PUBLIC EXPENDITURE AND POVERTY REDUCTION: EVIDENCE FROM NIGERIA

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ABSTRACT

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Key Words; Fiscal Policy, Public Expenditure, Economic Growth, Poverty Reduction, Augmented Solow Growth Model, Growth-Public Expenditure Model, Growth-Poverty Model, Policy Variable and Policy Simulation

Theoretical and empirical literature suggest that public expenditure plays very important role in economic growth, especially in the developing countries. Available statistics show that Nigeria's 5-year average annual real public expenditure/GDP ratio grew during the greater part of the study period 1981-2015, while the 5-year average annual real GDP growth and real GDP per capita growth rates are positive during the same study period, except for 1981-1985 and 1986-1990, respectively. The incidence of poverty, however, maintained upward movement, except for 2006-2010.

The foregoing interactions have been seldom, the focus of empirical studies in Nigeria. This study examines the effects of public expenditure on economic growth and poverty reduction in Nigeria from 1981-2015, using variants of two models and simulation exercise: augmented Solow growth model and growth-poverty model. Real public expenditure/GDP ratio is used as the policy variable and the simulation duration is for 5-years, 2016-2020. We use the autoregressive distributed lag (ARDL) bounds testing procedure by Pesaran *et al.* (2001) to estimate the two models, given that the annual data used for the models' estimations were integrated of order I(1) and I(0) and small sample size.

The results from the two models confirmed that public expenditure increases economic growth, though not significant, while economic growth does not reduce poverty. The same findings are confirmed through the simulation exercise. We, however, offer measures that would ensure growth and poverty reduction in Nigeria; public expenditure switch that encourages more investments in capital public expenditure, social sector public expenditure and private capital investment.

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DEDICATION

This thesis is dedicated to my late parents, Chief & Mrs. Eric Aninwetalu Obiechina (Ugonabo), my wife, Chika and three children: Adi, Eze and Ada. To Almighty GOD, who made all things beautiful in my life and family.

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CHAPTER ONE
Introduction

1.0 Background of the Study

Public expenditure plays very crucial role in the economic growth of any economy. Through public expenditure implementation, government could ensure resource allocation, regulation of financial markets, establishment of rules and regulations guiding the conduct of the society, provision of infrastructure and stabilisation of the economy [1]. Sustained economic growth engenders economic development and wellbeing of the citizenry – provision of goods and services, improved social services; health care services and education. On the other hand, lack of economic growth could lead to economic stagnation and inability of a nation to provide for the well-being of her people – results in increase in the level of poverty as well as distrust between government and her citizenry.

Poverty is one of the major challenges confronting governments, especially in the developing countries. Eradication of extreme poverty and hunger is the first, and perhaps the most significant goal of the Millennium Development Goals (MDGs) of the United Nations. Despite meeting the target of halving global extreme poverty rates by 2015, more than 1.2 billion people are still living on less than US$1.25/day, and many countries in the Sub-Saharan Africa (SSA) and South Asia (SA) are lagging in meeting the MDGS (United Nations Report, 2014). The SSA countries have, however, made progress in the area of poverty reduction. They appear to be the worst affected by the scourge, compared with the SA countries.

Examination of available statistics on the real GDP per capita income growth rate and real GDP growth rate shows that the SSA region performed below the SA region (Tables 1 and 2). The SSA after posting 5-year average annual growth rate in the real GDP per capita income of negative 2.8 and 1.9 per cent in 1981-1985 and 1991-1995,

[1] Provision of social goods (infrastructures for security, transport, water works, sanitation, energy, education and health) through public expenditure is generally believed to be a major way government affect economic growth and development.

increased to 2.8 per cent in 2001-2005. However, it declined to 1.5 per cent in 2011-2015, compared with the SA values of 2.8, 2.8, 4.3 and 4.9 per cent during the same period, respectively (Table 1).

Table 1: Average Annual Real GDP per Capita Income Growth Rate, 1981 – 2015

	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	2006-2010	2011-2015
World	0.8	1.9	0.6	2.0	1.8	1.4	1.6
East Asia and Pacific	3.2	4.0	2.8	2.2	3.3	4.1	3.8
Europe and Central Asia	1.2	2.6	0.1	2.8	2.1	1.0	1.1
Latin America and the Carribean	-1.2	0.2	1.4	1.4	1.3	2.5	1.1
Middle East and North Africa	-4.2	0.8	1.1	2.0	2.3	2.1	1.1
South Asia	2.8	3.4	2.8	3.6	4.3	5.0	4.9
Sub-Saharan Africa	-2.8	-0.1	-1.9	0.7	2.8	2.5	1.5

Source: Computed by the author from the World Bank Database. GDP Per Capita Income at Constant 2010 US dollars.

Similarly, the SSA experienced 5-year average annual real GDP growth rate of 0.1 per cent in 1981-1985. However, a decade later, it slightly inched to 0.8 per cent in 1991-1995. Further, it jumped to 5.5 per cent in 2001-2005, before declining to 4.2 per cent in 2011-2015. This is low, compared with the SA 5-year average annual real GDP growth rate, during the same period. For example, it is 5.3 per cent in 1981-1985, slightly declined to 5.0 per cent in 1991-1995, before increasing to 6.1 and 6.2 per cent in 2001-2005 and 2011-2015, respectively (Table 2).

Table 2: Average Annual Real Gross Domestic Product Growth Rate, 1981 – 2015

	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	2006-2010	2011-2015
World	2.6	3.7	2.2	3.5	3.1	2.6	2.8
East Asia and Pacific	4.8	5.6	4.1	3.3	4.2	4.8	4.5
Europe and Central Asia	1.8	3.1	0.4	2.9	2.4	1.4	1.5
Latin America and the Carribean	1.0	2.1	3.2	3.0	2.7	3.7	2.2
Middle East and North Africa	-1.0	4.0	3.5	4.0	4.3	4.3	3.1
South Asia	5.3	5.7	5.0	5.7	6.1	6.6	6.2
Sub-Saharan Africa	0.1	2.8	0.8	3.4	5.5	5.3	4.2

Source: Computed by the author from the World Bank Database. Real GDP Growth Rate at Constant 2010 US dollars.

The real GDP per capita income and real GDP growth rates of the SSA region, however, may hide the differences in the economic growth rates of countries within the region. Table 3 shows for the period 1981-2015, Nigeria witnessed positive average annual real GDP growth rate and real GDP per capita growth rate for greater part of 1981-2015, except for the periods, 1981-1985 and 1986-1990, respectively. The periods correspond with the declines in the level of economic activities in Nigeria, following the slump in the international crude oil price from about US$41.0 in 1981 to around US$11.0 per barrel in July 1986, government austerity measures in 1982, as well as the Structural Adjustment Programme (SAP) in 1986.

Also, its 5-year average annual real public expenditure/GDP ratio increased throughout the period, 1981-2015, except for 2001-2005, 2006-2010 and 2011-2015. It is 6.8, 9.5, 10.9 and 11.6 per cent in 1981-1985, 1986-1990, 1991-1995 and 1996-2000, respectively. Thereafter, it declined to 9.4, 7.6 and 6.2 per cent for 2001-2005, 2006-2010 and 2011-2015, respectively (Table 3).

Table 3: Average Annual Real Gross Domestic Product Growth Rate, Real GDP per Capita Growth Rate, Real Public Expenditure/GDP Ratio and Incidence of Poverty, 1981-2015

	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	2006-2010	2011-2015
Average Annual Real GDP Growth (%)	-2.6	1.5	0.5	3.3	11.2	7.2	4.7
Average Annual Real GDP Per Capita Growth(%)	-5.1	-1.2	2.0	0.7	8.4	4.4	2.0
Average Annual Real Total Public Expenditure/GDP (%)	6.8	9.5	10.9	11.6	9.4	7.6	6.2
Average Annual Incidence of Poverty (%)	39.2	45.0	50.0	69.3	70.9	57	71.9

Source: Computed by the author from the World Bank Database and CBN Statistical Bulletin, 2016 and National Bureau of Statistics (NBS) Reports.

Nigeria's incidence of poverty, however, soared and cuts across both the rural and urban communities in the early 1980s. The National Bureau of Statistics (NBS, 2012, p. 12) notes that the proportion of Nigerian population living below the poverty line increased significantly from 1980 to 2004. Nigeria became one of the poorest countries in the world; ranking among the highest in global poverty rankings; with

over 70.0 per cent of its population said to be living below the poverty line (USAID, 2011) and 72.0 per cent in 2012 (CBN, 2012). The 5-year average annual incidence of poverty maintained an upward movement throughout the period, 1981-2015, except for 2006-2010 (Table 3).

The interaction of public expenditure, economic growth and poverty reduction has continued to receive attention in economics literature. Studies have shown that public expenditure could have different impacts on the economic growth[2]. Some studies indicate negative relationship between public expenditure and economic growth, whereas others do not. Those that argue in favour of negative relationship are of the opinion that public expenditure crowds-out the private sector and impairs economic growth (Landau, 1983; Grier and Tullock, 1987; Diamond, 1989; and Devarajan *et al*, 1996). On the contrary, Lindauer and Velenchik (1992), Kelly (1997) and Erkin (1998) show the importance of public expenditure in improving economic growth. In addition, some studies find that increases in the economic growth reduces poverty (Roemer and Gugerty 1997; Dollar and Kraay, 2002), while some note, it does not. This is especially among the developing countries (Aigbokhan, 2000; Rodrick, 2000; and World Bank, 2013).

Though, public expenditure has been identified as important for achieving economic growth and by implication, poverty reduction. Nigeria has witnessed increases in her real public expenditure/GDP ratio during the study period, 1981-2015. Also, it has experienced periods of negative, slow, and high economic growth rates. In fact, she has achieved positive average annual real GDP growth rate and real GDP per capita for greater part of the study period. Yet, she experiences increases in her average annual incidence of poverty, except for the 2006-2010 (Table 3).

[2]Contributions of public expenditure to economic growth could be classified as productive or non-productive/growth enhancing or non-growth enhancing (Barro and Sala-i-Martin, 1992), and the composition of government outlays may be more relevant than the level (Kneller *et al.* 1999, p. 173 and Nijkamp and Poot, 2004, p. 107).

Therefore, Nigeria provides an interesting case study on the role of public expenditure on economic growth and poverty reduction. Studies using Nigeria data have shown varying impacts of public expenditure and/or decomposed public expenditure on economic growth[3]. Thus far, there are issues that have not been sufficiently addressed in the literature, the effects of public expenditure impact on economic growth and poverty reduction in Nigeria. Understanding the interactions of public expenditure, economic growth and poverty reduction would help policymakers achieve policy objectives and extend the frontiers of knowledge. In this regard, the study sets out to examine the effects of public expenditure on economic growth and poverty reduction in Nigeria from 1981-2015.

1.1 Statement of the Research Problem

Nigeria's quest for national development dates back pre-independence era. It commenced in 1946, when the then British colonial administration introduced the Ten-Year Plan of Development and Welfare for the country (1945-1956), following a circular from the Secretary of State for Colonies to all British colonies, directing the setting up of a Central Development Board (Onah, 2010). Since her independence in 1960, Nigeria has maintained increasing public sector presence; implemented various development plans, directed at achieving economic growth and development.

Table 3 shows post-1980 Nigeria's 5-year average annual real GDP growth rate and average annual real GDP per capita growth rate have been positive for the greater part of the period, 1981-2015. The average annual real total public expenditure/GDP ratio maintained an upward movement throughout the period, except for 2001-2005, 2006-2010 and 2011-2015. The country, however, witnessed rising 5-year average annual incidence of poverty throughout the post-1980 period till 2015, except for 2006-2010. For example, the proportion of Nigerian population living below the poverty line increased significantly from 1980 to 2004 (NBS, 2012, p. 12). In addition,

[3] (Ekpo,1995; Fajingbesi and Odusola, 1999; Akpan, 2005; Nurudeen and Usman, 2010).

unemployment rate continued to soar, re-echoing the phrase, 'Poverty in the Midst of Plenty'.

The foregoing conditions have raised some questions about the outcome of interaction of public expenditure, economic growth and poverty reduction in Nigeria. Does public expenditure increase economic growth, does economic growth reduce poverty and how does increase in the public expenditure affects economic growth and poverty reduction in Nigeria? Pioneering studies on the public expenditure, economic growth and poverty reduction relationship in Nigeria have focused mainly on how public expenditure complements private investment to generate economic growth, and or the different types of public expenditure impacts on economic growth (Ekpo, 1995; 1999; Ogiogio, 1995 and Fajingbesi & Odusola, 1999), using different methodologies. There is, however, need for research on the impact of public expenditure on economic growth and poverty reduction in Nigeria from 1981-2015.

1.2 Research Questions

The issues raised above have provoked series of questions, which the study attempts to provide answers.

(a) What is the effect of public expenditure on economic growth in Nigeria?
(b) What are the effects of different components of public expenditure on economic growth in Nigeria?
(c) What is the effect of economic growth on poverty reduction in Nigeria?
(d) What are the effects of public expenditure shocks on economic growth and poverty reduction in Nigeria?

1.3 Aim and Objectives of the Study

The aim of the study is to investigate the impact of public expenditure on economic growth and poverty reduction in Nigeria during the period, 1981 - 2015. To achieve this aim, we shall focus on the following objectives:

(a) Determine the effect of public expenditure on economic growth in Nigeria;

(b) Determine the effects of different components of public expenditure on economic growth in Nigeria;

(c) Determine the effect of economic growth on poverty reduction in Nigeria; and

(d) Determine the effects of public expenditure shocks on economic growth and poverty reduction in Nigeria.

1.4 Research Hypotheses of the Study

(i) Null Hypothesis: public expenditure does not affect economic growth in Nigeria, while the Alternative Hypothesis; public expenditure does affect economic growth in Nigeria.

(ii) Null Hypothesis: different components of public expenditure do not affect economic growth in Nigeria, while the Alternative Hypothesis; different components of public expenditure do affect economic growth in Nigeria.

(iii) Null Hypothesis: economic growth does not affect poverty reduction in Nigeria, while the Alternative Hypothesis; economic growth does affect poverty reduction in Nigeria.

1.5 Scope of the Study

The scope of the study is 1981-2015. The reason for the choice of the period is to capture the era within which the impact of poverty could be tracked based on available time series data from the NBS. Also, post-independence 1980s witnessed the first major slide in Nigeria's human developments indicators. In that decade, the country experienced serious economic hardship, following the crash of the international crude oil prices that affected its oil receipts, and the subsequent introduction of austerity measures by the government in 1982 and structural adjustment programme of 1986.

1.6 Significance of the Study

Nigeria has experienced both positive growths in her average annual real GDP per capita and average annual real GDP. Its average annual real total public

expenditure/GDP ratio has made remarkable improvement since 1980s (Table 3). It has, also, implemented several development plans, rolling-plans, poverty reduction strategy framework through the National Economic Empowerment and Development Strategy (NEEDS) from 2003 - 2007, as well as the Vision 20:2020[4]. Nonetheless, Nigeria's standard of living and poverty levels are worsening. Iheanacho (2014, p. 50) notes "the widespread level of poverty, dilapidated infrastructural facilities, massive unemployment, low capacity utilization, technological backwardness, short-life expectancy, urban congestion, excessive debt burden, environmental degradation and high incidence of diseases that besets the country".

The foregoing situation has posed serious challenges to policymakers and academia in Nigeria, given the increasing level of poverty amid positive average annual real GDP growth rate, real GDP per capita growth rate and increase in the average annual real public expenditure/GDP ratio for greater part of the study. It is expected that increases in public expenditure would lead to increase in economic growth, especially in the developing countries, which in turn, leads to poverty reduction. On the contrary, the Nigeria situation seemed to be a paradox, in that, public expenditure has increased, the economy has experienced positive growth for greater part of the study period, yet the incidence of poverty is on the increase.

It is, therefore, important to understand the trend and interaction of public expenditure, economic growth and poverty reduction in Nigeria. This is necessary for the formulation and implementation of effective public expenditure management policy in Nigeria that would facilitate growth and poverty reduction. The study is an empirical investigation aimed at explaining the impacts of public expenditure on economic growth and poverty reduction in Nigeria. Apart from the policy inferences - insights and informed guidance to policy makers, our understanding of the roles played by public expenditure, economic growth and poverty reduction would broaden our knowledge of public expenditure management vis-à-vis economic growth and

[4] The NEEDS is a medium-term planning, that centered on four pillars: wealth creation; employment generation; poverty reduction; and value orientation.

poverty dynamics in Nigeria. Furthermore, it will motivate researches into the role played by public expenditure, economic growth and poverty reduction nexus in Nigeria as well as build human capacity.

1.7 Methodology

Researches' are conducted for various reasons. They are conducted to generate different kinds of outcome; revalidation of existing knowledge, generation of new knowledge, adaptation of existing knowledge in new domains and the revision/improvement of existing knowledge based on newly revealed facts (Eboh, 2009, p.1).

