.11336	2.72054	-0.13916
2004	2.36909117	0.044922	2.497694	-0.71872	2.538424	-0.19266	2.947532	-0.2692
2005	-2.32426984	-0.02043	-3.30426	0.066924	-3.25322	-0.11449	-3.70857	-0.09211
2006	-1.62781734	0.019745	-2.01995	0.119332	-1.95555	-0.06	-2.73616	-0.04556
2007	-0.97941082	0.028517	-1.87827	0.186932	-1.84545	0.072749	-3.10729	0.074535
2008	-0.7493214	0.019042	-1.23015	0.090986	-1.15526	0.061131	-1.53684	0.081289
2009	-0.45335035	-0.1709	-0.15518	0.162784	-0.12639	-0.00036	-0.19663	-0.05233
2010	0.07516481	-0.00422	0.410811	0.233989	0.493001	0.076296	0.375065	0.05707
1991-10	**0.286678521**	**-0.12146**	**0.466761**	**-0.2702**	**0.470819**	**-0.05976**	**0.230372**	**-0.1582**

Note: The figures are in percentage deviation of the baseline from the actual. Hence, a minus implies a decrease and a positive sign implies an increase in the endogenous variable

5.4: Simulation[58] and policy analysis

Typically, simulation comprises ex post or historical simulation (in-sample simulation), whereas forecasting involves ex post forecast, ex ante forecast and backcasting. For ease of appreciation, these concepts are fisrt illustrated in Figure 5.2 before reverting to the discussion of the results obtained. In the Figure, T1 and T2 represent the time bounds over which the equations of a hypothetical model are estimated (the estimation period). T3 represents the time today (in the case of this study, T3 = 2010). The simulation begins in year T1 (1970 in the case of this study) and runs forward until year T2 (2008 as demonstrated in section 5.4.1). Historical values in year T1 are supplied as initial conditions for the endogenous variables, and historical series beginning in T1 and ending in T2 are used for the exogenous variable. There is no re-initialisation of the endogenous variables; after year T1 values for the endogenous variable are determined by the simulation solution. Forecasting involves a simulation of the model forward in time beyond the estimation period (2014 in this case). In a backcast, one begins with initial condition for all variables in period T1 and then using specified values for the exogenous variables before period T1, solves the model backward one period at a time.

[58] Simulation simply refers to the mathematical solution of a simultaneous set of difference equation. A simulation model refers to that set of equations. Simulations of a model might be performed for policy analysis, and forecasting. The general description of a simulation process includes: (1) Specify a model whose parameters have been estimated (or numerical values have been otherwise supplied); (2) Give the initial values for the endogenous variables (i.e., base-year values); (3) Give the time series for the exogenous variables (these may be historical series, or they may represent hypotheses about the future behaviour of the series); and (4) Solve the model over some range of time to yield solution for each of the endogenous variables (Olubusoye and Salisu, 2012).



Source: Culled from Olubusoye and Salisu (2012).

Figure 5. 2: Simulation Time Horizon

5.4.1: The result of the ex-post forecast of 2009 to 2010

What has been done here is to allow the estimation period to stop at 2008 and pretend as if the data for 2009 and 2010 (see the gap between T2 and T3 in Figure 5.2) do not exist. Using the model, values for these years (2009 and 2010) were forecasted. The main aim of this exercise is to test the forecasting accuracy of the model. The result of the exercise presented in Table 5.23 indicates that the model has a high predictive power as the forecasted values[59] almost perfectly match the actuals. For instance, in absolute term, the forecasted value of agricultural investment (AGIF) for 2009 only deviated from the actual (AGI) by 0.53% (that is, the forecasted value slightly or narrowly went up beyond the actual). For 2010, the absolute percentage difference between AGI and AGIF is 0.37%. In the case of agricultural output (AGY), the forecasted values (AGYF) for 2009 and 2010 missed the actual (AGY) by an absolute value of 1.5% and 1.7%, respectively.

The building and construction forecasted investment values (BCIF) for 2009 and 2010 departed from the actual (BCI) by 1.95% and 4%, correspondingly, whereas the percentage difference between the actual and the forecasted output values of the same sector are 9.9% for 2009 and 9.7% for 2010. For manufacturing investment, 2.3% and 4.6% absolutely represent the magnitude of the departure of the forecasted from the actual values for the years 2009 and 2010, respectively. In terms of the output of the sector, the absolute percentage departure stood at 3.5 and 3.4 for 2009 and 2010 respectively. For 2009, the absolute difference between the actual and the forecasted services sector investment (SVIF) is 2.9% as against 4.6% for 2010. In the case of the output of the service sector, this absolute percentage deviation came to 1.6 for 2009 and 1.9 for 2010. Again, these slight deviations of the forecasted values from the actuals lay credence to the forecasting ability of the model of this study.

[59] The variables with letter 'F' stand for forecasted values whereas those without 'F' are the actuals.

Table 5. 22: Ex post forecast of 2009 to 2010

Year	AGI	AGY	BCI	BCY	MANI	MANY	SVI	SVY
2009	0.53	1.5	1.95	9.9	2.3	3.5	2.9	1.6
2010	0.37	1.7	4	9.7	4.6	3.4	4.6	1.9

Note: *Figures are in absolute percentage deviation from the actual.*

5.4.2: The effects of oil resource abundance changes

Apart from using the validated model to carry out an ex-post forecast, attempt was also made to dig further by conducting ex-ante forecast which enables one peep into the future effects of the different time paths assigned to the exogenous variable of interest ORA on the endogenous variables. To drive this exercise, various assumptions were made. The first major assumption is that changes in ORA are bound to have major consequences on performance of the activity sectors of the Nigerian economy. In determining the time path for ORA, it was assumed that it would either increase or decrease by its last ten-year average change (5%). In addition, decision was also made about the length of the forecast period. It was chosen to limit the projection of data into the future to 2014. Even though the period may not be long enough for examinations of the model's steady state properties, it is enough to make inferences about the model's long-run simulation behaviour. This believe is anchored on the fact that the model do not contain long lags and as such, the period is assumed to be long enough for the effects of changes in ORA to work through the model. Also, it would be inappropriate to assume that all other policy variables that entered the model would continue to remain constant over a long period.

The scenario one of the ex-ante forecast experiment is the assumption of a 5% increase in ORA whereas scenario two is on the assumption of a 5% decrease in ORA .

Interpretation of the results[60] for scenario one

The results of the ex-ante forecast experiment based on the assumption of a 5% increase in ORA are presented in Table 5.24, below are in percentage deviation of the disturbed solution (5% increase in ORA) from the control (the baseline). In the case of agricultural and services sectors, the ex-ante forecast results are consistent with the results obtained under the 2-SLS and 3-SLS estimation method. The point of consistency here is that an increase in the ORA impacts on these sectors negatively. Comparing a scenario of 5% increase with the baseline, it was realised that the agricultural and services sectors fared better under the baseline economic activity arrangement than under the scenario of 5% advancement of ORA. For instance and in terms of the investment of the agricultural sector, it was observed that on the average (2011-14) the sector's output under the

[60] In the interpretation of the results for the two scenarios, attention is on the forecasted periods while those of the historical periods are only displayed in the Table.

baseline outweighs its output under the setting of 5% increase in ORA by 0.96%. For the services sector (over the same averaged period) the baseline investment of the sector overshadows that of the scenario of 5% increase in ORA by the magnitude of 0.44%. In terms of the outputs, Table 5.24 also reveals that the two sectors fared better under the baseline arrangement than in a situation of 5% increase in ORA. The agricultural sector output under the baseline experiment is by 0.05% better than if the system was disturbed by the 5% increase in ORA. The services sector output under the baseline dwarfed its output under the scenario of 5% increase in ORA by 0.12%.

In the case of building and construction as well as the manufacturing sectors, the results reveal that in terms of investment, the building and construction sector is not better under the scenario of 5% increase in ORA. Empirically, the average result for the forecasted period (2011-14) shows that investment in the building and construction sector under the baseline economic arrangement surpasses investment in the sector under the scenario of 5% increase in ORA by 0.43%. Similarly, the baseline investment of the manufacturing sector outshines the investment of the sector under the setting of 5% increase in ORA by 0.52%.

Further, the results reveal that output is enhanced in the building and construction as well as manufacturing sectors under the circumstance of 5% increase in ORA than in the baseline arrangement. Precisely, output in the building and construction sector over the forecasted period waned down by 0.21% under the baseline experiment, whereas the output of the manufacturing sector under the same baseline experiment diminished by 0.18% (Table 5.24). Thus, indicating that increase of ORA by 5% favours the building and construction and the manufacturing sectors through their outputs.

Table 5. 23: The Ex ante forecast result of a scenario of 5% increase in oil resource abundance.

Year	Agricultural investment	Agricultural output	Building and construction investment	Building and construction output	Manufacturing investment	Manufacturing output	Service sector investment	Service section output
1971-75	-0.37	0.02	-0.38	0.03	-0.41	0.04	-0.00	0.01
1976-80	-0.35	0.06	-0.92	0.08	-0.91	0.02	-0.37	0.04
1981-85	-0.12	0.06	-0.26	0.16	-0.31	0.00	0.02	0.07
1986-90	0.50	-0.02	0.46	-0.01	0.46	-0.01	0.73	0.02
1991-95	0.58	-0.08	0.99	-0.22	0.97	-0.04	0.61	-0.16
1996-00	-0.14	-0.04	0.07	-0.05	0.07	0.02	-0.12	-0.02
2001-05	-0.21	0.01	-0.18	-0.01	-0.15	0.00	-0.18	-0.01
2006	-0.33	0.05	-0.67	0.01	-0.61	-0.02	-0.37	0.01
2007	-0.17	0.03	-0.40	0.02	-0.39	-0.03	-0.21	0.02
2008	-0.23	0.04	-0.42	0.02	-0.39	-0.03	-0.16	0.02
2009	-0.13	0.01	-0.17	0.10	-0.14	-0.01	0.04	0.03
2010	-0.15	0.00	-0.12	0.09	-0.08	-0.04	0.23	0.00
2011	0.17	0.00	-0.07	0.01	-0.01	0.08	0.35	0.03
2012	0.64	0.03	0.17	-0.11	0.25	-0.14	0.42	0.09
2013	1.20	0.06	0.57	-0.27	0.66	-0.21	0.47	0.15
2014	1.82	0.09	1.06	-0.47	1.19	-0.28	0.50	0.21
2011-14	**0.96**	**0.05**	**0.43**	**-0.21**	**0.52**	**-0.18**	**0.44**	**0.12**

Figures are in percentage deviation from the baseline with positive sign indicating that the baseline favoures the sector more than the scenario.