The present research is an economic research aimed at investigating the impact of public expenditure on economic growth and poverty reduction in Nigeria. It is conducted, using the quantitative method. Quantitative method involves the systematic empirical investigation of observable phenomena through statistical, mathematical, or computational techniques (Given, 2008). The systematic investigation is built around theory that provides the functional relationship existing among the observable phenomenon. Consequently, theory and fact are the building-block of any meaningful research study. Eboh (2009, p. 2) points out that "theory plays an active role in uncovering facts, facts themselves equally play significant role in developing theory and science depends really upon stimulation of fact by theory and theory by fact".

In this regard, the theoretical framework of the research is that increase in public expenditure has positive impact on economic growth, especially in the developing countries and by implication on poverty reduction. The study adopts two regression models; growth-public expenditure, a variant of an augmented Solow model by Mankiw, Romer and Weil (1992), with public expenditure as one of its explanatory variables and growth-poverty model by Ravallion and Chen (1997), Agrawal (2008), Anyanwu (2013) and Agrawal (2015) with real GDP per capita (proxy for economic growth) as one of its explanatory variables.

The estimation results from the two regression models would be used for policy simulation exercise. Outcomes from the exercise will be analysed and policy implications and conclusion drawn. The estimation of the two multiple regression models shall be carried out with the help of EViews Version 9.5. The choice of EViews 9.5 as against the more recent versions, like EViews 10 and 11 during the study period is influenced by the cost of securing those latest versions. More so, where the outcome of the estimation result from the use of EViews 9.5 couldn't have been much different from those generated with the latest versions.

1.8 Structure of the Study

The study is divided into six chapters. Following the introductory chapter, which includes background to the study, statement of the problem, research questions, aim and objectives of the study, research hypotheses, scope of the study etc. is the chapter two. Chapter two is the literature review - it focuses on measurement and theory of public expenditure, economic growth and theoretical approaches to government intervention, economic growth and poverty, inference drawn from theoretical and empirical literature and conclusion. Chapter three is public expenditure, economic growth and poverty in Nigeria – stylized facts. Chapter four discusses the research methodology - theoretical framework and estimation method for the two regression models: growth-public expenditure and growth-poverty as well as the policy simulation exercise. Chapter five presents the model estimation result and analysis of both the growth-public expenditure and growth-poverty. In addition, it presents the model appraisal and policy simulation analyses. Finally, chapter six is the conclusion and policy recommendations – research major findings, problems and limitation of the study, policy implications and areas for further research.

1.9 Conclusion

Nigeria economy has over the years witnessed increases in her level of economic activities: real public expenditure, positive real GDP growth and growth in real GDP per capita. However, the levels of poverty have been on the increase, and the standard of living on the downward trend, during the study period. This has raised some

questions, about the ability of public expenditure to facilitate economic growth and reduce poverty, hence the need for the study. The study investigates the impact of public expenditure on economic growth and poverty reduction in Nigeria during the period, 1981-2015, using two regression models. The outcomes of the models' estimations will be used for policy simulation exercise.

The study, however, is expected to produce a Doctor of Philosophy dissertation that would provide an insight into how public expenditure impacts on economic growth and poverty reduction in Nigeria during the study period. Also, it will assist policymakers to design public expenditure management measures that would influence the level of economic growth, to achieve developmental changes; poverty reduction as well as extend the frontiers of knowledge on public expenditure, economic growth and poverty reduction relationship.

CHAPTER TWO
Literature Review

2.0 Introduction

This chapter focuses on the theoretical and empirical literature on public expenditure, economic growth and poverty. It provides the platform for explaining and predicting how public expenditure elicits economic growth and reduces poverty[5]. Theoretical and empirical models of neoclassical and endogenous growth dominate the growth literature. The models help in predicting the determinants of growth and reasons why economic growth could be prominent in one country compared with the other. The chapter is divided into seven sections. Section 2.1 considers measurement and theory of public expenditure. Section 2.2 is economic growth. Sections 2.3 and 2.4 are economic growth and fiscal policy, and empirical evidence on public expenditure and economic growth. Section 2.5 is economic growth and poverty, while sections 2.6 and 2.7 are inference drawn from theoretical and empirical literature and conclusion.

2.1 Measurement and Theories of Public Expenditure

Public expenditure relates to state activities. State in this context refers to a sovereign, which may take different forms. For example, Nigeria is a sovereign state, with three-tiers of government, namely, federal/central, state and local. Each of these tiers of government runs expenditure, that is, appropriated in its annual budget. Brennan (1998) notes that the emergent of public expenditure, provides the basis for defining a comprehensive theory of the state around the notion of 'market failure' in public finance economics. He asserts that for public economics, it was a significant development because, until then, analysis was focused on the tax side of the budget[6].

Adubi and Obioma (1999) conceived public expenditure as the expenses, which the public sector incurs for its maintenance, benefit of the economy, external bodies and

[5] The knowledge of theory underpinning the economic phenomenon under study helps us to build economic models that attempt to mimic the true-life situation.

[6] Other activities of the state may include; production, redistribution, consumption, provision of rules and regulations and security of life and property, and each of these activities may have different influences on the economy.

other countries[7]. It reflects the cost of policy choices of governments in respect of the quantity of goods and services provided to both the public and private sectors of the economy. Rice (1983) observes that almost every government action result in expenditure changes and costs in both the public and private sectors of the economy. He identified two distinct costs that are involved in the public expenditure definition; costs of providing goods and services through the public expenditures, representing the amount that appears in the public sector accounts and costs incurred by the private sector expenditure as a result of rules, regulations and laws introduced by government.

Public expenditure could be classified according to several ways (World Bank, 1988). In terms of government budgeting, public expenditure can be classified into two, namely, recurrent and capital. The recurrent expenditures of government involve all consumption items, salaries and wages, while the capital expenditures consist of expenses that contribute to the long-term development, such as spending on social and economic infrastructure. In Nigeria, public expenditure is classified both according to economic and functional classifications. Under the economic classification, there is the recurrent and capital, whereas the functional classification is General Administration; defense, internal security, national assembly, Social and Community Services; education, health and other Social and Community Services, Economic Services; agriculture, construction, transportation and communication and other economic services and Transfers; public debt servicing, pensions and gratuities, contingencies/subventions (CBN, 1996).

Public expenditure performs several roles in the economy. Musgrave and Musgrave (1989) identified three traditional roles of public expenditure, namely; allocation, stabilization and distribution. First, allocation function is undertaking to balance the provision of private and public goods in appropriate mix, given the available resources – this underscores the relevance of government in the provision of social

[7] Public expenditure is sometimes used interchangeably with public sector. Public sector is that portion of the national economy in which economic and non-economic activities are under the control and general direction of government.

goods. Second, the stabilisation role is concerned with the attainment of balance of payment equilibrium, full employment of labour and price stability, growth in per capita income. Third is the distribution function, which centers around income distribution and attempts at narrowing the gap between the rich and poor, thereby, ensuring fair and just state.

2.1.1 Measurement of Public Expenditure

There is, however, near absence of a consensus among scholars on what constitutes an acceptable theory for explaining public expenditure size or its growth (Musgrave, 1969; Mundle and Rao, 1997). Heald (1983) notes the considerable uncertainties about what comprised public expenditure, attributing it to a rather an amorphous concept. Similarly, Likierman (1988, p. 7 - 8) observes that "the process of revising the definition of public expenditure goes on all the time, citing, Public Expenditure White Paper (1986: 403) "The scope and definition of public expenditure may be altered from one White Paper to the next…This behaviour of the public expenditure definition can be seen in many countries. Of course, it is not difficult to see that "changes of this kind can make it difficult for anyone trying to analyse trends over time".

These differences could be as a result of data classification, time frame of the study and conceptual framework adopted by scholars that suites their research[8]. Larkey *et al.* (1984) explains that the phenomenon of public expenditure growth theoretically depends on what measures, what countries and what time periods are selected for explanation. In the same line, Cullis and Jones (1987) posits no 'scientific' or 'neutral' measure of public sector size that can be adduced, pointing out that the size of the public sector was largely, a matter of choice. For example, the UK Central Statistical Office (CSO) offers at least ten measures of the size of public expenditure (Griffiths and Wall, 1991).

[8] Peacock and Wiseman (1979, p.18) noted that "it is possible to classify the data in so many different ways - the organisation of data itself presupposes some kind of hypothesis".

Measuring the size of public expenditure could include transfers or not? Beck (1976) notes that the inclusion of transfers would exaggerate governments' use of resources, while the omission could be deceptive, given that government transfers to households require diversion of taxpayers' income to government for the financing of transfer programs. On the other hand, Lewis-Beck and Rice (1985) suggests the redistribution of income shows the influence of government, and therefore, the need for the inclusion of transfers in the measure of public expenditure. Aligning to the inclusion of transfers in the measurement of public expenditure, Buchanan and Flowers (1987, p. 63) note:

> "This [transfer] is as much a real cost as direct outlay for tanks, planes, and paper clips. When estimating the real cost of government, the distinction between productive and transfer expenditures is not useful". According to them, "taxation imposed on some members of the community is a real cost of securing the benefits arising from the direct subsidising of other members even through explicit money transfers".

Also, the measurement of public sector could involve expressing it as a ratio of the national product (that is, its relative size to the national output) or its absolute term. Musgrave (1978, p. 17) noted that "it seems reasonable ... to measure growth of the public sector not in absolute terms (even if measured by real per capita expenditures), but as a share in total income..." However, Henrekson (1992) observes the absolute growth measure was methodologically more attractive for several reasons, namely; (i) that the ratio of public expenditure to GDP (GNP) is inconsistent, in that, it can exceed unity due to the existence of taxable transfers, (ii) that public expenditure can grow in relative terms either because of public expenditure has accelerated relative to the growth of GDP (GNP) or because there has been a decline in the rate of growth of GDP (GNP).

In addition, scholars differ as to whether the national product, that is, used as the denominator be expressed at its market prices or factor cost. Brown and Jackson (1990, p. 160) posit with market prices, "the factor cost measure of GDP (or GNP) will be biased and measures of the relative size of the public sector will be subject to

error … the answer is that the relative size of the public sector is an arbitrary measure. No single measure is the true one, but one measure can be more useful than another for purposes. Political arguments that rest upon the value of these ratios must likewise be arbitrary".

Another consideration in the measurement of public expenditure size is whether, it should be expressed in its nominal or real value. Where expressed in its nominal value, it is possible that prices of public expenditure will be increasing without increase in the quantity of goods and services provided. Ruggles and Ruggles (1970, p. 68) posit that "[a] time series of the major economic constructs relating to output will ... reflect both changes in prices and changes in quantity". Computing the nominal level of public expenditure as a ratio of GDP or GNP may seem to have accommodated the challenge of adjusting for changes in price level. This may be true, where the prices of publicly and privately produced goods have risen at the same rate. Beck (1981, p. 96) noted that, "if the price (unit cost) of government services rises at the same rate as the general price level, there is no divergence between the two measures of public sector size".

In the use of nominal value, the effect of price changes (Inflation) in the estimation of public expenditure size could be accommodated with the price index, such as the Consumer Price Index (CPI) and the GNP deflator or GDP deflator used as the denominator. Fan *et al.* (2004) in their study of 'Public Expenditure, Growth and Poverty Reduction in Rural Uganda' used the GDP deflator as the denominator to deflate public expenditure. On the other hand, Abizadeh and Yousefi (1988) in their investigation of the causes of public expenditure growth in Canada, conclude that the use of real or current/nominal values does not significantly alter the result. Also, it was suggested that the main reason proffered by those in support of the use of real values rather than nominal values was that the rate of inflation in the public sector were generally higher than the general price level in the economy (Abizadeh and Basilevsky, 1990).

2.1.2 Theories of Public Expenditure

Diamond and Tait (1988) notes historically, some of the most prominent theoretical constructs of the public expenditure-growth models are discussed within the framework of Wagner's law and Peacock and Wiseman theory.

2.1.2.1 Wagner's Law

Adolf Wagner's postulation is the law of increasing state spending, indicating that public expenditure rises as the economy grows. The law shows the presence of high growth of the public investment/total investment ratio in the economy at the early stages of economic growth and development. Thus, as the per capita income in an economy grows, the relative size of the public sector also grows. Bird (1971, p. 1) observes that Wagner's empirical findings "formulated a law' of expanding state expenditures, point to the growing importance of government activity and expenditure as an inevitable feature of a 'progressive state".

Musgrave and Musgrave (1989) provided three reasons why the increased state expenditure is needed: socio-political, economic and historical. In the socio-political sphere, they pointed out that the state social functions expand over time, insurance, retirement benefits, natural disaster aid (internal or external) and environmental protection programme, while the economic reasons are the increased activities of government in the advancement of science and technology. Finally, government resort to borrowing or loans in order to execute some of its functions, thus, piling up public debt, while interest on debt grows.

Scholars have used different versions of the Wagner's Law in their studies (Mann, 1980; Afxentiou, 1986; and Afxentiou and Serletis, 1991). These different versions indicate the empirical relationship between 'the growth of state activity' and 'economic progress' (Table 4). Afxentiou (1986), however, notes the absence of objective criteria for ascertaining, which of these different versions is the most appropriate and convincing test of the law. Below is a box indicating the different versions of the Law;

Table 4: Summary of the Versions of Wagner's Law

(i) Peacock and Wiseman Version

Public expenditure increases at a faster rate than output

Thus, E= f(GNP), where E = Total Government Expenditure and GNP = Gross National Product

They argued that the elasticity of E with respect to GNP is greater than unity

(ii) Pryor's Version

In growing economies, the share of public consumption expenditure in natonal income increases

Thus, C = f(GNP), where C = Total public consumption expenditure, and GNP is the Gross Domestic Product

This implies that the elasticity of C with respect to GNP shall be greater than unity

(iii) Goffman's Version

He noted that "...as a nation experiences economic development and growth, an increase must occure in the activities of the public sector and that the ratio of increase, when converted into expenditure terms, would exceed the rate of increase in output per capta" (Goffman, 1968, p. 359)

Thus, E = f(GNP/P), where E = level of government expenditure, GNP/P is the per capita gross national product and P is the population

This implies that the elasticity of E with respect to GNP/P shall be greater than unity

(iv) Musgrave's Version

He noted that the law "must be interpreted as postulating a rising share of the public sector ... or ratio of public expenditure to GNP...(in the contex of) ... development of a country from low to high capita income ... " (Musgrave, 1969, p. 74)

Thus, E/GNP = f(GNP/P), where E/GNP is the ratio of public expenditure to GDP and GNP/P is the per capita gross domestic product and P is the population

This shows that the elasticity of public expenditure to GNP with respect to GNP per capita must be greater than unity

(v) Gupta and Michas Version

They enquired whether or not the elasticity of public spending per capita with respect to GNP per capita is greater than unity

Thus, F/P = (GNP/P)

(vi) Modified Peacock and Wiseman Share Version (Mann, 1980)

This converts the traditional Peacock and Wiseman version into the 'share version' of Musgrave version

Thus, we have E/GNP = f(GNP), it requires the ratio of income elasticity to GNP to be greater than zero

Source: Adopted from Demirbas, S. (1998).

The central theme of the Wagner's law has been tested with remarkable differences in research outcomes. Peacock and Wiseman (1961) queried whether Wagner's ideas could always be applied to all societies. They suggested the time pattern of actual public expenditure growth did not fit well with Wagner's law. They assert that Wagner's argument "… adopts an organic theory of the state. It is difficult to believe that this theory is superior to other explanations of the character of the state "(Peacock and Wiseman, 1961, p. xxiii). However, Ram (1986) used both time series and cross-section evidence for 115 countries, individual country time-series data, and the result

shows some support for the Wagner's law, while most of the inter-country cross-section results showed mixed results.

There may be no doubts that the magnitude of public expenditure has been increasing over time in almost all the countries of the world - by ensuring resource allocation, regulation of financial markets, establishment of rules and regulations guiding the conduct of the society, provision of infrastructure and stabilisation of the economy. This implies that as these roles played by public expenditure grows as the economy continues to grow - Wagner' hypothesis. However, it is possible that the economy grows as a result of the increasing impact of public expenditure – Keynes's law.

Therefore, we could acknowledge the growing impact of the public expenditure as induced by the economy. That is, public expenditure as a consequence of the national output, and the need that public expenditure could be the cause of growth of national output[9]. In Nigeria, the 5-year average annual real public expenditure/GDP ratio has been on the increase (Table 3), owing to the huge receipts from crude oil production and sales, and the increased demand for public goods by the citizenry.

Aigbokhan (1996) in his study notes a bi-directional causality between government total expenditure and national income. Also, Dogo *et al* (2013) found support for the Wagner's hypothesis in Nigeria, using the Goffman's version of the law. It provided empirical evidence to support the existence of a long-run equilibrium relationship between economic activity and government expenditure in Nigeria. Aligning with Aigbokhan (1996), Udo and Effiong (2014) note a bidirectional relationship between government spending and economic growth in Nigeria. Also, the analysis showed that public expenditure in the Nigerian economy has direct effect on economic growth. However, in Ghana, Gatsi *et al.* (2019) find that public expenditure and economic

[9] Udo and Effiong (2014, p. 41) notes that "Theoretically, there are two competing school of thought defining this causal relationship. First, Wagner (1883) postulated that public expenditure is an endogenous variable and that there exist long run tendencies for public expenditure to grow relatively to some national income aggregates such as the gross domestic product (GDP)". Keynes (1936) postulated that public expenditure is an exogenous variable and can be applied to catapult an economy – used in enhancing aggregate demand during the great depression of the 1930. To this end, public expenditure is a cause and not the consequence of national output, which is in contradistinction with Wagner's law.

growth are cointegrated, and there is no Granger causality from real economic growth to real government expenditure. The causality test shows Wagner's hypothesis does not hold, and that the Keynesian theoretical standpoint that public expenditure is an exogenous factor is maintained.