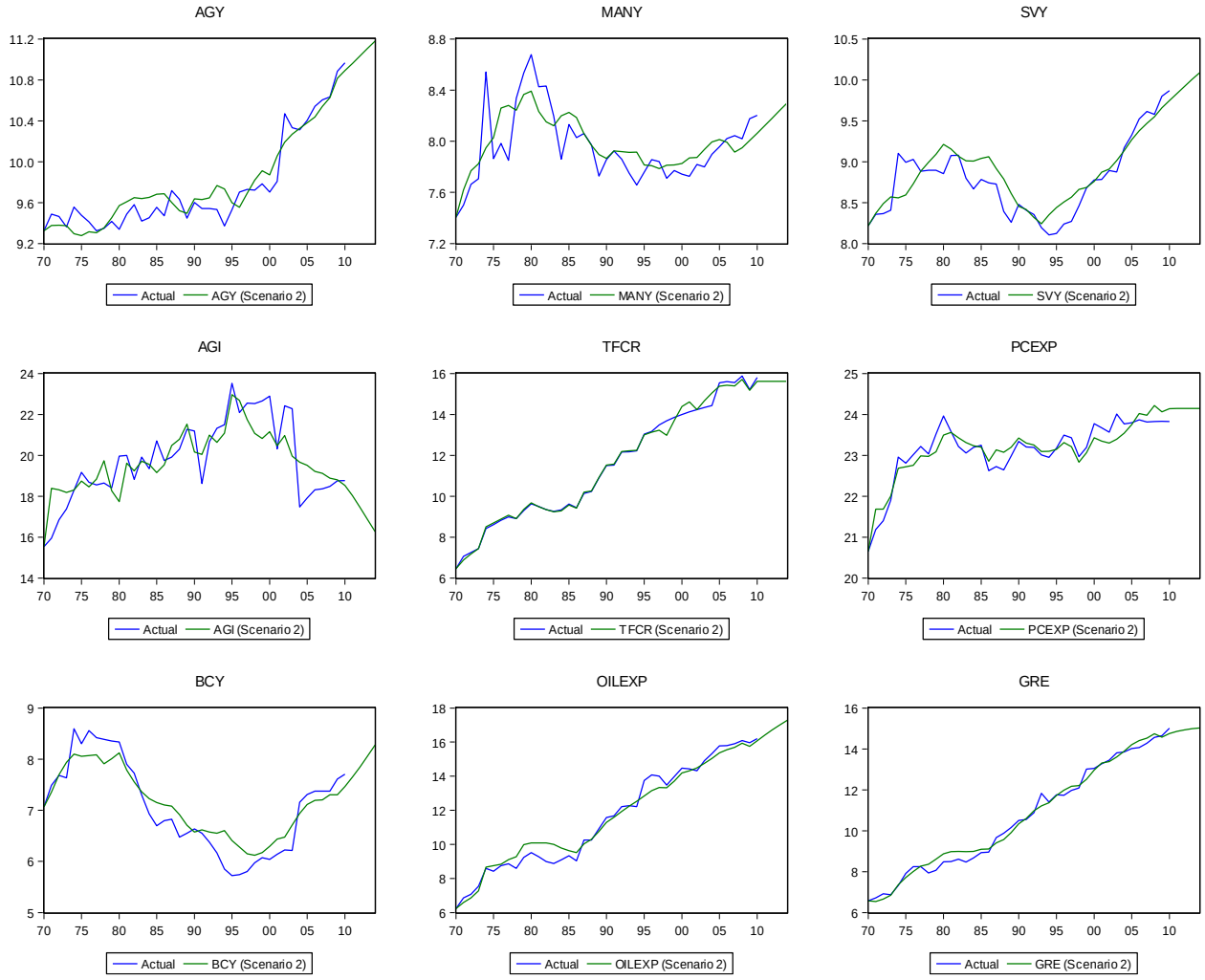


Figure 5. 3: The Ex ante forecast result of 5% increase in oil resource abundance

Interpretation of results for scenario two.

Scenario two applies to 5% decrease in ORA and the forecast results that relate to it are presented in Table 5.25, from this Table, it is noticed that over the four year forecast period (2011-14), agricultural investment and output proved to be better under a scenario of 5% decrease in ORA than in the setting of the baseline. The baseline investment relating to the agricultural sector is worse than the investment level relating to the same sector under the situation of 5% reduction in ORA by 0.51%. Over the four-year forcast period, 0.01% is the amount by which agricultural output under the scenario of 5% diminution of ORA is better than the agricultural output that emerged from the baseline experiment. Thus, the forecast shows that the agricultural sector fared better in investment and output under the scenario of reduced ORA.

The result for the building and construction sector is mixed - the sector improved with a 5% decrease in ORA via investment (0.17%) and worsened under the same setting through the output sector (0.15%). Thus, if improving investment in the building and construction sector is the goal, measures that constrain ORA should be pursued whereas if the goal is to enhance the sector's output, policies that expand ORA should be of concern. In the case of the manufacturing sector, the four year forecast result shows that a scenario of 5% shrinkage in ORA only improves the sector through investment by the magnitude of (0.13%) whereas the output of the sector proved to be better under the baseline situation. Under this arrangement, the output of the manufacturing sector gained by 0.04%.

For the services sector, the results of the four-year forecast show that the already identified inverse relationship between the sector and ORA persists. This inverse relationship manifested the investment and output of the sector. The story being developed here is that a decrease of ORA by 5%, makes the services sector (on average 2011-14) to advance by 0.84% in its investment and by 0.08% in its output. Thus, the services sector fared better as ORA diminishes.

Table 5. 24: The Ex ante forecast result of a scenario of 5% decrease in oil resource abundance.

Year	Agricultural investment	Agricultural output	Building and construction investment	Building and construction output	Manufacturing investmentt	Manufacturing output	Service sector investment	Service sector output
1971-75	-0.37	0.02	-0.38	0.03	-0.41	0.04	-0.00	0.01
1976-80	-0.35	0.06	-0.92	0.08	-0.91	0.02	-0.37	0.04
1981-85	-0.12	0.06	-0.26	0.16	-0.31	0.00	0.02	0.07
1986-90	0.50	-0.02	0.46	-0.01	0.46	-0.01	0.73	0.02
1991-95	0.58	-0.08	0.99	-0.22	0.97	-0.04	0.61	-0.16
1996-00	-0.14	-0.04	0.07	-0.05	0.07	0.02	-0.12	-0.02
2001-05	-0.21	0.01	-0.18	-0.01	-0.15	0.00	-0.18	-0.01
2006	-0.33	0.05	-0.67	0.01	-0.61	-0.02	-0.37	0.01
2007	-0.17	0.03	-0.40	0.02	-0.39	-0.03	-0.21	0.02
2008	-0.23	0.04	-0.42	0.02	-0.39	-0.03	-0.16	0.02
2009	-0.13	0.01	-0.17	0.10	-0.14	-0.01	0.04	0.02
2010	-0.15	0.00	-0.12	0.09	-0.08	-0.04	0.23	0.00
2011	-0.11	-0.01	-0.10	0.07	-0.05	0.06	0.42	-0.03
2012	-0.32	-0.02	-0.06	0.10	-0.02	0.06	-0.68	-0.07
2013	-0.62	-0.02	-0.17	0.17	-0.13	0.04	-0.97	-0.09
2014	-0.97	-0.01	-0.36	0.25	-0.33	0.02	-1.28	-0.12
2011-14	**-0.51**	**-0.01**	**-0.17**	**0.15**	**-0.13**	**0.04**	**-0.84**	**-0.08**

Figures are in percentage deviation from the baseline with positive sign indicating that the baselines worsen the sector more than the scenario.