2.1.2.2 Peacock and Wiseman Hypothesis

Peacock and Wiseman conducted research to explain the growth of public expenditure in the United Kingdom between the periods of 1890-1955. Their narrative was that government expenditure in the United Kingdom did not follow a smooth trend but appeared to jump upwards at discrete intervals. They associated these jumps with major social events, signaling out the World War II. They argued that broader social expenditures displaced military expenditure, once hostilities had ended, and that government expenditure depends broadly on revenue (Peacock and Wiseman, 1961). As observed by Rowley and Tollison (1994), Peacock and Wiseman probed the Wagner's Law and introduced their displacement effect hypothesis to explain the time path of the growth of public expenditure in democratic countries.

The interpretation of the Peacock and Wiseman thesis indicates public expenditure grew over period, not at a constant rate, but roughly in a stepwise style. Bird (1972) points out that the movement from one 'step' or 'plateau' to another coincided with the two world wars. In addition, Brown and Jackson (1990, p. 123) notes that "Peacock and Wiseman's study (1961) is probably one of the best-known analyses of the time pattern of public expenditure". Underlying the hypothesis is the notion of tolerable taxation levels. The duo explained that a shift in this proportion could be caused by the following:

(a) Displacement Effect

This shows as government introduces further tax policy, owing to national emergency, for example, war, taxpayers become more accepting of the new tax increases. However, post exposure to the new tax policy herald's maximum tolerable taxation level as taxpayers become increasingly familiar with the new

arrangements. Thereafter, government shall be able to maintain expenditure at historically high levels, even where the period of emergency or crisis had passed.

Thomson (1979) notes the displacement effect was generalised to include any major social upheaval like the Great Depression of the 1930s and could be applied to analyses of other countries' experience. The displacement effect has been extended to include non-global social upheavals as illustrated (Singh and Sahni, 1984). Nagarajan (1979, p. 100 and 102) asserts:

> "...empirical studies investigating the 'displacements' in government spending resulting from the 'social disturbances' of a 'non-global' nature are virtually negligible. The only difference between World War (major social upheaval) and a 'bilateral' war ('non global social upheaval) is that the number of countries concerned is smaller - but the impact on a country immediately concerned may be even larger compared with a country which, during the World Wars, was not really concerned with the war activities on its own territory … claims that" if the 'displacement effect' is linked solely with responses to social disturbances caused by world wars, then this hypothesis would obviously fail to explain the shifts in government spending in many countries in the 1960's and 1970's. It is quite conceivable that a non-global' upheaval is likely to have a greater impact, in terms of the magnitude of social disturbances at the national level in many developing countries".

2.2 Economic Growth

Economic growth is very important for the development of any country. Countries strive to achieve economic growth. The early economic growth theory was influenced by the pioneering works of the classical economists - emphasis was on trade within and among nations, and the need for nations to embark on trade and specialise in areas, they seemed to have comparative advantages over others. The works of Mercantilism, Adam Smith etc. are at the forefront. Another school of thought that impacted on economic growth is the Keynesian theory, which flourished as a result of the great depression of 1930s that shocked several countries. Later are the neo-classical and endogenous growth theory and models.

Economic growth theories and models provide platform for explaining and predicting how economies grow or not[10]. Theoretical models of neoclassical and endogenous growth dominate the growth literature. The models help in predicting growths and reasons why economic growth could be prominent in one country compared with the other. The section is divided into two major subsections. Subsection 2.2.1 considers classical and neoclassical growth models. Under this subsection, we discussed Harrod-Domar growth model, Solow growth model and augmented Solow growth model. In subsection 2.2.2 is the endogenous growth model

2.2.1 Classical/Neoclassical Growth Model

Adam Smith was one of the foremost classical economists. His classical work 'An Inquiry into the Nature and Causes of the Wealth of Nations', published in 1776 provides the beacon for the subsequent developments in the macroeconomic theories of economic growth[11]. In its simplest form, the growth model depends on the level of inputs of three factors of production – land, labour and capital (Clunies-Ross *et al*, 2009, p. 82). This suggests that increases in the size of labour force (L), in the amount of capital (K), and in the available land (H) lead to increases in the total output (Y), thus, postulating the basic production function. In the form:

$$Y = f(L, K, H) \tag{2.1}$$

Therefore, growth in total output Y_g will be caused by growth in the labour force Lg, the capital stock K_g, and the availability of land H_g. Also, included is improvements in technology T_g lead to expanded output.

$$Y_g = f\left(L_g, K_g, H_g, T_g\right) \tag{2.2}$$

The neoclassical model was developed out of the works of the classical school of economics. Their growth theory is preoccupied with the accumulation of productive

[10]The knowledge of theory underpinning the economic phenomenon under study helps us in building economic models that attempt to mimic the true-life situation.

11 Emphasise was on the accumulation of factors. Modern growth theory has shifted to stress the importance of efficiency or productivity of factors .

factors; capital, labour, and technology. The most common production function applied by the proponents is the Cobb-Douglas production function. It explains the amount of output that would be produced given a combination of inputs, which are basically labour and capital. Barro and Sala-i-Martins (2004, p. 27), note that the process of economic growth depends on the shape of the production function, and starting point of understanding the Solow model is the neoclassical production function[12]. They posit that production function is neoclassical, if the following three conditions are satisfied[13].

$$Y = F(K, L, T) \tag{2.3}$$

(i) Constant Return to Scale

This is also known as homogeneity of degree one in $K\ and\ L$. We ignore T, which is a non-rival input, unlike $K\ and\ L$ that are rival inputs. Thus, $F(.)$ exhibits constant returns to scale, if we multiply $K\ and\ L$ each by the same positive constant, λ.

$$F(\lambda K, \lambda L) = \lambda * F(K, L)\ for\ all\ \lambda > 0$$

(ii) Positive and Diminishing Returns to Private Input

For all $K > 0$ and $L > 0$, $F(.)$ exhibits positive and diminishing marginal products with respect to each input:

$$\frac{\partial F}{\partial K} > 0, \quad \frac{\partial^2 F}{\partial K^2} < 0$$

$$\frac{\partial F}{\partial L} > 0, \quad \frac{\partial^2 F}{\partial L^2} < 0$$

(iii) Inada Conditions

The marginal product of capital (or labour) approaches infinity as capital (or labour) goes to zero. Also, approaches zero, as capital (or labour) goes to infinity.

[12]In the neoclassical model, holding constant the levels of technology and labour, each increase in capital increases the output, but this addition to output decreases as capital increases and this equally holds for labour.

[13] (Ibid).

$$\lim_{K\to 0}(F_K) = \lim_{L\to 0}(F_L) = \infty$$

$$\lim_{K\to \infty}(F_K) = \lim_{L\to \infty}(F_L) = 0$$

2.2.1.1 Harrod-Domar Growth Model

The growth model uses a production function, which has a fixed, constant relationship with the amount of capital invested, that is, (K) and the amount of output produced (Y). This implies that the capital-output ratio is constant, denoted as K/Y and can be expressed as; (v). In addition, the model assumes constant returns to scale, implying that any change in capital leads to the same change in output. Clunies-Ross *et al,* (2009) note the model in the following form:

$$v = K/Y$$

Or

$$v = \Delta K/\Delta Y \tag{2.4}$$

However, the rate of growth of total output (Y), which is equally the rate of growth of an economy, given as, (g), thus,

$$g = \Delta Y/Y \tag{2.5}$$

Dividing both sides of equation (2.4) by output (y), we have,

$$v/Y = \Delta K/\Delta Y \,.1/Y \tag{2.6}$$

Therefore,

$$\Delta Y/Y = \Delta Y/Y \,.1/v \tag{2.7}$$

$$g = \Delta Y/Y \,.1/v$$

It is further explained that for the economy, the change in (K) is equal to investment I, and this equal to total savings (S), therefore; $K/Y = S/Y\Delta$. The proportion of total output, that is, saved - savings rate (s) is in the form:

$$g = s/v \tag{2.8}$$

Equation (2.8) shows the Harrod-Domar growth model. It indicates the rate of growth of an economy is equal to the savings rate divided by the capital-output ratio. It shows that once the capital-output ratio is determined and the savings ratio known, the growth rate of an economy could be determined. The model could be used in the development context to estimate the saving and investment requirements for particular rates of growth (Clunies-Ross *et al.*, 2009).

The model emphasises the relevance of saving and investment for the achievement of growth. Nevertheless, increased investment may be lacking in the developing countries that are characterised with low saving culture, and this could affect the growth of capital formation. In a study, assessing the relevance of investment to economic growth, Barro and Sala-i-Martin (2004, p. 23) compare investment and growth among sub-Saharan Africa, East Asia and OECD countries. They note that in a cross-country data from 1960 to 2000, the average annual growth rate of real per capita GDP for 112 countries was 1.8 per cent, while the average ratio of gross investment to GDP was 16.0 per cent. For 38 sub-Saharan African countries, the average growth rate was barely 0.6 per cent, with an average investment ratio put at 10.0 per cent, compared with nine East Asian 'miracle' economies with average growth rate of 4.9 per cent, and average investment ratio of 25.0 per cent. On the other hand, with 23 OECD countries, the average growth rate was 2.7, whereas the average investment ratio was 24.0 per cent.

2.2.1.2 Solow Growth Model

Mankiw (1995) notes Solow growth model is very useful for explaining country growth experiences and as a theoretical framework for explaining cross-country

growth patterns[14]. In the growth model, the long run economic growth rate is exogenously determined by the rate of technological progress and population growth. According to Mankiw (1995), the model assumes a Cobb-Douglas production function[15];

$$\mathrm{Y_t} = \mathrm{K}_t^{\propto}(A_t \mathrm{L}_t)^{1-\propto} \tag{2.9}$$

$$0 < \alpha < 1$$

L and A are assumed to grow exogeneously at rates n and g . Therefore,

(i) $\mathrm{L}_t = L(0)e^{nt}$

(ii) $A_t = A(0)e^{gt}$

Thus, with effective unit of labour at $A_t \mathrm{L}_t$ growing at rate $n + g$

Where:

Y = Output, K = Capital, L = Labour, A = Level of Knowledge or technology (Labour-augmenting technological progress), t = time, α = the share of capital in total output, k = Stock of Capital per effective labour, y = Level of output per effective labour, $s(y)$ = Fraction of output saved and assumed to constant, that is, $0 \leq s(y) = s \leq 1$, $\delta > 0$ = Capital depreciates at a constant rate, $g > 0$ = Technology A grows at exogenous rate, $n > 0$ = Labour L grows at exogenous rate. With a constant fraction of the output, s, being invested, differentiate K with respect to time, we determine the dynamics of K for a given labour and technology. Given that $\frac{\partial k_t}{\partial t} \equiv \dot{k}_t$

[14] Solow's contribution to economic growth theory; his model identifies that the possible differences in growth among countries over time or across parts of the world could be as a result of variation in output per worker, differences in capital per worker and differences in the effectiveness of labour. The model posits that only growth in the effectiveness of labour that can lead to permanent growth in output per worker, while that of the changes in the capital per worker is modest (Romer, 2012, p. 27). The narrative of the model is that the physical accumulation of capital over time cannot be held responsible for the vast growth in output per person, or the geographical differences in output per person.

[15] Mankiw *et al.*, (1992, p. 409).

That is, $\dot{k}_t$denotes differentiation with respect to time.

$$\frac{\partial K_t}{\partial t} = sy_t - (n + g + \delta)k_t \quad (2.10)$$
$$\dot{k}_t = sy_t - (n + g + \delta)k_t$$

Equation (2.10) implies that k converges to a steady state value k^* define by

$$sk^{*\alpha} = (n + g + \delta)k^* \text{ or } k^* = [\frac{s}{n+g+\delta}]^{1/(1-\alpha)} \quad (2.11)$$

The steady state capital-labour ratio is related positively to the rate of saving and negatively to the rate of population growth. Thus, the Solow model is concerned with the impact of saving and population growth on real income. Substitute equation (2.11) into the production function of equation (2.9) and taking logs, we have the steady-state income per capita.

$$In\left[\frac{Y(t)}{L(t)}\right] = InA(0) + gt + \frac{\alpha}{1-\alpha} In(s) - \frac{\alpha}{1-\alpha} In(n + g + \delta) \quad (2.12)$$

The $(n + g + \delta)$ is the effective depreciation rate for the capital-labour ratio ($k \equiv K/L$). Thus, where saving, s, is 0, capital per person k would decline partly because of depreciation of capital at the rate δ, increase in the number of persons at the rate n and decline in technological progress g. It is assumed that efficiency growth g and depreciation rate of capital δ are the same across countries, whereas $A(0)$ the initial level of efficiency to vary randomly across countries, owing to differences in resource endowments, technology, institutions, climate, and so on (Manki et al., 1992, p. 411)[16].

[16] Note $InA(0) = \alpha + \epsilon$ (Where α is a constant and ϵ is a country-specific shock. A is also called the total factor productivity or technological development.

Log income per capita at a given time:

$$In\left[\frac{Y}{L}\right] = \alpha + \frac{\alpha}{1-\alpha}\, In(s) - \frac{\alpha}{1-\alpha} In(n + g + \delta) \quad (2.13)$$

From the growth model, with respect to the factors of labour, capital and technological progress, Odedokun (2000, p. 293) made the following suppositions: (i) with increase in capital and/or labour, the marginal returns generated by this variation would be positive, but progressively diminishes. Thus, the higher is the capital-labor ratio $\frac{K}{L}$, the smaller becomes the marginal product of capital, and vice-versa; (ii) Also, with a given technological progress, the capital-labor ratio $\frac{K}{L}$ would increase as capital increases per worker and the labour productivity would reach a higher level, before declining; and (iii) As the marginal returns diminishes, the effect of capital accumulation per worker on output would become lesser, as $\frac{K}{L}$ keeps increasing. Impliedly, the impact of progression in $\frac{K}{L}$ on $\frac{Y}{L}$ is likely to be more pronounced, where capital is not relatively abundant[17].

2.2.1.3 Augmented Solow Growth Model

Mankiw, Romer and Weil (1992) also referred to MRW model improved the efficiency of the Solow growth model by adding human capital to the process of growth. MRW (1992) model is of the form:[18]

$$\mathrm{Y_t} = \mathrm{K}_t^{\propto} H_t^{\beta} (A_t \mathrm{L}_t)^{1-\propto-\beta} \quad (2.14)$$

Where H is the stock of human capital and let s_k the fraction of income invested in physical capital and s_h the fraction of income invested in human capital are:

[17]It is, however, contended by the proponents of the Solow model that capital accumulation would have a larger impact on labor productivity in the developing countries, as opposed to developed ones, and that in the long-run, output per capita in all countries will grow at the same exogenously determined rate of technological progress (Mankiw, 1995 and Oukhallou, 2016).
[18]Jalilian and Odedokun (2000, p. 293) note the inclusion of investment in human capital as a regressor converts the model into the so-called augmented Solow model.

$$\dot{k}_t = s_k y_t - (n + g + \delta)k_t$$

$$\dot{h}_t = s_h y_t - (n + g + \delta)h_t$$

Where,

$y = \frac{Y}{AL}$, $k = \frac{K}{AL}$ and $h = \frac{H}{AL}$ are quantities per effective unit of labour. There is the assumption that human capital depreciates at the same rate with physical capital. Also, it is assumed that $\alpha + \beta < 1$ shows decreasing return to scale that is, decreasing return to all capital. Where $\alpha + \beta = 1$, there are constant return to scale and hence, the absence of steady state for the model. However, given that, it observes a decreasing return to scale, items (i) and (ii) imply that the economy converges to a steady- state (Mankiw *et al.*, 1992).