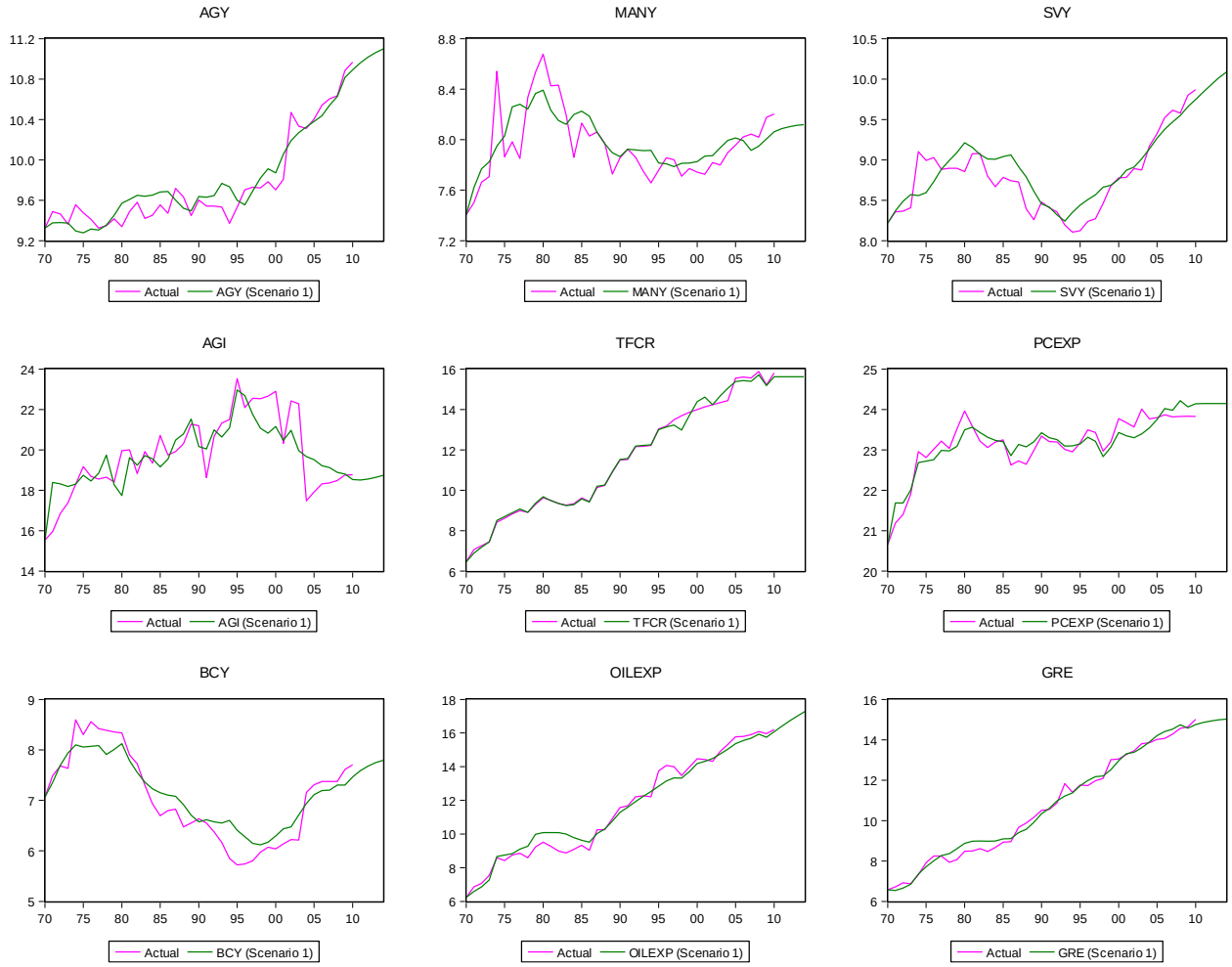


Figure 5. 4: The Ex ante forecast result of 5% decrease in oil resource abundance

CHAPTER SIX

SUMMARY, CONCLUSION AND LESSONS FOR POLICY

6.1: Summary and Conclusion

The disagreements among economists on whether growth and development are enhanced or hindered in economies that acquire large natural rents from the resources they own still attract the attention of net oil exporting countries. These disagreements have led to various studies on how such wealth can be translated to sustainable development. Theoretical framework that recognises how a booming sector can hamper growth through spending and movement effects has often times formed the basis for the empirical model of such studies. In Nigeria, like in most other oil exporting countries, the discovery of oil came with great opportunity and significant risk. It was perceived from the literature that the oil sector can create economic misfortune via retarding the investment and output growth potentials embedded in the non-oil sectors.

Against this backdrop, this study sought to empirically examine the issues that relate to the effects of ORA on sectoral performance in Nigeria. First, the study estimated the effects of ORA on investment in the activity sectors of the Nigerian economy. Second, the magnitude of the effects of ORA on the output of the activity sectors was also analysed. These issues constituted the main thrust of this thesis.

To tackle the aforementioned issues, annual aggregate data that spans 1970 to 2010 were used in the estimation of the model. The model was estimated using the simultaneous equation techniques; the 2-SLS and the 3-SLS. The evaluation of the model focused on three related issues; How well the endogenous variables tracked the historical data series; the model's forecasting potential; and the ability of the model to simulate turning points in the endogenous variables. The simulation statistics relevant to answering these questions were obtained and presented. Ex-ante forecast which allows researchers to peep into the future effects of the different time paths assigned to ORA was conducted.

A number of interesting and important results emerged. First, the results of the effects of ORA on the individual activity sectors are summarised. The results of the 2-SLS and 3-SLS show that ORA has negative but significant effect on the agricultural sector output and investment. It was found in this study that ORA has a positive but insignificant effect on the manufacturing sector output. The effect of ORA on the manufacturing sector investment was found to be positive and insignificant. In the case of the services sector, the analyses revealed that ORA has a negative and insignificant effect on the sector's output. The effect of ORA on the services sector investment was also insignificantly negative. For the building and construction sector, the result of the estimated function disclosed that ORA has a positive and significant effect on the output of the sector. The results for the building and construction sector investment function revealed that ORA has a positive but statistically insignificant effect on the building and construction sector investment.

The results relating to the evaluation of the model's performance presented in section 5.3 indicated that the model's dynamic performance is reasonably good. It was found from the results that virtually in every case, the simulated values tracked actual series very well. The variance proportion of the simulation error, captured in Table 5.21, shows that the ability of the model to replicate the degree of variability in the endogenous variables is reasonably high. The covariance proportion generated from the model which measured the remaining unsystematic forecasting errors also pointed to the better fit of the model. In addition, the result of the ex post forecast of 2009 to 2010 presented in Table 5.23 indicated that the model has a high predictive power as the forecasted values almost perfectly match the actuals.

Further, the results of the ex-ante forecast showed that comparing a scenario of 5% increase in ORA with the baseline, the agricultural sector and the services sector are better-off under the baseline economic activity arrangement. In case of building and construction and the manufacturing sectors, the results revealed that in terms of investment, the building and construction sector is worse-off under the scenario of 5% increase in ORA. It was also found that the baseline investment of the manufacturing sector outshines the investment of the sector under the setting of 5% increase in ORA. In

addition, the results disclose that output is enhanced in the building and construction and manufacturing sectors under the 5% increase in ORA than in the baseline arrangement.

Finally and on the other hand, the ex-ante forecast result that applies to the scenario of 5% decrease in ORA shows that on the average (2011-14), the agricultural investment and output proved to be better under this scenario than in the setting of the baseline. The result for the building and construction sector is mixed - the sector is improved by a 5% decrease in ORA via investment but worsened under the same setting with repect to output. In the case of the manufacturing sector, the four year forecast results show that a scenario of 5% shrinkage in ORA only improves the sector through investment, whereas the output of the sector proved to be better-off under the baseline situation. For the services sector, the results show that the sector's investment and output improved under the scenario of 5% decrease in ORA.

6.2: Policy lessons arising from the study

This study analysed the effects of ORA on sectoral performance in Nigeria. Several major findings emerged and lay the basis for policy lessons summarised in this section.

First, it was noted that ORA has negative effects on the agricultural and services sectors investment and output. This no doubt is a case of Dutch disease and to deal with it, it is important to consider policies that reduce the negative effects of the disease. One of such policies is to directly subsidise the exposed sectors by at least helping famers to stay in business or by providing the basic infrastructure that will enable the services sector to thrive. It was shown in a study by Herberg (1984) that Indonesia suffered a much less severe case of Dutch disease than did Nigeria in part because the Indonesian government subsidised the ailing agriculture sector. In effect, Indonesia consciously took steps to encourage agricultural growth. In fact, after the first oil shock in 1973, the government of Indonesia increased its fertiliser subsidy by 300% for a period of three years (Glassburner 1988). Due to this active encouragement of agriculture, an extreme case of Dutch disease was prevented. However, in Nigeria, Bienen (1988) indicates that much of the government's spending went towards the non-traded sectors, not towards agriculture. Partly as a result of this neglect, Nigeria suffered a severe case of Dutch disease. Therefore, it is evident that the government of Nigeria can at least mitigate the negative effects of ORA by actively subsidising the traditional export sectors.

Second, resource abundance, even when it persists for centuries, is ultimately transient. In this regard, the overriding concern is what will Nigeria do if its oil dries up in the absence of strong manufacturing or agricultural sector? What happens to Nigeria if America (the largest importer of Nigeria's oil) becomes a net exporter of oil? This indeed would mean little or no revenue from the oil sector. Given that at present the manufacturing sector's contribution to the Nigeria's GDP is less that 5%, Nigeria faces an uncertain future. Meanwhile, it is not too late to take remedial action on the insignificant and negative effects of ORA. A deep understanding of the inhibitions to a successful translation of the huge oil revenue into sustainable development is key to dealing with the poor effect of ORA on the activity sector of the Nigerian economy. The right policy mix which includes macroecomic stability, efficient management of oil revenue, economic diversification as

well as accumulation of human, institutional and social capital is what Nigeria needs in order to ensure that the Dutch disease effects of ORA is significantly stemmed if not totally stamped out. Indeed, policymakers must note that the key to Nigeria's future is in the non-oil export as it is the main nation's passport to attaining competitive economic advantage in today's international community.

Third, to better manage its oil revenue, Nigeria could learn from the experience of Botswana where diamond exports, instead of hurting the country's exports, boosted exports from manufacturing, mining and agricultural sectors. Botswana's experience is one where natural resource (diamond) has been combined with human ingenuity to create human capital and knowledge innovation, thereby contributing positively to the country's economic growth and development. With a good political will and a sincere commitment to development, Nigeria could replicate the Botswana's experience.

Finally, the poor nature of the relationship between the oil sector and the manufacturing sector as demonstrated in this study corroborates the popular position in the literature - that the oil sector is an enclave. Its backward and forward linkages with the other sectors is considered in the literature to be naturally low. What Nigeria needs at this moment is to move more towards the manufacturing sector that guarantees high productivity activities and benefits the economy more as it is a key source of innovation. This shift towards manufacturing does not just present opportunity for a diversifired economy that generates increased systemic linkages but also opens the shut doors to small and medium enterprises (SMEs) which guarantees widespread employment and sustained economic development. This policy agenda also possesses the long run potentials to reduce poverty as well as narrowing the persistent high level of inequality common in the Nigerian society, the chief source of Nigeria's importunate crime, terrorism, and conflict.

6.3: Limitations of the study and areas for future research

At this juncture, it is affirmed that the research findings reported in this study appear satisfactorily robust, and have appreciably achieved the study objectives laid out in chapter one. However, an attempt to build a "super-model" of a developing economy - one that captures all reality and leaves no room for further modifications is often

considered unrealistic. The truth is that this caveat has influenced this study. Economists acknowledge that, models reflect the builders' perceptions of the economy being modelled. Though it was recognised that the issue of the extent of sectoral disaggregation to be entertained in a model is largely informed by the purpose of the study, there are several aspects of the model equations that could be further disaggregated. For instance, the services sector could be further disaggregated into; communications, transportations, and utilities. These sectors can, in turn, be subdivided into smaller subsectors. This no doubt would have at least enabled us to see (if any) the effect of ORA on the phenomenal growth recorded in the communication's sector. Further, in the external sector, export can further be disaggregated by major trading partners instead of being based on commodity groups as it has been done in this study. Another plausible area to consider in the future in modelling of studies of this kind is the potential effect of ORA on employment, debt overhang and sectoral output prices.