(i) $k^* = \left(\frac{s_k^{1-\beta} s_h^{\beta}}{n+g+\delta}\right)^{1/(1-\alpha-\beta)}$

(ii) $h^* = \left(\frac{s_k^{\alpha} s_h^{1-\alpha}}{n+g+\delta}\right)^{1/(1-\alpha-\beta)}$

Substituting items (i) and (ii) into the production function in equation (2.14) and taking logs, gives an equation for income per capita in equation (2.15). The equation shows that the steady-state income per capita depends on population growth and accumulation of physical and human capital as below.

$$In\left[\frac{Y(t)}{L(t)}\right] = InA(0) + gt - \frac{\alpha+\beta}{1-\alpha-\beta} In(n + g + \delta) + \frac{\alpha}{1-\alpha-\beta} In(s_k) + \frac{\beta}{1-\alpha-\beta} In(s_h) \quad (2.15)$$

Thus, MRW note the quantitative prediction of convergence to steady state. Let y^* be the steady-state level of income per effective worker given by equation (2.15) and let y_t be the actual value at time t. Approximating around the steady state, the speed of convergence is in the following form.

$$\frac{dln(y_t)}{d_t} = \Lambda[ln(y^*) - ln\,(y_t)] \quad (2.16)$$

Where; $\Lambda = (n + g + \delta)(1 - \alpha - \beta)$ is the convergence rate and this implies that $ln(y_t) = \left(1 - e^{-\Lambda t}\right) ln\,(y^*) + e^{-\Lambda t} ln\,(y_0)$, where y_0 is income per effective worker at some initial date. Subtract y_0 from both sides,

$$ln(y_t) - ln(y_0) = \left(1 - e^{-\Lambda t}\right) ln\,(y^*) - \left(1 - e^{-\Lambda t}\right) ln\,(y_0) \quad (2.17)$$

Substitute (y^*) of equation (2.15) in equation (2.17);

$$ln(y_t) - ln(y_0) = \left(1 - e^{-\Lambda t}\right) \frac{\alpha}{1-\alpha-\beta} In(s_k) + \left(1 - e^{-\Lambda t}\right) \frac{\beta}{1-\alpha-\beta} In(s_h) - \left(1 - e^{-\Lambda t}\right) \frac{\alpha+\beta}{1-\alpha-\beta} In(n + g + \delta) - \left(1 - e^{-\Lambda t}\right) ln(y_0) \quad (2.18)$$

2.2.2 Endogenous Growth Model

The endogenous growth theorem sprang more as a reaction to the neoclassical growth theory[19]. The works of Romer (1986) and Lucas (1988) on both human knowledge and capital development provides the early attempts to explain the long run rate of growth endogenously. Also, other scholars have made contributions into this alternative model of growth, where investment in capital is very important for the long run economic growth. The idea of capital includes research and development spending (R&D) and human capital formation. Grossman and Helpman (1994, p. 42) described it as "the 'new' growth theory (NGT) to indicate the claim to originality, while some advocates of the theory are quite clear in their opinion that the new theory would revolutionise the way economists think about certain problem".

In the endogenous growth model, technological progress in form of generation of new ideas as means of achieving economic growth, escapes from the diminishing returns in the long run (Barro and Sala-i-Martin, 2004, p. 61)[20]. The endogenous growth model is of the form:

[19] The endogenous growth model has been applied in economic research, using different specifications of the impact of public expenditure on economic growth (Kibritcioglu and Dibooglu, 2001).

[20] The new model of economic growth unlike the neoclassical model has constant return to scale considering that capital and labour are rival goods and of homogenous degree one, while technology is freely available to all, that is, non-rival good and non-excludable (no legal restriction to usage) (Barro and Sala-i-Martin, 2004, p. 61).

$$Y = f(K, L, A) \tag{2.19}$$

Y = output, K = both physical capital and human capital, L is labour, A = the level of technology, which is a positive constant. Thus, output per capita becomes $y = Ak$. The endogenous theory version of production function is without diminishing returns and (A) is a positive constant that indicates the level of technology, and the marginal products of capital are constant at the level $A > 0$.

2.3 Economic Growth and Fiscal Policy

2.3.1 Theoretical Approaches to Government Intervention

Adam Smith in his book, titled "An Inquiry into the Nature and Causes of the Wealth of Nations" provided the early platform for assessing the reason(s) behind government intervention on an economy. He proposed the three following duties for the State: (a) protecting society from violence and aggression, (b) protecting every member of society from injustice and oppression and (c) erecting and maintaining certain public works and public institutions, which would not be erected and maintained by individuals.

However, the limit and extent of government involvement in performing these unique roles could depend on the system of economic system practiced by the state. Karnik (1998) in his essay titled 'Theories of State Intervention' identified four theoretical approaches of state intervention on an economy[21]. They are as follows: neoclassical approach; public choice approach; transactions costs approach; and information theoretic approaches.

(i) Neoclassical Approach

The State performs basic objective of maximisation of social welfare as its being reason for intervention on the economy. With this primary objective of the State, there is the presumption that private sector activities in the economy may not guarantee the

[21] Karnic, A (1998) Theories of State Intervention Department of Economics, University of Bombay [Online] Available at: http://archive.mu.ac.in/arts/social_science/eco/pdfs/depart/dwp38.pdf Accessed on August 5, 2020.

maximisation of social welfare, thus, the existence of market and its failure. Explanation of this was espoused in Adam's third reason for the State intervention, erecting and maintaining certain public works and public institutions, which would not be erected and maintained by individuals.

Public works and public institutions are categorised as public goods, with unique characteristics features of non-rivalrous and non-exclusion, and these undoubtedly impairs private sector ability to provide such goods, given the large costs involved in providing/producing them. The absence of production of such goods by the market enhances the need for emergent of State to assume the responsibility. For examples, certain goods fall within pure public goods: judicial system; involving courts of different hierarchy, legislative system; provision of rules and regulation, guiding the conduct and behaviours of citizens and national defense; security of lives and properties. There are also quasi-public goods; health services, transport system; land, air and sea, education, research and development etc. The provision of both the pure and quasi-goods may be quite cumbersome and too expensive for the private sector to engage in the production/provision and still make profit. Where provided, they would be inadequate, making it necessary for government intervention.

(ii) Public Choice Approach

Under the public choice approach, the views of the State and its functionaries are different unlike the neoclassical approach. The primary objective of State functionaries in the public choice approach is the maximisation of their own welfare, which could be against the State principle of maximisation of social welfare in the neoclassical approach. The State functionaries as the principal officers of the State are driven by the desire to maximise their own utility; this could lead to partisanship in State allocation and provision of certain facilities in favour of one group or the other against the overriding interest of the State. For example, in Nigeria, there have been allegations of State functionaries marginalisation of certain ethnic/religious group in the appointment to leadership of some government departments/ministries,

considered very lucrative or sensitive as well as situating government projects without due diligent.

Under such practices, competence could be compromised and jettisoned at the altar of State functionaries' parochial interests, thereby reducing productivity and growth. Pritchett (1996) suggests in his 'white elephant' hypothesis that public investment in developing countries are often used for unproductive and inappropriate projects. Similarly, Chamorro-Narvaez (2012) notes the inability of public expenditure to generate economic growth in developing countries could be associated with their vulnerability to rent-seeking, poor governance and corruption.

In this regard, there is the assumption of government failures in maximising social welfare, and market being considered as welfare enhancer and a limiting factor to the powers of the State and its functionaries'. Thus, in the public choice approach, there is the desire by State functionaries to maximise their own utility as well as every rational economic agent (Schumpeter, 1942 and Nordhaus, 1973). This puts to doubt the genuineness of the State to be a neutral participant in the economic process and may favour sectional interest in order to further its own welfare.

(iii) Transactions Costs Approach

In the allocation of resources, either by the State or market, there is the incurrence of transaction cost. Accordingly, both the State and markets are interested in the minimisation of transactions costs. The perseverance of transaction costs form part of the reasons for market failures, as evidenced in both the neoclassical approach and public choice approach. Government position in incurring the costs may be different from the market, in that, it mostly considers social cost rather than private cost.

In the production of public goods, Karnik (1998) notes the presence of two main sources of transactions costs: exclusion costs and costs of communication and information. He notes that firms would always shy away from these transaction costs. The inability of firms to meet up the transaction cost leads to market failures and the

emergent of government intervention. Government policies and business environment could exacerbate the transaction costs of firms, thereby, affecting their productivity and growth. Such increased transaction cost could be in form of increased taxes on firms' incomes. Though, such taxes would increase fund for financing public expenditure, it could lead to stifling of firms' investible funds and impairs productivity. Hence, market failure becomes prevalent, where the transactions costs are so high that the existence of markets is no longer worthwhile (Arrow, 1970, p. 68).

(iv) Information Theoretic Approach

The approach is like the neoclassical approach that is directed at market failure being the reason for State intervention. It, however, goes beyond the latter by identifying the underlying causes of market failure, principally arising from the absence of perfect information. Hence, the State intervenes to maximise social welfare in response to market failures, arising out of imperfect information and incomplete risk markets (Stiglitz, 1994). Under this approach, there is the assumption of perfect information and that this information is fixed.

The market suffers from set of risk and collapses in the absence of this perfect information. With the presence of imperfect information, the market may not be considered Pareto efficient and such, encourages the intervention of the State to improve welfare. Information asymmetries may limit the opportunities for trading, given that both the buyers and sellers may not have access to same information at the same time, regarding the selling and buying of goods. On the other hand, where there is complete disclosure of information, it makes room for the existence of perfect market and less failure (Karnik, 1998).

Government intervenes on the economy trying to wrestle market inequalities; transaction costs, imperfect information through issuance of rules and regulation, fiscal policy measures; public expenditure, taxation and deficit, or monetary policy measures; interest rate, exchange rate and credit creation etc. Government, also, could

intervene for the sake of promoting the general wellbeing of the citizenry as well as other goals: ensuring national unity and peace.

2.3.2 Economic Growth and Fiscal Policy Model

Generally, Government intervenes on an economy through its fiscal and monetary policy actions. In terms of fiscal policy, one of the policy variables government uses in intervening on an economy is public expenditure. Odedokun (2001) notes public expenditure accounts for over 25.0 per cent of the GDP in the developing countries in the last three decades, and while public expenditure and revenue do not entail the entirety of government actions on the economy, they do account for most of it.

The growth effect of government intervention on an economy, through its fiscal policy action, is discussed under the neoclassical and endogenous growth models. In the neoclassical growth model, government interventions in form of fiscal policies could affect the level of income during transition to steady state and not the steady-state economic growth rate, which can only be affected by the exogenous rate of technological progress and population growth (labour force)[22]. On the other hand, the endogenous growth model, pioneered by Romer (1986), Lucas (1988) and others insists that policies can affect the level of income during the transition to steady state and steady state long run growth.

Since the pioneering works of Romer (1986) and Lucas (1988), some scholars have used one form of fiscal policy variable, especially public expenditure/components to indicate that it could have either positive or negative impact on the long run economic growth or output growth per worker. Scholars like (Barro, 1990; Bajo-Rubio; 2000; Milbourne *et al.*, 2003; and Carboni and Medda, 2011) have modeled the effects of public expenditure and or taxes on the steady state economic growth and transition to steady state economic growth.

[22] However, policies could affect the speed of transition from one steady state to another, thus, economic growth during the transition (Barro and Sala-i-Martins, 1995, Odedokun, 2001).

2.3.2.1 Barro Model

Public-good was incorporated into the Cobb Douglas production function to form an endogenous growth model (Barro, 1990 and Barro & Sala-i-Martin, 2004, p. 220). They noted "in the AK model, anything that changes the level of the baseline technology, A, affects the long-run per capita growth rate", Also, they pointed out that government preferences in respect of public services determine the coefficient, A, which in turn affects the economy's long run growth rate.

Using the Cobb-Douglas production function, they assumed that government purchases of goods and services, G, enters the production as pure public good.

$$y_i = AL_i^{1-\propto} . K_i^{\propto} . G^{1-\propto} \quad (2.20)$$

Where:

$$0 < \propto < 1$$

Equation (2.20) implies that production for each firm exhibits constant returns to scale in the private inputs, L_i and K_i. However, they posit that for a fixed, G, the economy will face diminishing returns to the accumulation of aggregate capital, K. But, with G rising along with K in equation (2.20), diminishing return would not occur, that is, the production function exhibits a constant return to K_i and G for fixed L_i.

Also, it is noted that the form of production function implies that the public services are complementary with the private inputs, in that, an increase in G, raises the marginal product of L_i and K_i. Thus, if the exponent on G in equation (2.20), were to be less than $1-\propto$, then there would be diminishing returns to K_i and G, and these diminishing returns would rule out endogenous growth. In contrary, where the exponent is greater than $1-\propto$, growth rate would tend to increase over time. Furthermore, where the exponent on G is exactly equals $1-\propto$, so that the constant returns to K_i and G, imply that the economy is capable of endogenous growth. Each firm chooses the same capital-labour ratio $k_i = k$, and the production function from equation (2.20) is aggregated to get equation (2.21)

$$Y = ALK^{\propto}.G^{1-\propto} \quad (2.21)$$

2.3.2.2 Bajo-Rubio Model

Oscar Bajo-Rubio (2000) in his paper titled 'A Further Generalization of the Solow Growth Model: The Role of the Public Sector' developed a growth model framework that could be used for empirical analysis of growth. The narrative is based on an augmented version of the Solow growth model that includes the role of public spending, private sector and finance in generating per worker income growth rate - a growth equation in terms of the shares of private factors and fiscal policy instruments, with a non-monotonic relationship between government size and growth. The model is of the form:

$$Y = K^{\alpha}Z_1^{\beta_1} \dots Z_m^{\beta_m}(AL)^{1-\alpha-\sum_{i=1}^{m}\beta_1}\left(\frac{KG}{K}\right)^{\gamma}(\frac{TR}{K})^{\theta} \quad (2.30)$$

Where; Y denotes output; K is private physical capital, $Z(i=1,\dots,m)$ are other private inputs (such as human capital and the like), L is labor, and A is a labor-augmenting factor; finally, KG and TR are the government-provided inputs: public physical capital and transfer payments, respectively, and $\alpha > \gamma + \theta$. The production function of equation (2.30)

$$y = A\bar{k}^{\alpha}\bar{z}_1^{\beta_1} \dots \bar{z}_m^{\beta_m}\left(\frac{KG}{K}\right)^{\gamma}(\frac{TR}{K})^{\theta} \quad (2.31)$$

The small letters indicate *per capita* variables, and small letters with a bar indicate *per capita* variables in efficiency units (i.e., for any variable, X: $x = {}^{X}/_{L,}\ \bar{x} = {}^{X}/_{AL}$. The *per capita* production function exhibits decreasing returns to scale in both private capital and all private inputs, for a given state of congestion in the use of public capital and transfers. s_{KG} is the share of gross public investment in public output, whereas depreciation is assumed to be the same for capital inputs.

Accumulation equations of Inputs

$$\dot{K} = s_K\,(I-\tau)Y - \delta \tag{2.32}$$

$$\dot{Z} = s_{z_i}(I-\tau)Y - \delta Z_i \forall_i = 1,\dots,m \tag{2.33}$$

$$\dot{KG} = s_{KG}(\tau)Y - \delta KG \tag{2.34}$$

Thus, rates of change in factors and efficiency terms:

$$g_{\bar{k}} = \frac{\dot{K}}{K} - g_A - n \tag{2.35}$$

$$g_{\bar{z}_i} = \frac{\dot{Z}_i}{K} - g_A - n \;\forall_i = 1,\dots,m \tag{2.36}$$

$$g_{\overline{kg}} = \frac{\dot{KG}}{KG} - g_A - n \tag{2.37}$$

Where g_x denotes the rate of growth of variable X, and n is the rate of population growth (i.e., $n = g_L$); $g_A$is the rate of technical progress. Equating (2.35), (2.36) and (2.37) to zero, Bajo-Rubio establishes the steady state values of $\bar{k}, \bar{z}_i \; and \; \overline{kg}$ and also; $\overline{tr^*} = \frac{S_{TR}\tau y^*}{A}$, the share of transfer in public output, with asterisks denoting steady state and replaced them in the steady-state equation (2.30) and obtain the log;

$$y^* = lnA_0 + g_A t - \frac{\alpha+\sum_i \beta_i - \theta}{1-\alpha-\sum_i \beta_i}\ln(\delta + g_A + n) + \frac{\alpha-\gamma-\theta}{1-\alpha-\sum_i \beta_i} lns_K + \frac{\beta_1}{1-\alpha-\sum_i \beta_i} lns_{z_1} + \cdots + \frac{\beta_m}{1-\alpha-\sum_i \beta_i} lns_{z_m} + \frac{\gamma}{1-\alpha-\sum_i \beta_i} lns_{KG} + \frac{\theta}{1-\alpha-\sum_i \beta_i} lns_{TR} + \frac{\gamma+\theta}{1-\alpha-\sum_i \beta_i} ln\tau + \frac{\alpha+\sum_i \beta_i - \gamma - \theta}{1-\alpha-\sum_i \beta_i}\ln(1-\tau) \tag{2.38}$$

Where A is the initial value of the technological parameter A, i.e., $A_t = A_0 e^{g_A t}$, with t. To derive a growth equation, he made an approximation around the steady state;

$$\frac{dln\bar{y}}{d_t} = -\lambda(ln\bar{y} - ln\bar{y}^*) + \theta(g_{TR} - a_A - n)t \tag{2.39}$$

$\lambda = (1 - \alpha - \sum_{i=1}^{m} \beta_i + \theta)(\delta + g_A + n)$ is the speed of convergence. Solving the differential equation (2.39) and replace the steady-state equation (2.38) in it, and divide by t, the equation for rate of growth of per capita output:

$$g_y = (1-\theta)g_A + \frac{(1-e^{-\lambda t})}{t}\Big\{lnA_0 - \frac{\alpha+\sum_i \beta_i - \theta}{1-\alpha-\sum_i \beta_i}\ln(\delta + g_A + n) + \frac{\alpha-\gamma-\theta}{1-\alpha-\sum_i \beta_i} lns_K + \frac{\beta_1}{1-\alpha-\sum_i \beta_i} lns_{z_1} + \cdots + \frac{\beta_m}{1-\alpha-\sum_i \beta_i} lns_{z_m} + \frac{\gamma}{1-\alpha-\sum_i \beta_i} lns_{KG} + \frac{\theta}{1-\alpha-\sum_i \beta_i} lns_{TR} + \frac{\gamma+\theta}{1-\alpha-\sum_i \beta_i} ln\tau + \frac{\alpha+\sum_i \beta_i-\gamma-\theta}{1-\alpha-\sum_i \beta_i}\ln(1-\tau) - lny_0\Big\} + \theta(g_{TR} - n) \quad (2.40)$$

In equation (2.40), s_K and s_{z_i} (i=1,...,m) denote the shares of gross investment on private inputs in private output, and s_{KG} and s_{TR} the shares of gross public investment and transfers in public output, instead of the shares in total output. The model shows a non-monotonic relationship between the rate of growth of per capita output and the size of the public sector. It shows the levels of public inputs would lead directly to a higher growth, but they will leave a smaller quantity of output available for the accumulation of private inputs and this will eventually lead to reduction in the rate of growth of per capita output. While, y_0 is the initial per capita output.