Additionally, this study only focused on bringing solution to the sectoral macroeconomic imbalances presently rocking the Nigerian economy without any effort made to draw comparison on different measures of ORA and countries with similar resource type. A comparative study that would not just probe the estimation implications of the various ORA measures found in the literature but also compare countries with similar resource type should be explored in the future. Such a study should expect to find out if different ORA measure applies to different countries. For example, using the percentage of oil export to total export as a measure of ORA in a country that is oil resource rich but decides to export a little would yield a misleading result.

In order to assess behavioural responses to ORA indicators, the focus of future studies should be changed from a macroeconomic orientation towards a microeconomic orientation. More so, many current policies of the government are aimed at micro solutions. Thus, it seems challenging to model the driving forces behind the process of economic development by examining only macro issues.

The degree of reliability of the data available for research analysis in the developing countries is oftentimes in doubt. It is a generally acknowledged fact that in practical

econometric work, errors in data may sometimes be a more source of problem than the choice of estimation procedure (Denton and Kuipter,1965), and that even consistent estimators are sensitive to data and peculiarities of whatever particular structure being studied (Cragg,1967). Thus, it is logical to assert that the quality of model's simulation results is as good as the quality of data used in calibrating the model. In the course of sourcing data for this study, it was noticed that blank colums for several years are a common feature of most statistiacal publications, especially for the developing countries. In addition, the incomparability of data from different sources or even those from the same source but published at different priods, was a huge frustrating experience. Even as the author claims to have minimised the effect of these data inadequacies through the choice of better estimators, he remains humble to acknowledge that due to data limitations, in relation to the models of this study, the ambition in modelling and the use of econometrics were fairly moderate.

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APPENDICES

Appendix 1.

List of Estimated Equations

Results of the estimated equations are presented below. Figures in parenthesis are the t-statistics and the R squared statistics.

1. AGY = 6.1773-0.5508**ORA**+0.0208**RGDP** -0.0579**ATRFALL** + 0.0083**RLR** +0.0834**MS** +0.0002**REXR**

(5.03**)** **(**-2.29**)** **(**0.61**)** **(**-1.12**)** **(**1.79**)** **(**2.56**)** **(**0.69**)**

-0.0893**AGI** + 0.4832**AGY(-1)**

(-4.38**)** **(**3.84**)**

R^2=0.90

2. MANY = -4.3281+ 0.5810**ORA** + 0.0016**MS** -0.0144**RGDP** +0.0006**REXR** +0.0389**MANI** + 0.5345**UPOP**

(-1.68**)** **(**1.63**)** **(**0.03**)** **(**-0.24**)** **(**1.63**)** **(**1.59**)** **(**2.81**)**

-0.0046**RLR** + 0.6497**AGY** + 0.2957**MANY(-1)**

(-0.64**)** **(**2.95**)** **(**2.28**)**

R^2=0.57

3. SVY = 0.5908-0.3061**ORA** -0.06696**RGDP** + 0.0796**MS** -0.0001**REXR**-0.0431**SVI** -0.0079**RLR** + 0.4357**MANY**

(0.79**)** **(**-1.14**)** **(**-1.95**)** **(**3.61**)** **(**-0.20**)** **(**-3.62**)** **(**-1.37**)** **(**4.43**)**

+ 0.6685**SVY(-1)**

(9.54**)**

R^2=0.91

4. BCY = -12.4937 + 0.9816ORA -0.1133RGDP-0.2236MS -0.0007REXR +0.0897BCI -0.0135RLR

(-5.24) (1.20) (-1.65) (-3.41) (-1.40) (3.34) (-1.50)

+ 0.3297MANY + 1.4367AGY + 0.6647BCY(-1)

(1.90) (5.96) (10.45)

R^2=0.89

5. AGI = 18.84-5.5286**ORA** +0.0301**RGDP** -0.0545**RIR** + 0.3806**P** -0.0001**REXR** +0.6097**AGI(-1)**

(2.57**)** **(**-1.48**)** **(**0.10**)** **(**-1.95**)** **(**1.56**)** **(0.42)** **(4.28)**

-0.5852**IMCG**

(-1.32)

R^2=0.64

6. MANI = -32.0867 + 5.6436**ORA**-0.7745**RGDP** +0.0255**RIR**+0.0005**REXR** +1.9271**IMRMCG**-0.3306**P**

(-2.25**)** **(**2.18**)** **(**-3.02**)** **(**1.82**)** **(**0.24**)** **(**2.25**)** **(**-1.21**)**

+0.1812**MANI(-1)** + 1.4097**AGI** +0.2354**MANEXP**

(1.58**)** **(**6.29**)** **(**1.09**)**

R^2= 0.50

7. SVI = 7.1562 -0.8927**ORA** +0.6949**SVI(-1)** + 0.0037**RIR** -0.0020**REXR** -0.1570**P** -0.0754**RGDP**

(1.67**)** **(**0.26**)** **(**5.76**)** **(**0.16**)** **(**-0.79**)** **(**-0.59**)** **(**-0.22**)**