$g_y = \frac{(lny_i - lny_0)}{t}$,

Thus, the rate of growth of *per capita* output, together with its steady-state level, would be maximized for:

$$\tau = \frac{\gamma+\theta}{\alpha+\sum_{i=1}^{m} \beta_i} \quad (2.41)$$

He noted that the non-monotonic relationship found between the rate of growth of per capita output and the size of the public sector, including the ‘‘optimal’’ size of the public sector as in equation (2.41) was equivalent to the results derived in Barro (1990).

2.3.2.3 Milbourne *et al.* Model

Milbourne *et al.* (2003) in their paper titled 'Public Investment and Economic Growth' used a variant of the augmented Solow model to examine whether public investment has a distinctive role in determining economic growth. They distinguished between public and private investment, rather than total investment, and considered both the steady state and transition to steady state. The modeled total output in the form:

$$Y_t = K_t^{\alpha} H_t^{\beta} \prod_{j=1}^{m} G_{jt}^{\gamma j} (A_t L_t)^{1-\alpha-\beta-\gamma} \quad (2.50)$$

Where: Y_t is total output, K_t stock of private capital, H_t is the stock of human capital, G_{jt} is the stock of government capital of type j, j=1…m, L_t is the size of the labour force, and A_t is the measure of technology. Labour force grows exogenously at a rate n, whereas A_t grows exogenously at a rate x. The model assumed the proportion of income devoted to private capital to be s_K, and that devoted to human capital investment as s_H, and for each type of government capital as s_{Gj}[23]. Also, the depreciation rate of each capital stock as δ. On the accumulation of capital stocks: they are assumed to accumulate in a standard linear fashion[24].

Considering this, the per capita level of output associated with the steady state is expressed as follows:

$$lny^* = lnA_0 + xt + \frac{\alpha}{\Delta} lns_K + \frac{\beta}{\Delta} lns_H + \sum_{j=1}^{m} \frac{\gamma_j}{\Delta} lns_{Gj} - \frac{\alpha+\beta+\gamma}{\Delta} \ln (n + x + \delta) \quad (2.51)$$

Where $\Delta \equiv (1 - \alpha - \beta - \gamma)$ and y^* is the level of per capita output, $\frac{Y_t}{L_t}$. They assume growth rate of technology (x) across countries was constant and $(A_0 = \alpha + \epsilon)$, α, being constant and ϵ *is* country specific shock. Given transition to steady state:

[23] The authors noted the contention of Pritchett (1996) that public capital investment in developing countries may suffer from white elephant projects that do not generate growth.

[24] The steady state of the model was defined as when the capital stocks per effective unit of labour, example $K_t/A_t L_t$ is constant. Thus, implying that the levels of all capital stocks and outputs grow at the exogenous rate $(n + x)$.

$$\frac{dlny_t}{dt} \approx \Delta(n + x + \delta)(lny^* - lny_t \quad (2.52)$$

They defined $\lambda \equiv \Delta(n_x + \delta)$, then λ is the speed of convergence for the economy. Therefore, substituting equation (2.51) in (2.52);

$$lny_t - lny_0 = \frac{\alpha}{\Delta'} lns_K + \frac{\beta}{\Delta'} lns_H + \sum_{j=I}^{m} \frac{\gamma_j}{\Delta'} lns_{Gj} - \frac{\alpha+\beta+\gamma}{\Delta'} \ln(n + x + \delta) - (1 - e^{-\lambda t}) lny_0 + z_t \quad 2.53)$$

Where $\Delta' \equiv (1 - e^{-\lambda t})$ and z_t is a function of time t and time zero. For fixed t, equation (2.53) could be written as and assuming only one public capital type:

$$lny = \alpha_0 + \alpha_1 lns_K + \alpha_2 lns_H + \alpha_3 lns_G + \alpha_4(n + x + \delta) + \alpha_5 lny_0 + \varepsilon \quad (2.54)$$

The study distinguished between public and private investment, rather than total investment, and considered both the steady state and transition to steady state. At the steady state, there was no significant effect from public investment on the level of output per worker. However, they found a significant contribution of public investment on economic growth in the transition model.

2.3.2.4 Carboni and Medda Model

Carboni and Medda (2011) in their paper, titled 'Government Spending and Growth in a Neoclassical Model' provided a non-linear theoretical relationship between public spending and economic growth. They explained how government size (τ) and the composition of public spending affect economic growth - given the size of government, different allocation of public resources leads to different growth rates in the steady state. For instance, core infrastructure (such as roads and highways, infrastructure, telecommunication systems, R&D capital stock has larger impacts on overall output compared with other public types of capital, such as; law and order, health, education, social security, distribution of wealth and public administration services in general).

In addition, they note that the accumulation of physical capital (share of investment in GDP) is one of the main forces determining the level of real output per capita. Government can influence private capital through the tax rate and public capital accumulation through public expenditure. The general form of their model;

$$Y = K_p^{\alpha}\,(LE)^{1-\alpha-\gamma_1-\gamma_2} K_{G1}^{\gamma_1} K_{G2}^{\gamma_2} \tag{2.60}$$

K_P = Private capital stock, L is total employment, E is the labour augmenting technology and K_G is the public sector or government capital. Elasticities are bounded between 0 and 1. Constant returns to scale are assumed such that $0 < \alpha + \gamma_1 + \gamma_2 < 1$. Assuming a permanent balanced government budget, ruling out debt-financing of government spending, public spending financed by levying an average flat-rate tax on income $\tau (0 < \tau < 1)$

Thus, $\tau . Y = G = G_1 + G_2$ and $\emptyset . G;\ G_2 = (1 - \emptyset) . G$ (2.61)

Where; G_1 are traditional core productive expenditures, G_2 are all others productive government expenditures and φ $(0 \leq \varphi \leq 1)$ is the share of G_1 on total spending. With public capital accumulation depending on total government revenues, and assuming equal depreciation rates (δ) for different kinds of public capital, accumulation dynamics are defined by;

$$\begin{aligned} \dot{K_{G1}} &= \emptyset . G - \delta K_{G1}; \\ \dot{K_{G2}} &= (1 - \emptyset) . G - \delta K_{G2} \end{aligned} \tag{2.62}$$

Where, dots indicate time derivatives, Carboni and Medda Model (2011, p. 7) explained equations (2.61) and (2.62) in the excerpt.

> "For a given $(\emptyset)$, if government wants to raise investment in public capital it is necessary to augment the tax rate(τ). The economy will benefit from increased public capital, but it must support a greater fiscal burden, which subtracts resources from private firms. As long as public capital productivity is equal to private capital productivity, changes in fiscal policy will have neutral effects on overall production. By contrast, a trade-off between private and public capital productivity occurs and, given their different productivity, the effects of an expansion (reduction) in government spending will depend on the composition of expenditure"

Private capital accumulation depends positively on the private savings ratio (S_K) and total income, and negatively on the average tax rate. Also, they assumed a depreciation ratio (δ) equal to that of public capital. Accumulation equations of Input,

$$\dot{K_P} = S_K\,(1-\tau).Y - \delta K_P \tag{2.63}$$

They expressed all quantities in terms of (technology-augmented) labour input, so that accumulation equations (2.62) and (2.63) becomes:

$$\dot{k_{G1}} = \emptyset.\tau.y - (\delta + n + x).K_{G1} \tag{2.64}$$

$$\dot{k_{G2}} = (1-\emptyset).\tau.y - (\delta + n + x).K_{G2} \tag{2.65}$$

$$\dot{k_P} = s_K\,(1-\tau).y - (\delta + n + x).K_P \tag{2.66}$$

Where lower case letters show variables divided by (LE), *n* is the labour growth rate and *x* the labour-augmenting technological progress. Output per unit of technology-augmented labour is:

$$y = k_p^{\alpha} k_{G1}^{\gamma_1} k_{G2}^{\gamma_2} \tag{2.67}$$

Growth of public and private capital was bound by the diminishing returns. Setting equations (2.64) - (2.66) each to zero, they derived expressions; $k_{p,} k_{G1}\ and\ k_{G2}$ in the steady state, given the production function equation (2.67) and substituting derived expressions $\ddot{k_p}, \ddot{k_{G1}}\ and\ \ddot{k_{G2}}$. Where $(\ddot{\cdot})$ denotes steady-state values.

Substituting $\ddot{k_p}, \ddot{k_{G1}}\ and\ \ddot{k_{G2}}$ into equation (2.67) provides the long-run steady-state output per unit of technology-augmented labour;

$$\ddot{y} = \left[\frac{s_K^{\alpha}(1-\tau)^{\alpha}\tau^{\gamma_1+\gamma_2}\emptyset^{\gamma_1}(1-\emptyset)^{\gamma_2}}{\delta+n+x}\right]^{\frac{1}{1-\alpha-\gamma_1-\gamma_2}} \quad (2.68)$$

Accordingly, equation (2.68) portends that the steady-state level of output is related to exogenous and endogenous factors, as well as to the elasticities in the production function. The exogenous factors constitute the private savings ratio (positively related), the rate of depreciation of capital inputs (negatively related), the rate of population growth and technological progress (negatively related). On the other hand, the endogenous factors were the public policy instruments: (1) the size of the government, expressed as the ratio of total government spending over total output,(τ), and, (2) the allocation of the public budget to the accumulation of K_{G1} and K_{G2} expressed by ($\emptyset$) and $(1-\emptyset)$.

Thus, increase in public expenditure could have negative consequences on the economic growth of any nation, given that this would reduce resources available for the growth of private sector. The authors note the harmful effects of public policy instruments on the steady state level of output per worker. The term $(1-\tau)^{\alpha}$ in equation (2.68) represents a detrimental aspect of government spending in the private sector, since only a fraction of $(1-\tau)$ in the total output (i.e. the private agents' disposable income) remains to influence production with elasticity(α) . On the other hand, a fraction (τ) of output is devoted to the creation of productive public capital. This latter positively influences total output at elasticity equal to $(\gamma_1+\gamma_2)$.

The endogenous growth models of Barro, (1990), Oscar Bajo-Rubio (2000), Milbourne *et al.* (2003) and Carboni and Medda (2011) show the roles of public spending, finance and private sector in generating per worker income growth. Public spending in the growth models is financed through revenue generation from the private sector. Governments rely heavily on revenue generation from this source to finance its expenditures. Increase in the public expenditure, could require the

generation of additional revenue for its funding, and such affects the investment decisions and growth potentials of the private sector - accompanied by the decline in income size of the sector, given that more would be taken away from them in the form of taxes.

Governments' excessive tax burden on the private sector to finance its expenditure could crowd-out the sector and distorts the market, with negative impact on productivity and growth (Barro, 1996 and Milesi-Feretti and Roubini, 1998). Also, Odedokun (2001) acknowledges predictions of fiscal policy and growth theoretical models that government taxes on investment and income impedes growth, by reducing returns from them, thereby, reducing the accumulation of both physical and human capital.

Therefore, fiscal policy variables could play very important roles in achieving per worker income growth. Their inclusions in the growth model has attracted attentions from scholars. In a seminal paper, Arrow and Kurz (1970) developed a growth model, where aggregate production benefits from public capital services, and government finances public capital by levying a proportional income tax, by subtracting resources from private agents[25]. Odedokun (2001), however, suggested that fiscal policy variables impact on per worker income growth could be achieved by considering and testing them at different levels of aggregation. He acknowledges these roles of fiscal policy variables and notes in all cases, public spending as well as their sources of finance do not appear simultaneously in a particular equation, in order that we avoid, what he termed "double counting"

In particular, the endogenous growth models prediction of positive impact of public expenditure on the economic growth are especially for the low-income/less developed countries, where the public sector/total output ratio is smaller than a certain threshold and negative, where it is bigger than that threshold (Barro, 1990; Barro and Sala-i-

[25] cited in Carboni and Medda (2011) and (Fisher and Turnovsky, 1998).

Martin, 1992; Oscar Bajo-Rubio, 2000; and Milbourne, *et al.*, 2003). Though, there is no consensus among scholars on the exact value of public sector/total output ratio necessary for public expenditure to have positive impact on economic growth. Afonso *et al.* (2005) suggest countries with "small" public sectors/public spending of below 40.0 per cent of GDP on the average have a more efficient provision of public services positive impact on growth and development. However, Fosu *et al.* (2011) found the optimal growth-maximising level to fluctuate between 8.4 and 11.0 per cent of GDP, depending on the country as well as the econometric technique applied, whereas Miller and Stoukis (2001) indicated a public investment "optimal" level of 18.0 per cent of GDP, for a different set of low- and middle-income economies.

2.4 Empirical Evidence on Public Expenditure and Economic Growth

Public expenditure could play very important role in the economic activities and development of any country; ensures efficiency in resource allocation, regulation of financial markets, establishment of rules and regulations guiding the conduct of the society, provision of infrastructure and stabilization of the economy. Through the interplay of foregoing activities, output growth could be achieved, and development changes enhanced.

Empirical studies, however, differ on the role of public expenditure in ensuring long run economic growth among developed and developing countries. These studies are influenced mostly by two growth models: neoclassical and endogenous. In the neoclassical Solow growth model, public policy or public spending has no place in generating the long run economic growth (Solow, 1956; Swan, 1956). In fact, the proponents argue that fiscal policy only affect the transition part to steady state equilibrium.

Mankiw, Romer and Weil (1992) achieved the steady state by incorporating the human capital development into the growth model, as one of its explanatory variables. This improved the behaviour of the regressors in explaining the changes in the dependent variable, per worker growth. Also, some scholars have included one form

of public expenditure or public policy into the Solow model, to determine its effects on the long-run economic growth, under the endogenous growth literature.

In the endogenous growth model, public policy or public spending has place in generating the long run economic growth (Romer 1990; Barro, 1990; Barro and Sala-i-Martin, 1992). The growth model seemed very popular among scholars, especially those interested in the long run impact of public expenditure and or its components on the economic growth. The nucleus of growth in the endogenous growth model revolves around human capital development, knowledge or technological progress (Romer, 1986 and Lucas, 1988). Chamorro-Narvaez (2012) notes that the accumulation of any of these determinants take place through a conscious decision by private agents on investment in a economy. Such investment decisions of the private agents/firms permit fiscal policy of government to impact on the long run growth, through its taxes or public expenditure.

Aside, the positions of the neoclassical and endogenous growth models on the impact of public policy/public expenditure on economic growth in the long run, Ram (1986) suggests two opposing schools of thought, namely; those that are against argues (i) governments are inefficient in the conduct of its activities. (ii) governments impose excessive burden and costs on the economic system through its regulatory process, and (iii) fiscal and monetary policies of governments tend to distort economic incentives and impeded productivity and growth. On the contrary, are those in favour that (i) government ensures conflict resolution through the harmonisation of conflicts between private and social interests. (ii) government forbids the exploitation of her citizen from foreigners and (iii) governments social optimal direction could secure productive investment, economic growth and development.

2.4.1 Growth and Public Expenditure in Developed Countries (DCs)

Studies are inconclusive on the nature of relationship between public expenditure and economic growth in the long run in the developed countries. Barro (1990); Bajo-Rubio (2000); and Milbourne *et al.* (2003) predict the presence of non-monotonic

relationship existing between public expenditure and economic growth in the long-run in the developed countries, where the size of government is considered large, amidst a certain threshold [26]. Similarly, Folster and Henrekson (2001) note "Theoretical reasoning … point to an expectation of a negative effect in countries where the size of the government sector exceeds a certain threshold. In practice, we only observe very large public sectors in rich countries."

Grier and Tullock (1987) find evidence of a negative relationship between the growth rate of real GDP and the growth rate of the government share of GDP in their study of 115 countries, using a cross-sectional time series analysis with data averaged over 5-year intervals. In line with Grier and Tullock (1987), Folster and Henrekson (2001) in a study of advanced countries, used data spanning from 1970-1995, and notes a robust negative relationship between government expenditure and growth. The study indicated that 10.0 per cent increase in the value of the public expenditure coefficient results in a decrease of 0.7 per cent growth rate. The negative and significant relationship between public expenditure and the growth in per capita real GDP is an indication that increase in public expenditure does not increase the real GDP per capita, but rather retards it. Increase in public expenditure entails more revenue for government to fund the former. Such action denies the private sector of investible funds required for private capital accumulation and growth.

Conversely, Kelly (1997) in his study of the effects of public expenditure on growth among 73 countries over the period, 1970-1989 observes that much of the literature attributes weak growth to public investment and social expenditures, which inhibits growth through crowding-out and rent-seeking. He, however, noted that such concerns may have been over-exaggerated in literature. Corroborating this, Erkin (1998) posits in a study of the relationship between government expenditure and

[26] This seems to influence the outcomes of studies between public expenditure and economic growth in advanced economies, where there exists large public sector/GDP ratio. Nonetheless, studies under this sphere remain inconclusive. The optimal level of public infrastructure occurs where the marginal product of public infrastructure equals marginal social cost. Thus, any public infrastructure beyond this level crowds-out private investment and reduces the level of output or stifles growth (Carboni and Medda, 2011).

economic growth for New Zealand that higher government expenditure is not inimical to consumption, but instead raises private investment that, in turn, accelerates economic growth.

Also, public consumption and investment could have different impacts on economic growth. Public investment is expected to be growth enhancing compared with public consumption with negative impact on growth. Diamond (1989) finds that government consumption has negative impact on growth. He contends, it crowds-out private investment, hampers economic growth in the short run and diminishes capital accumulation in the long run. Similarly, Barro (1991) investigates the effect of public investment and public consumption expenditures on growth rates with a cross-country data. The study indicates that public investment has no significant effect on growth rates, while the rate of economic growth is negatively related to the share of government consumption expenditure.

On the other hand, Perotti (2004) in his study, based on a quarterly VAR model, with a sample of countries; the United States, the United Kingdom, Australia, Canada and Germany finds that output and private investment react more significantly to government consumption shocks than to public investment. He tried to unravel what could be responsible for the negative impact of public investment on economic growth in the developed countries. Accordingly, he notes that developed countries might have too much public capital relative to their optimal level, such that public investment could have a very low, or even negative marginal product. Furthermore, he suggests that where public investment crowds-out productive private investment, it can be shown having a negative multiplier after the general equilibrium effects are played out.

Aligning with Perotti (2004), Kamps (2004) in his study of 22 OECD countries finds public investment shocks having downward influence on economic growth. Kamp notes that Japan shows large public capital to output ratio compared with other countries under study. It supports the plausible presumption of capital/output ratio in

Japan being beyond its optimal level, so that any further public capital investment would have an unfavorable effect on GDP, hence the negative marginal productivity of public investment. However, this may not be conclusive, given that Portugal with the lowest public capital to output ratio has a negative marginal productivity of public capital, whereas the other countries in the sample had a larger ratio, but still a positive macroeconomic effect of public investment.

Corroborating with Perotti (2004) and Kamps (2004), Afonso *et al.* (2005) explain the issue of efficiency and financial resources in the management of public investment in a study of developed countries. They developed a public sector efficiency composite indicator in their study of advanced OECD economies that includes; information on administration, education, health (life expectancy, infant mortality), income distribution, economic stability and economic performance outcomes. The public sector efficiency composite indicator is evaluated through the variations, over a 10-year average unemployment rate. Among their findings was that higher public investment expenditures are associated with diminishing marginal returns. In addition, they suggested countries with "small" public sectors/public spending, that is, below 40.0 per cent of GDP on the average have a more efficient provision of public services and with a stronger impact on macroeconomic development.

On the contrary, studies have shown that countries with high shares of total public investment tend to grow quickly (Landau, 1983; Aschauer, 1989; and Gupta *et al.*, 2005). For example, in his study of the United States during the period 1949-1985, Aschauer (1989) finds that military public investment and public consumption have slight impacts on private investment in equipment, whereas infrastructure capital stock (core infrastructure) like streets, highways, airports, mass transport, sewers, and water systems etc. had a strong positive effect on the return rate of private capital and the level of output. The study supports the view that public expenditure or some of its components could bring about positive changes in the long run growth through different channels.

2.4.2 Growth and Public Expenditure in Less Developed Countries (LDCs)

The impact of public expenditure on economic growth in developing countries may behaviour differently compared with the developed countries. Countries with small size of public sector are predicted to have positive effects of public expenditure impact on economic growth in the long run (Barro, 1990; Bajo-Rubio, 2000; Milbourne *et al.*, 2003; and Chamorro-Narvaez, 2012). Though, the predictions remain an issue of large debate among researchers, owing to the interplay of many factors; governance, political stability, presence of private investment in the developing countries (Chamorro-Narvaez, 2012).

Notwithstanding, public expenditure by economic classification indicate varying impacts on economic growth. Devarajan *et al.* (1996) considered the impacts of public expenditure by economic classification on economic growth for a group of developing countries and finds that recurrent expenditure was positively related to the real GDP per capita, whereas the capital expenditure had a significant negative relationship with growth of real GDP per capita. The negative effect also holds for each of the major components of public investment including transport and communication. Devarajan *et al.* (1996) main findings were corroborated by Odedokun (2001).

Odedokun (2001) study was based on a sample of 103 low-income countries, which was further classified into low-income, high-income, mineral exports dependent and foreign aid dependent groups. He investigates the effects of fiscal policy variables, namely; different categories of government expenditure, revenue and deficits on economic growth. Using a panel of annual data series over three decades, the result suggests that the effects of the fiscal variables on growth vary across countries. For example, capital expenditure was found to have a negative impact on growth. However, expenditure son wages and salaries are growth-promoting.

M'Amanja and Morrissey (2005) aligned with Devarajan *et al.* (1996) and Odedokun (2001). They used auto-regressive distributed lag (ARDL) techniques to investigate

the relationship between various measures of fiscal policy on growth, using annual data for the period, 1964-2002 in Kenya. They formulated an ARDL model and noted that it was more appropriate for small samples data. They categorised government expenditure into productive and unproductive and found the to be neutral to growth as predicted by economic theory. Contrary to expectations, productive expenditure had strong adverse effect on growth.

In a related study, Taban (2010) adopted the Barro (1990) endogenous growth model and examined the linkages between public spending and economic growth in Turkey, using different estimation techniques, namely; the bounds testing for cointegration approach developed by Pesaran *et al.* (2001) and the modified WALD (MWALD) causality test developed by Toda and Yamamoto (1995). The study finds the share of the total government spending and the share of the government investment to GDP to have negative impacts on the growth of real per capita GDP in the long run for a sample period of 1987: first quarter to 2006: fourth quarter. However, using the MWALD causality test, the study shows a strong bi-directional causality between the total government spending and economic growth. However, there was no statistically significant relationship between the share of the government consumption spending to GDP and economic growth.

The foregoing studies, however, tend to contradict the theoretical predictions that developing countries are expected to have positive impacts of public investments on economic growth compared with the developed countries. Pritchett (1996) suggests in his 'white elephant' hypothesis, public investment in developing countries are often used for unproductive and inappropriate projects. Consequently, the share of public investment can be very poor measure of the actual increase in economically productive public capital. However, Pritchett (1996) supposition tends to cast doubt on the efficiency and profitability of public investment selection and execution in developing countries. Lack of efficiency and consideration for profitability in the selection and execution of public investment could have the potential of increasing the total cost of investment, reduce productivity of such investment, and retards

economic growth and development. Similarly, there could be challenge of bureaucratic inefficiency, excessive fiscal burdens and distortions in the incentives system and market intervention by governments. Chamorro-Narvaez (2012) attributed the inability of public expenditure to have positive impact on economic growth in developing countries to their vulnerability to rent-seeking, poor governance and corruption.

Some studies, however, are of the opinion that public investment has positive impact on economic growth. The fear that fiscal operations of government, for instance, increases in public investment would crowd-out the private sector, and thereby, reduce economic growth was dispelled in a study by Agénor and Montiel (1996). The authors note that government budget deficits tend to have a negligible influence on interest rates and hence, the crowding-out effect would be of an insignificant magnitude in the case of small and middle-income countries. They sighted that public investment provides developing countries that lack infrastructures; transportation, education and public health services, which are very important for private investment in human or physical capital. These services are presupposed to be non-substitutable and imperative for economic growth and development.

Aligning to Agénor and Montiel (1996), Odedokun (1997) used a sample of 48 developing countries for the period 1970-1990 and finds that infrastructural public investment promotes economic growth. Similarly, Hemming *et al* (2002) suggests that public investments are expected to generate larger macroeconomic impacts in the developing countries compared with developed countries, considering the existence of higher margin of improvement at the infrastructure level, among other development and economic variables. In an empirical survey, they noted public investment multiplier effect could be up to 1.4 in middle income countries, while it is weak and even negative in some cases in advanced economies. They explained that crowding-out is strong when public spending, especially on infrastructure substitutes for private spending or when the interest rate and exchange rate rose, owing to fiscal

policy expansion. According to them, this may not be the case for developing countries, given the regime of fixed exchange and interest rates in most of them.

The result of (Agénor and Montiel, 1996; Odedokun, 1997; and Hemming *et al.*, 2002) was corroborated by Niloy *et al.* (2007). The authors confirmed in their examination of the impact of public expenditure on economic growth for 30-52 developing countries in 1970s and 1980s, that government capital expenditure in GDP has a significant positive association with economic growth, but the share of government current expenditure in GDP was shown to be insignificant in explaining economic growth. In India, an examination of the effect of government development expenditure on economic growth from 1950-2007 show a significant positive impact on economic growth (Ranjan and Sharma, 2008).

In addition, Fosu *et al.* (2011) focused on the issue of optimal level of public investment in developing countries, under the constraint of crowding-out the private sector. They used a panel data from 33 Sub-Saharan African countries, during the period 1967 to 2008 to evaluate the relationship among private investment, public investment and economic growth considering the constraint posed by the crowding-out effect of public investment on the private sector. The results indicate that public investment play a crucial role in determining economic growth. Also, they found current level of public investment in Sub-Saharan economies to be on average, sub-optimal. The study identified the growth-maximising level to fluctuate between 8.4 and 11.0 per cent of GDP depending on the country, as well as the econometric technique used[27].

Further distinction of investment between public and private shows different impacts on economic growth. Khan (1996) separated total investment into private and public investments and estimated their respective impacts on economic growth. The issue of efficiency and selectivity in executing public investments and expected returns therefrom was brought to fore in the study of 95 developing countries. He finds that

[27] Miller and Stoukis (2001) in their study show a public investment "optimal" level of 18 per cent of GDP, for a different set of low- and middle-income economies.

private and public investments have different impacts on economic growth. Private investment has a much more significant macroeconomic influence than public investments. He, however, notes the unique role of government in identifying types of public investment that would have positive net returns and likely to be complementary to the private sector. He warned that public investments that do not meet these criteria would most likely elicit downward influence on factor productivity and economic growth, and that such should be discouraged.

The findings of Khan (1996) was confirmed by M'Amanja and Morrissey (2005). They found private capital investment to be more growth enhancing than public investment. In addition, Makuyana and Odhiambo (2018) in their study of the relative impact of public and private investment on economic growth in South Africa, using annual data from 1970 to 2017. The study applies the Autoregressive Distributed Lag (ARDL)-bounds testing approach to cointegration and finds that private investment has a positive impact on economic growth both in the long-run and short-run, while public investment has a negative effect on economic growth in the long-run.

There are evidence of positive/negative impacts of certain types/components of public investment on economic growth, and this could help to identify the growth-enhancing investment as well as facilitate public expenditure management. For example, Easterly and Rebelo (1993) considered the relationship between fiscal policies and economic growth. Their approach is based on Barro (1991) and estimates the cross-country growth equations for the period 1960 to 1980. Their regressions include measures of public investment at various levels of disaggregation and several conditioning variables. Among others, their research outcome indicates a strong relationship between public investment in transportation and communication and economic growth. Also, Ramirez (2004) disaggregated public expenditure by its functions and finds that public infrastructure, which comprised transport, communications, water and sewer systems, education and health care positively affects growth in Mexican, during the period, 1955 to 1999.

However, Milbourne *et al.* (2001) in their study, investigated the impact of public investment share, disaggregated into six sectors: transportation and communication, agriculture, education, health, housing, and industry on real GDP per capita. The study found each share of the sectors to be statistically insignificant, and these were similar to the aggregate results. In Lebanon, Saad and Kalakeck (2009) examined the growth effects of government expenditure on economic growth over the period, 1962 to 2007. They focused on defence, education, health, and agriculture, using a multivariate cointegration analysis to examine each of the sectors effect on economic growth. The study shows that government expenditure on education had a positive effect on growth in the long-run, but a negative effect in the short run. Its spending on defence had a negative effect on economic growth in the long run and insignificant impact in the short-run. The health sector spending had negative impact on growth in the long run, yet with insignificant effect in the short run. In both the long run and short run, sectoral spending on agriculture was found to be insignificant.

In Nigeria, several studies indicate varying results. For example, Ekpo (1995) studied the relationship between government expenditure (functional classification) and economic growth in Nigeria, using an annual data from 1960-1990. The study applied Ordinary Least Square (OLS) estimator and indicated that capital expenditures on transport and communication, agriculture, health and education have positive influence on private investments in Nigeria, which invariably enhances the growth of the overall economy, whereas, capital expenditure on construction and manufacturing, crowds out private investments. However, Nurudeen and Usman (2010) examined the effects of functional classification of government expenditure on economic growth. The results reveal that government expenditure on education has negative effect on economic growth, while expenditure on transport and communication and health increases economic growth.

In addition, some studies in Nigeria, however, have been conducted using the economic classification approach to public expenditure and its impact on economic growth. For example, Ogiogio (1995) examined the growth impact of recurrent,

capital and sectoral expenditures over the period 1970-1993. The study notes that contemporaneous government recurrent expenditure has more significant effect than the capital expenditures, while five-year lag of capital expenditures are more growth inductive. Therefore, he asserts that for an effective assessment of capital investment programmes on the economic growth, one would require a five-year planning horizon. He indicated that government investment programmes in socio-economic infrastructure provide a conductive environment for private-sector-led growth.

Fajingbesi and Odusola (1999) investigation, however, shows that real capital expenditure positively and significantly affects real output, whereas the effect of real recurrent expenditure was relatively marginal. Nevertheless, Akpan (2005) disaggregated public expenditure into capital, recurrent, administrative, economic service, social and community service and transfers to ascertain, which of them enhances growth or not. The findings indicate no significant association between most components of government expenditure and economic growth in Nigeria.

2.5 Economic Growth and Poverty

Poverty is one of the major obstacles confronting both developed and developing countries. It is very prevalent among the developing countries compared with the developed countries. Many reasons have been offered for the growing level of poverty among the developing countries. Lack of sustained economic growth is suggested to be at the forefront of engendering poverty (Roemer and Gugerty, 1997; Dollar and Kraay, 2002; and DFID, 2014). This section is divided into five subsections. Subsection 2.5.1 is the meaning and typology of poverty. Subsection 2.5.2 discusses the Millennium and Sustainable Development Goals, while section 2.5.3 highlights economic growth and poverty relationship. Sections 2.5.4 and 2.5.5 are economic growth and poverty model and empirical evidence on economic growth and poverty.

2.5.1 Meaning and Typology of Poverty

2.5.1.1 Meaning of Poverty

Poverty has broad definition and viewed differently by authors. Metaphorically, Aboyade (1975) posits that poverty is like an elephant and could be more easily recognised than defined. Alluding to Aboyade (1975), Ajakaiye (1998) in his literature on poverty notes that a standard concept of poverty remains elusive, owing to the multidimensional nature as well as its dynamic properties. However, attempts have been made by some authors to analyse poverty within the context of deprivation.

Aku *et al.* (1997) explain poverty from five dimensions of deprivation: (i) personal and physical deprivation experienced from health, nutritional, literacy, educational disability and lack of self-confidence; (ii) economic deprivation drawn from lack of access to property, income, assets, factors of production and finance; (iii) social deprivation as a result of denial from full participation in social, political and economic activities; (iv) cultural deprivation in terms of lack of access to values, beliefs, knowledge, information and attitudes, which deprives the people the control of their own destinies; and (v) political deprivation in term of lack of political voice to partake in decision making that affects their lives. Collaborating Aku *et al.* (1997), Sen (1999) in his book, 'Development As Freedom' sees poverty as the 'deprivation of various forms of freedom', while Umo (2012, p. 4) opined that "a person is poor when he/she lacks the means for functioning in terms of what he/she wants … thus, poverty essentially boils down to lack of 'capabilities to function".

Further elucidation of poverty shows 'deprivation of various forms of freedom' to embraces both absolute and relative, material and non-material in both rich and poor countries (Clunies-ross *et al.*, 2009, p. 16). Deprivation is very critical in ascertaining poverty and could manifest in different forms and sizes depending on country specifics. In a Nigerian study, Ijaiye *et al.* (2011) posits the various manifestations of poverty to include among others: lack of income and productive resources sufficient to ensure sustainable livelihood, hunger and malnutrition, ill health, limited or lack

of access to education and other basic services, increased morbidity and mortality from illness, homelessness and inadequate, unsafe and degraded environment and social discrimination and exclusion.