R^2=0.51

8. BCI = -0.6306+0.0647**ORA** -0.1006**BCI(-1)** + 1.0905**MANI** + 0.0012**REXR** + 0.0437**P** +0.0376**RGDP** - 0.0042**RIR**

(-0.56**)** **(**0.07**)** **(**-2.10**)** **(**20.59**)** **(**1.79**)** **(**0.64**)** **(**0.41**)** **(**-0.74**)**

R^2=0.94

9. PCEXP = 19.7429 + 0.0001**FINC** -0.0007**REXR** + 0.7570**PEXP**

(60.67**)** **(**1.42**)** **(**-2.26**)** **(**10.88**)**

R^2=0.80

10. MANEXP = 1.3793 +0.0000**FINC** -0.0010**REXR**+0.0050**PEXP**

(1.41**)** **(**-6.85**)** **(**-1.02**)** **(**1.9**9)**

R^2=0.61

11. OILEXP = 1.0952-0.0013**REXR** + 0.0047**ROILP** + 0.9437**OILEXP(-1)**

(3.00**)** **(**-2.78**)** **(**5.18**)** **(**38.76**)**

R^2=0.99

12. IMCG = 10.6687 + 0.0018**REXR** + 0.1362**IMCG(-1)** + 0.2413**FEXE**+0.1021**RGDP**

(4.99**)** **(**2.05**)** **(**0.96**)** **(**4.21**)** **(**0.98**)**

R^2=0.46

13. IMRMCG = 5.6548 -0.0017**RGDP** +0.0007**REXR** + 0.4204**IMRMCG(-1)** + 0.0988**FEXE** +0.2676**CAPUTL**

(3.98**)** **(**-0.03**)** **(**1.99**)** **(**3.58**)** **(**4.39**)** **(**1.68**)**

R^2=0.73

14. **MD** =0.2492+0.0000**GNP**+0.0001**NIR** +0.6977**MS(-1)** -0.0371**CPI** + 0.3249**GRE**

(0.45**)** **(**1.09**)** **(**0.02**)** **(**14.26**)** **(**-0.66**)** **(**4.22**)**

R^2= 0.99

15. **REXR** = 12.5605 + 0.0066**NEXR** -0.1050**OPEN** +0.0054**TOT** +0.5511**P**-0.4849**YG**-0.9468**GGDP**

(0.57**)** **(**4.32**)** **(**-3.84**)** **(**9.87**)** **(**4.26**)** **(**-0.78**)** **(**-3.42**)**

+0.1922**REXR(-1)**

R^2= 0.96

16. **TFCR** =1.6311 +0.1271**RGDP** +0.5468**OPEN** + 0.2567EPPT

(3.88**)** **(**1.31**)** **(**2.97**)** **(**3.08**)**

R^2=0.99

17. **GCE** = 1.4377+ 0.4461GCE(-1) +0.7484OPEN-0.4171RGDP -0.1082FGDEBT

(2.36) (3.27) (2.37) (3.23) (-0.71)

R^2=0.98

Appendix 2: Forecasting and Simulation Diagnostics

Root Mean Squared Error = $\sqrt{\sum_{t=T+1}^{T+h}(\widehat{y_t} - y_t)^2/h}$

Mean Absolute Error = $\sum_{t=T+1}^{T+h}|\widehat{y_t} - y_t|/h$

Mean Absolute Percentage Error = $100\sum_{t=T+1}^{T+h}\left|\frac{\widehat{y_t}-y_t}{y_t}\right|/h$

Theil Inequality Co-efficient

$$= \frac{\sqrt{\sum_{t=T+1}^{T+h}(\widehat{y_t}- y_t)^2/h}}{\sqrt{\sum_{t=T+1}^{T+h}\widehat{y_t^2}/h} + \sqrt{\sum_{t=T+1}^{T+h}y_t^2/h}}$$

Bias Proportion

$$= \frac{\left((\sum\widehat{y_t}/h)- \bar{y}\right)^2}{\sum(\widehat{y_t}- y_t)^2/h}$$

Variable Proportion

$$= \frac{\left(S_{\bar{y}}- S_y\right)^2}{\sum(\widehat{y_t}- y_t)^2/h}$$

Covariance Proportion

$$= \frac{2(1-r)S_{\widehat{y}}S_y}{\sum(\widehat{y_t}- y_t)^2/h}$$

Appendix 3: The Sectoral Percentage (%) Composition of RGDP in Nigeria from 1960 – 2010.

Sector/ Year	1960	1970	1980	1985	1990	1995	2000	2005	2010
Agriculture	64.27	44.74	20.61	32.70	31.52	34.19	35.83	41.19	41.84
Crude Oil	0.44	11.04	21.41	35.89	37.46	33.24	32.45	24.26	16.05
Manufacturing	4.58	7.53	11.05	5.99	5.50	4.92	4.24	3.79	4.19
Building/ Construction	4.45	5.24	9.69	1.65	1.63	1.86	1.95	1.52	1.93
Services	12.99	18.45	15.05	9.45	10.25	11.55	12.12	15.21	17.50
Total GDP	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

***Source*:** Computed by the Author from the CBN's Statistical Bulletin (2011).