In providing what seems like a common working definition, Ravallion (1992, p.4) notesd that "Poverty can be said to exist in a given society when one or more persons do not attain a level of material well-being deemed to constitute a reasonable minimum by the standards of that society". According to him, this serves important for the identification and understanding of the nature, variants, and measurement of poverty within a society. Also, it would aid government policy intervention and poverty eradication.

2.5.1.2 Typology of Poverty

In line with Ravallion (1992), Anyanwu (2012) notes that the wide-ranging approaches and methods of poverty measurements are very important for understanding the various dimensions and determinants of poverty – a requirement for effective pro-poor development strategies.

(a) Absolute Poverty

It indicates the extremity of poverty and involves the condition in which an individual does not afford the basic necessities of life, food, clothing and shelter. The absolute poverty measure considers persons or group of person's annual income vis-à-vis their poverty threshold or poverty line. The implication of the foregoing is that what is considered as the person's annual income vis-à-vis the poverty threshold may vary from one clime to another. For example, in Nigeria, the National Bureau of Statistics (NBS) uses the absolute poverty as one of the measures of poverty in Nigeria. There are, however, the international absolute poverty measurement figures, expressed in terms of US$1, US$1.5 or US$2.00 per day. These poverty threshold measures could allow for tracking of the progress achieved in the fight against poverty through the efforts of development programmes in shifting the poverty line from one position to another.

(b) Relative Poverty

It refers to the inability of certain segments in a society to earn adequate income or command resources that satisfy their basic needs in line with that obtains in the better-off segments (UNDP, 1997). It tends to correspond with exclusion approach to the concept of poverty - the poor are viewed as those that are excluded, owing to lack of resources from what is considered the usual way of life in their society (Ozughalu and Ogwumike, 2015). Also, it indicates the extent to which a person's or group of persons income fall below the level of income considered by a particular society as the minimum level of income required for subsistence[28]. Ozughalu and Ogwumike (2015, p. 5) note it is "measured as a certain percentage (usually 50%) of the median income of a country … Naturally, therefore relative income poverty tends to increase with the country median". According to the National Bureau of Statistics in Nigeria, it seeks to compare with the extent to which one's income fall below what is considered important by a particular jurisdiction for a reasonably decent life.

In comparing absolute poverty and relative poverty, it is suggested that inclusive growth is in line with absolute definition of pro-poor growth but not with the relative definition (World Bank, 2009 and Anand *et al*, 2013). Under the absolute definition of poverty, growth is seen as pro-poor as long as poor people benefit in absolute terms as shown by agreed measures of poverty (Ravillion and Chen, 2003). Nonetheless, with relative poverty, growth is said to be pro-poor, if and only if, the incomes of poor people grow faster than those of the population as a whole: meaning that inequality falls (World Bank, 2009 and Anand *et al.,* 2013).

(c) Consumption Poverty

It involves measuring poverty relative to one's income. A measure of consumption could be in terms of aggregating the annual consumption of a particular group. For example, the NBS in Consumption Survey uses this means to capture the annual consumption of a target group, and this provide for policy advocacy for poverty

[28] Ravallion (1992) notes a common working definition is inability to afford the minimum needs that are deemed reasonable by the standards of the society in question.

eradication. In aggregating the annual consumption, attention is usually given to the basket of commodities, its nature and content. In terms of food content, attention is drawn to medical requirement of whether it meets up with the quantity of calories/protein or other mineral components required for the survival of a normal person/family. The challenge of this measure of poverty is that the income of a person or group of persons may vary over time.

(d) Capability Poverty

This form of poverty was popularised by Amartya Sen, who defines poverty as 'capability deprivation' as against 'income deprivation' or 'consumption deprivation'. Capabilities approach to poverty deals with one's standard of living and ability to be socially useful and influence activities that effects his life in the society. This embraces broad manifestations, including absolute and relative, material and non-material in both rich and poor country – FREEDOM. Umo (2012) pointed out that these various elements of freedom, that constitute development is characterised as capabilities.

(e) Subjective Poverty

This form of poverty measure corresponds with the dissatisfaction approach to concept of poverty – the poor are considered as those, who feels that their income levels could avail them the opportunity of having access to what they considered as the minimum standard. Afonja and Ogwumike (2003) note subjective poverty requires individual, that is, the poor inclusive to define what they considered to be decent or minimally adequate standard of living. It is based on the subjective assessment of person(s) perception of poverty line. For example, through questionnaires in a living standard survey, persons or households could be requested to specify the level of income or consumption, they considered appropriate for their subsistence. This may seem very challenging, given that it is subjective in nature, except if thresholds are earmarked in the questionnaire.

(f) Chronic Poverty

Chronic poverty is a very perverse form of poverty, upon which the person(s) termed to be chronically poor and helpless in the conduct of his affairs to achieve decent living. In this category of poverty are destitute; handicapped by physical or mental afflictions but does not necessarily mean disability. The identification of this class of poverty includes people that are poor and cannot help themselves on more or permanent basis (Umoh, 2012).

(g) knowledge Poverty

Umoh (2012, p. 7) notes that "knowledge poverty is perhaps the 'mother' of all kinds of poverty". It is a variant of asset poverty in the sense that knowledge can be seen as part of human capital assets. Knowledge as capital asset may not be transferable but empowers the knowledgeable person with the understanding of how to navigate out of any situation, he or she finds oneself. Under this situation, such a person is not found helpless. 'Knowledge is power' and coincidentally, most people who are materially poor are largely also knowledge – poor (Ibid.).

(h) Asset Poverty

Assets/wealth approach to the concept of poverty refers to poor person's ownership of property, near liquid assets like shares, stocks/equities that could easily be converted into money as well as the inclusive nature of the financial system in which those assets are traded. That is, is the financial system deep enough to provide space for such category of persons to participate in it? Similar to the asset approach is the material conceptualisation of poverty. The material poverty refers to the lack of ownership and control of physical assets such as land, machinery and animal husbandry (UNDP,1997).

Umoh (2012) noted that the relation between assets or wealth of a person is very important in determining the level and composition of poverty. He posits three reasons; first, assets poverty can be computed to show how far one's assets can go in sustaining one in living below/above poverty level, second, some people categorised

as poor already have some degree of wealth or assets and this should be taken into account by policy and third, a wealthy man/nation today may slip into poverty tomorrow, owing to erosion in the value of the assets.

Assets are traded in financial markets, which are part of the financial system. A developed financial system ought to be inclusive in nature to benefit the poor and other disadvantaged groups in the society (Demirguc-Kunt and Klapper, 2012). The increasing interest in the need for financial inclusion by developing economies can be traced to the literature on the effect of financial development on economic growth (Ajakaiye and Olowookere, 2013). For instance, many studies have shown that financial development tends to increase economic growth and reduce inequality and poverty (Roubini and Sala-i-Martin, 1992; Jalilian and Kirpatric, 2001; and World Bank, 2008).

In Nigeria, the financial system has witnessed some development, what is left is for the impact on the system to reflect on the real sector (Ajakaiye and Olowookere, 2013). Thus far, majority of Nigeria's enterprises (over 80.0 per cent) describe poor access to finance as the most difficult problem, they face (NBS-SMEDAN, 2012). Financial inclusion in Nigeria is yet to fully evolve as explained by the World Bank Global Findex data, relative to some other countries. The World Bank Global Findex data indicates that only about 30.0 per cent of Nigerian adults have accounts with formal financial institutions compared with Kenya and South Africa, which have values of 42.0 and 54.0 per cent, respectively (Demirguc-Kunt and Klapper, 2012).

2.5.1.3 Measurement of Poverty

The World Bank (1992) noted three key issues to be considered in the measurement of poverty, namely; first, the yardstick to be applied in assessing living standards of people by determining, who is poor or not, second, drawing the poverty line, that is, the cut-off line of living standard level, below which a person is classified as poor and counting the people whose income is below the line, and third, measuring the depth and severity of poverty. We shall briefly discuss some of the measures of

poverty, namely, headcount, poverty gap, Foster-Greer-Thorbecke (FGT) and human development index[29].

(i) Headcount Poverty

The most widely used multidimensional poverty measures since the 1970s are the 'counting approaches' (Alkire and Foster, 2011). Thus, most applications of counting measures tend to report a headcount ratio. It involves counting the number of poor, and then expressing poverty as the ratio of the number of the poor to the total number of people in the society or community, that is assessed. Englama and Bamidele (1997) note the head-count measure could be represented in the mathematical form below.

$$H = {}^{q}/_{n} \tag{2.70}$$

Subject to $G = 0 < 1,\ therefore: q < n$

H= the number of all the poor people expressed as a ratio of the total population of the society or community assessed

q= the total number of poor people

n= the overall population of the society or community assessed

G= the Gini coefficient, that is, the aggregate inequality measure

The head-count measure is a very useful measure of poverty but has been criticized that it may not be broken down into dimension to show how people are poor. For example, Sen (1984) noted that, it does not take into account the extent of the shortfall of incomes of the poor from the poverty line. Also, Englama and Bamidele (1997) observed that a reduction in the income of all the poor, which does not affect the income of the rich, will leave the head-count measure completely unaltered. In addition, they opined that the measure is insensitive to distribution of income among

[29] There are some other measures, like Human Development Index (HDI), it combines three components in the measurement of poverty: (i) life expectancy at birth (longevity); (ii) education attainment; and (iii) improved standard of living determined by per capita income. The Alkire-Foster (or 'AF') Method is a recent approach in the literature for measuring poverty, and it takes into cognizance, overlapping or simultaneous deprivations that a person or household experiences when using different indicators.

the poor, noting that, any transfer of income from one poor person to another, who is richer, cannot increase the head-count measure of poverty.

(ii) Poverty-Gap

Poverty-gap or income-shortfall measure of poverty tries to avoid the shortcomings of the head-count measure. It measures the transfer that would bring the income of every poor person, exactly up to the poverty line, thereby, eliminating poverty. The 'head-count' and 'poverty-gap' are income-based measures of poverty. Given the poverty line, income Π, y_i is person's income among the set of the poor people S, thus, g, is the poverty-gap of person i

$$g = \Pi - y_i \tag{2.71}$$

Total poverty cap is given as:

$$g = \sum_{i \in S} g_i$$

Indicating the mean income of the poor as y^*, and the mean poverty gap of g^*, then

$$y^* = \sum_{i \in S} {y_i}/{q}$$

$$g^* = \Pi - y^* = {g}/{q} \tag{2.72}$$

The income-gap ratio can be expressed as:

$$I = {y^*}/{\Pi} \tag{2.73}$$

(iii) Foster-Greer-Thorbecke (FGT)

Foster-Greer-Thorbecke (1984) developed a methodology that addresses the limitations of headcount and poverty-gap measures of poverty. This involves the combination of the following: (i) the head-count poverty index given by the percentage of the population, that live in the households with a consumption per capita less than the poverty line; (ii) poverty-gap index, which reflects the depth of

poverty by taking into account, how far the average poor person's income is from the poverty line; and (iii) the distributional sensitive measure of squared poverty-gap defined as the means of the squared proportionate poverty-gap that reflects the severity of poverty. Foster-Greer-Thorbecke (1984) provides the FGT poverty measure in the form:

$$P_\alpha = \frac{1}{n}\sum_{t=1}^{q}\left(\frac{Z-yi}{Z}\right)^\alpha \qquad (2.74)^{30}$$

Where:

P_α = The measure reduces to the head count ratio (q/n) when $\alpha = 0$, to the poverty–gap, when $\alpha = 1$ and to poverty severity index when $\alpha = 2$

Z= an agreed poverty line

n= the number of people in an economy,

q= the number of poor (those with incomes at or below Z),

yi= individual incomes below the poverty line (income gap ($Z - yi$ is zero for those income above the above the poverty line) and

α = a "sensitivity" parameter and takes the value 0, 1 and 2

The measures of poverty explained in the subsection 2.5.1.3 may not be exhaustive, given the multidimensional nature of poverty, and the fact, that a single definition of it, has remained elusive. Hence, Ajakaiye (1998) postulation that a standard concept of poverty remains elusive, owing to the multidimensional nature as well as its dynamic properties. In this regard, there could be several measures of poverty, to the extent they are used as methodological tools for fruitfully policy analysis.

Though, headcount poverty, poverty gap and Foster-Greer-Thorbecke (FGT) are very common measures of poverty in literature, there are also, the use of the Human

[30] If α is low, the the FGT metric weights of all the individuals with incomes below z are roughly the same. Where α is high, those with the lowest incomes (farthest below z) are given more weight in the measure. The higher the FGT statistic, the more poverty in an economy.

Development Index (HDI) and Alkire-Foster method of multidimensional measurement. According to the (UNDP, 2013)[31], HDI combine three components in the measurement of poverty: (i) life expectancy at birth (longevity); (ii) education attainment; and (iii) improved standard of living determined by per capita income. The Alkire - Foster method of multidimensional measure builds on the Foster-Greer-Thorbecke poverty measures and takes into cognizance, the multidimensional nature of poverty[32]. This involves counting the different types of deprivation that individuals or household may suffer at the same time (overlapping or simultaneous deprivations)

Notwithstanding the measures of poverty, the scourge of poverty, especially among the developing countries goes beyond mere measurement issues. There are other non-quantitative issues of poverty that could have dire consequences on those inflicted[33]. They are such that every nation must consciously fight to reduce. In analyzing the impact of poverty, Von Hauff and Kruse (1994) highlighted three major consequences, namely, (i) consequences for those affected. That is, for the people affected, poverty leads to physical and psychological misery caused inter-alia by inadequate nourishment, lack of medical care, lack of basic and job related education and marginalisation in the labour market; (ii) consequences for the national economies of countries affected, arising through the formation of slums in cities, a worsening of ecological problems particularly as a result of predatory exploitation in the agricultural sector and through the failure to use the available human resources; and (iii) consequences for the political and social development of the countries affected (Ijaiya, *et al*., 2011, p. 146).

[31] The first relates to survival-vulnerability to death at a relatively early age. The second relates to knowledge being excluded from the world of reading and communication. The third relates to a decent living standard in terms of overall economic provisioning (UNDP, 2013).

[32] The Alkire-Foster method of multidimensional measurement was developed at the Oxford Poverty and Human Development Initiative (OPHI), University of Oxford by Sabina Alkire and Professor James Foster.

[33] Further elucidation of poverty shows 'deprivation of various forms of freedom' to embraces both absolute and relative, material and non-material in both rich and poor countries (Clunies-ross *et al.*, 2009, p. 16).

2.5.2 Millennium/Sustainable Development Goals of the United Nations

The September 2000 Millennium Summit of the United Nations marked an epoch in the world fight against extreme poverty and hunger[34]. The world leaders adopted the UN Millennium Declaration, which committed nations of the world to a new global partnership, aimed at reducing extreme poverty and other time-bound targets, within a stated deadline of 2015. The MDGs are as follows; MDG 1: Eradicate extreme poverty and hunger, MDG 2: Achieve universal primary education, MDG 3: Promote gender equality and empower women, MDG 4: Reduce child mortality MDG 5: Improve maternal health, MDG 6: Combat HIV and AIDS, malaria and other diseases, MDG 7: Ensure environmental sustainability and MDG 8: Develop a global partnership for development.

An assessment of the programme indicates that the number of people living in extreme poverty declined worldwide by more than half, falling from 1.9 billion in 1990 to 836 million in 2015; primary school enrolment rate increased, and the number of out-of-school children of primary school age worldwide declined by almost half, to an estimated 57.0 million in 2015 from 100 million in 2000, across the world (United Nations Report, 2014 and 2015)[35]. In addition, there are improvements in gender equality with empowerment of women, as more girls are in school, more women are in paid employment and many more women are now in government around the world. Infant mortality rate for under 5-year old declined by more than half, dropping from 90 to 43 deaths per 1,000 live births between 1990 and 2015, while the maternal mortality ratio also declined by 45.0 per cent since 1990, with an improvement in contraceptive prevalence; and new malaria and HIV cases declining, HIV infections declined by approximately 40.0 percent between 2000 and 2013 (United Nations Report, 2015).

[34] The nature and magnitude of poverty and hunger among individuals and households in the developing countries, and its consequences on the international communities were among the factors responsible for the United Nations establishment of Millennium Development Goals.

[35] The United Nations Development Programme (UNDP). *The Millennium Development Goals Report 2015* United Nations [Online] Available at ; https://www.undp.org/publications/millennium-development-goals-report-2015 Accessed on June 17, 2021.

There is no gaining saying about the success rate of the MDGs in the world. However, the question is how has Nigeria fared in achieving these MDGs? There are mixed reports on the success level of the MDGs in Nigeria. For example, Government noted in the Nigeria 2015 Millennium Development Goals End-Point Report (2015, p. ii) in the excerpt:

> "As clearly indicated in the Report, Nigeria began to find its rhythm in the implementation of the MDGs from 2005. That was the year it successfully negotiated a debt relief from the Paris Club which enabled it to increase and target public investments in pro-poor interventions aimed at achieving the MDGs. In addition, the Presidential Committee on the Assessment and Monitoring of the MDGs and the Office of the Senior Special Assistant to the President on MDGs (OSSAPMDGs) were established to guide the use of the Debt Relief Gains (DRGs) in the execution of pro-poor programmes and projects. This Exit Report thus provides up-to-date data and analysis on Nigeria's experience in implementing the MDGs…. used the framework to improve its hitherto very poor health indices and low-gender parity index, among other indicators. The efforts translated into the reduction of maternal and child mortality and getting Nigeria on the way to eradicating polio through effective national and international partnership. Moreover, these efforts aided the reduction in the spread of malaria and HIV and AIDS, and achievement of higher net enrolment rate in basic education and gender parity in the primary school. They also led to improved access to safe drinking water".

However, according to the United Nations report (2015), about 60.0 per cent of the world's one billion extremely poor people are found in five countries in 2011: India, Nigeria, China, Bangladesh and the Democratic Republic of the Congo. In addition, out of the 2.1 million new HIV infections that occurred in 2013, 75.0 per cent occurred in 15 countries with Nigeria, South Africa and Uganda accounting for almost half of them all[36]. Nigeria has infant mortality rate of 72.7 deaths/1,000 live births, a contraceptive prevalence of 15.1% (2013), health expenditure of 3.9% of GDP (2013); HIV prevalence of 3.17% (2014 est.), a HIV burden of 3,228,600 (2013) and HIV-associated deaths of 174,300 (2014), with life expectancy at birth of 53.02

[36] The United Nations Development Programme (UNDP). *The Millennium Development Goals Report 2015* United Nations. [Online] Available at: https://www.undp.org/publications/millennium-development-goals-report-2015 Accessed on June 17, 2021.

years[37]. Further, Olabode *et al.* (2014) in their assessment of the MDGs achievement in Nigeria shows that she would not attain the MDG targets by the end of 2015, even if smaller nations in Africa did so, such as Ghana, Cameroon and Botswana. It is also noted that Nigeria, like most SSA countries, has failed to meet any of the MDGs, owing to multiplicity of health system-related, political and systemic challenges[38].

With the success level recorded in the implementation of the MDGs programme, the General Assembly adopted the 2030 Agenda for Sustainable Development that includes 17 Sustainable Development Goals (SDGs) with the aim of positively transforming the world. The goals are Goal 1: No Poverty, Goal 2: Zero Hunger, Goal 3: Good Health and Wellbeing, Goal 4: Quality Education, Goal 5: Gender Equality, Goal 6: Clean Water and Sanitation, Goal 7: Affordable and Clean Energy, Goal 8: Decent Work and Economic Growth, Goal 9: Industry, Innovation and Infrastructure, Goal 10: Reduced Inequality, Goal 11: Sustainable Cities and Communities, Goal 12: Responsible Consumption and Production, Goal 13: Climate Action, Goal 14: Life Below Water, Goal 15: Life on Land, Goal 16: Peace and Justice, Strong Institutions and Goal 17: Partnerships to achieve the Goal. The SDGs cover different aspects of human development - social development, environmental protection and economic growth. The SSA countries that are worst affected by poverty and hunger as well as other social and economic disconnects is expected to make more progress, given its performance in the MDGs end - report of 2015.

Nonetheless, with the emergent of the COVID-19 global threat that affected most economies of the world, achievement of the SDGs by member nations may be affected by its lingering impact. For example, according the World Economic Outlook report, global recovery prospects remain highly uncertain one year into the pandemic. The new virus mutations and the accumulating human toll raise concerns, even as growing vaccine coverage lifts sentiment. It suggested that economic

[37] Central Intelligence Agency (CIA) *World Factbook*. Nigeria. Retrieved [Online] Available at: https://www.cia.gov/library/publications/resources/the-world-actbook/geos/ni.htmlon Accessed June 17, 2021. [Google Scholar]

[38] Sachs J. D, McArthur, J. W. The millennium project: a plan for meeting the millennium development goals. [Online] Available at: *The Lancet*. 2005 Jan 22-28;365(9456):347–53. [PubMed] Accessed June 17, 22021. [Google Scholar].

recoveries are diverging across countries and sectors, reflecting variation in pandemic-induced disruptions and the extent of policy support[39].

2.5.3 Economic Growth and Poverty Relationship

Economic growth and poverty relations have generated two contending views in literature, namely, the 'trickle-down' and 'trickle-up' theories (Nindi and Odhiambo, 2015). The proponents of the 'trickle-down' approach believe that high economic growth trickles down to the poor, given that the distribution of income remains constant (Aghion and Bolton, 1997; Todaro, 1997; Roemer and Gugerty, 1997; Dollar and Kraay, 2002; Ravallion and Chen, 2003; and Thorbecke, 2013). To the proponents, economic growth is very important for poverty reduction – sustained economic growth raises the income of members of a society, and in turn, reduces the level of poverty. Thus, poverty reduction policies shall be aimed at encouraging economic growth (Todaro 1997; Roemer and Gugerty 1997; Dollar and Kraay, 2002; Ravallion and Chen 2003; Bourguignon 2004; and Thorbecke, 2013)[40].

On the other hand, the 'trickle-up' approach posits that economic growth does not improve the lives of the poor, but rather tickles-up to the middles class and the very rich (Todaro 1997). This, in turn, heightens the income disparity between the middle class and very rich on one side, and the very poor. The narrative of the approach is presence of reinforcing factors that maintain poverty amongst the poor population and impedes them from contributing to economic growth (Nindi and Odhiambo, 2015).

2.5.3.1 Distribution of Economic Growth

The nature of distribution of economic growth is important for the economic growth-poverty reduction. Growth associated with distributional changes would perhaps, have more effects on poverty reduction than growth that does not. For example, the

[39] World Economic Outlook: Managing Divergent Recoveries April 2021 [Online] Available at: https://www.imf.org/en/Publications/WEO/Issues/2021/03/23/world-economic-outlook-april-2021 Accessed on July 1, 2021.

[40] Increase in the real GDP growth would influence firms to require more workers, hence, generate more employment opportunities. With more workers being employed, they would be paid wages, which encourages them to spend more on their family welfare and improves the standard of living. By so doing, poverty could be reduced.

distribution of income/assets within a country through a pro-poor public expenditure, land reform as well as access to financial markets - financial inclusion will reduce poverty. Similarly, access to credit facility by the poor that are involved in small and medium scale enterprises will help in the distribution of credit across this category of persons in the society, and this will impact positively on poverty reduction. The World Bank (2004, p. 47) notes that "On average, every additional percentage point of growth in average household consumption reduces that share of people living on less than US$1 a day] by about 2.0 per cent". Therefore, the extent to which growth reduces poverty could depend on the degree to which the poor participate in the growth process and share in its proceeds.

2.5.3.2 Sectoral Composition of Economic Growth

Sectoral composition of economic growth is an important factor in determining economic growth and poverty reduction. For example, growth in the sectors of the economy, where the poor are dominant would have wider spread of impact on poverty reduction than the sectors, where the poor are less. In a developing country, like Nigeria, where majority of the citizens live in the rural area and are engaged in the production of primary products (agriculture), growth in that sector will lead to poverty reduction, because such growth will generate income for the poor and increase their demand for goods and services, they use[41]. Such demand for goods and services will generate employment opportunities and improve incentives for advances in human capital development, which, in turn, promotes economic growth and poverty reduction.

2.5.3.3 Quality of Economic Growth

The effectiveness of economic growth to reduce poverty could be anchored on its quality and not really on the rate of growth per se? A relatively low economic growth rate of 2.0 per cent per annum may have a greater development impact (more inclusive) than a narrowly based high growth rate of say 4.0 per cent or more per

[41] Focus of growth in such sector should be on productivity and diversification (value-chain), rather than increase in acreage and raw materials as these could be more growth enhancing.

annum. For example, during the eight years tenure of President Bill Clinton (1992-2000), the United States experienced an average growth rate of 3.0 per cent, resulting in the creation of 32 million jobs and poverty fell drastically to a record low since 1960s (Krugman, 2003). Ironically, in the eight years of the civilian administration of President Olusegun Obasanjo of Nigeria, for the period, 1999-2007, the average growth of the economy was 6.0 per cent, and yet did not translate into any substantial reduction in poverty or unemployment, nor did it reduce inequality (Umo, 2012). It may not be out of place to say that some developing countries fall into this category. That is, where impressive growths have been achieved, yet with very little to show for improvement in the level of poverty[42].

2.5.3.4 Sustained High Rate of Growth and Development policies

Economic growth is known to be useful for reducing the level of poverty. However, the pervasiveness of poverty among the developing countries has led many to question the efficacy of economic growth to exclusively reduce poverty (Roemer and Gugerty, 1997; Teshome, 2012). Poverty reduction transcends mere increase in economic growth. It is contended that prevalent illiteracy, growing vulnerability to hunger and diseases, environmental deteriorations, among others, affect human welfare outside of income (Streeten, 1994; World Bank, 1990). With high level of poverty in a country, there is need for sustained high rate of growth and pursuit of development policies that are directed at improving the living standards of the poor.

The attainment of sustained high economic growth may have eluded many developing countries in the Sub-Saharan Africa. Ames *et al.* (2001) notes that the sustained high rate of growth would depend upon some key structural measures, namely, regulatory reform, privatization, civil service reforms, improved governance, trade liberalisation and banking sector reforms. Furthermore, it shall be such that would expand employment opportunities, productivity and wages of the poor, sufficient to lift large

[42] Many countries in the developing world have achieved impressive economic growth rates in recent years, but the poverty levels in these countries have in general not reduced significantly (World Bank, 2013 and 2014).

numbers of people out of poverty (largest part of the country's labour force in the economy) - inclusive growth (IG)[43].

2.5.3.5 Level of Income Inequality

Related to the growth-poverty relations is the income inequality. The Kuznets (1955) curve hypothesis provides the pioneering study for assessing the income inequality and growth relations. It posits that as incomes grow in the early stages of development, income inequality initially increases – as a wider proportion of the population partakes in the rising national income, it declines. It is an indication that the level of income inequality is important for determining economic growth and poverty reduction.

Ravallion and Datt (1999) note the potential adverse implications of high-income inequality for the rate of economic growth. They viewed it as likely responsible for why the same rate of economic growth might be less effective in reducing poverty in one clime than another. In an economy, where income inequality is persistently low, the poor would tend to obtain a higher share of the gains from growth than in an economy, in which inequality is high. As the differences in the income inequality widens, poverty increases and the less effective growth would be to reduce poverty (Lustig *et al.,* 2000 and McKay, 2013)[44].

2.5.4 Economic Growth and Poverty Model

Economic growth and poverty model explain the impact of economic growth on reduction of poverty. Though, it has been suggested that persistent issues of poverty among the developing countries have put to doubt the usefulness of economic growth

[43] It is often used interchangeably with other terms like, 'broad-based growth', 'shared growth', and 'pro-poor growth (Ravallion, 2004; Ianchoivicna & Gable, 2009; and Klasen 2010). Inclusive growth provides an insight into what could happen to an economy with impressive growth, yet with high level of poverty and low standard of living. In their paper, Ozughalu and Ogwumike (2015, p .16) note the need for the emergent of inclusive growth as "the high level of poverty, high rate of unemployment and great extent of income/wealth inequality occurring simultaneously with high economic growth rates in the developing regions of the world have compelled researchers and policymakers in these regions to focus attention on the new development paradigm of 'inclusive growth".

[44]Economic growth is very important for poverty reduction DFID, 2015). However, the initial level of income distribution and how it shifts as the economy grows helps to determine the extent to which economic growth results in poverty reduction (Nindi and Odhiambo, 2015).

to reduce poverty (Roemer and Gugerty, 1997; Teshome, 2012). Many economic growth and poverty studies have inclined to the role of economic growth to tackle the challenges of poverty (Ravallion and Datt, 1996; Bhagwati, 2001; Datt and Ravallion, 2002; and Suryahadi *et al.,* 2009).

Suryahadi *et al.* (2009, p.112) points out primarily, that the model to estimate the impact of economic growth on poverty is in the form:

$$dP = \alpha + \beta y + \varepsilon \qquad (2.75)^{45}$$

Where; P is the level of poverty rate and dP is the change in poverty rate, y represents the rate of economic growth, ε is the error term, while $\alpha \; and \; \beta$ are the parameters to be estimated. They note that the parameter β to be estimated, represents the effect of growth on poverty. It shows the percentage point change in poverty rate due to 1.0 per cent GDP growth. They used panel data from provinces within a country as the unit of observation, explaining the unavailability of such time series data in developing countries and the implausibility of pooling data across countries[46].

Also, several scholars have expanded the basic economic growth-poverty model of equation (2.75) to include both the effects of economic growth change and income change, using the Gini income inequality coefficient as one of the explanatory variables (Ravallion and Chen, 1997; Anyanwu (2013); and Agrawal (2015). They developed the economic growth–poverty model in form of panel data with provinces within a country or among countries as the unit of observation.

The general form of economic growth-poverty model by Ravallion and Chen (1997), Anyanwu (2013) and Agrawal (2015);

$$P_{it} = f(g_{it}, y_{it}, x_{it}) \qquad (2.76)$$

[45] Ravallion and Datt (1996) estimated various specifications and extensions of equation (2.75).
[46] Datt and Ravallion (1998) estimated the model using panel data of Indian states, though it required some adjustments that took care of the effect of migrations and the initial conditions of each province, which may affect poverty change within each province. Similarly, Agrawal (2008) used the same method, applying state-level data in his study 'Economic Growth and Poverty Reduction: Evidence from Kazakhstan.

The natural log-linear transformation of equation (2.76) is in the form:

$$logP_{it} = \alpha_i + \beta_1 \log(gy_{it}) + \beta_2 \log(y_{it}) + \varepsilon_{it} \quad (2.77)$$
$$(i = 1, \dots, N; t = 1, \dots, T)$$

Where:

P_{it} is the measurement of Poverty at time (t) (Head count), α_i is a fixed effect reflecting time differences between countries, β_1 is the elasticity of poverty with respect to income inequality given by Gini-coefficient[47] gy_{it} in a country (i) at time (t), β_2 = The ''growth elasticity of poverty'' with respect to real per capita GDP given by y, y_{it} is the real GDP per capita in a country (i) at time (t) and ε_{it} is the error term in a country (i) at time (t).

2.5.5 Empirical Evidence on Economic Growth and Poverty

Studies on the economic growth-poverty relationship are mostly conducted among the developing countries. They emphasises the roles of economic growth to tackle the problems of poverty[48], which is adjudged the most powerful instrument for reducing poverty and improving the quality of life in developing countries (DFID, 2015). Nevertheless, Roemer and Gugerty (1997) note the two arguments that are often made against the proposition that economic growth reduces poverty. First, the Kuznets curve hypothesis. Second, the obvious depth and persistence of poverty has created doubts about the ability of economic growth to reduce poverty.

According to the authors, these doubts are especially prevalent among development professionals working directly with the poor in developing countries.

[47] The measure of income inequality is the Gini coefficient. It is the ratio of the area between the Lorenz curve and the diagonal (the line of perfect equality) to the area below the diagonal. As a measure of income inequality, the Gini coefficient ranges from 0 to 1.

[48] Ravallion and Datt (1996), Agrawal (2008) applied the growth-poverty model in province-level data in Kazakhstan. He modeled a percentage of the population whose income was below a given poverty-line as a function of average income per capita, poverty-line and income inequality. The study indicates that provinces with higher growth rates achieved faster decline in poverty. He pointed out that, it happened largely through growth, which led to increased employment and higher real wages and contributed significantly to poverty reduction.

Notwithstanding, they used OLS to regress the growth of income for the poorest two groups against the growth of GDP per capita for the entire population in a growth-poverty model. The study shows that an increase in the rate of GDP growth translates into a direct one-for-one increase in the rate of growth of average incomes of the poorest 40.0 per cent. GDP growth of 10.0 per cent a year was associated with income growth of 10.0 per cent for the poorest 40.0 per cent of the population. For the poorest 20.0 per cent, the elasticity of response was 0.921; GDP growth of 10.0 per cent was associated with income growth of 9.21 per cent. These results gave strong support to the proposition that growth in per capita GDP could be, and usually a powerful force for reducing poverty.

Similarly, Dollar and Kraay (2002) applied the growth-poverty model in a study sample of 92 countries. They observe that with average incomes rise, the income of the poorest fifth of the society rose proportionately. They argued that this effect holds across regions, income levels, and growth. They submitted that the share of income of the poorest quintile does not vary systematically with average income. It, also, does not vary with many of the policies and institutions that explain growth rates of average incomes, nor does it vary with measures of policies intended to benefit the poorest in the society. Among the measures are good rule of law, openness to international trade and developed financial markets. According to them, these factors have little system effect on the share of income that accrues to the bottom quintile.

The findings of Dollar and Kraay (2002) on the efficacy of economic growth to reduce poverty have generated criticisms among scholars, probably given their positions at the Bretton Woods Institute during the study. Also, then was the departure of Prof. Joseph Stiglitz as Chief Economist and the subsequent departure too, of Prof. Ravi Kanbur. In his studies, Prof. Kanbur notes that economic growth alone would not be enough to reduce poverty, and emphasised the need for the redistributive tax and spending policies of government (Kanbur, 1998 and Kanbur and Lustig, 1999), and this is in contradistinction with Dollar and Kraay (2002).

Also, the World Bank (1990) and Ravallion and Datt (1999) note that economic growth is not enough for poverty reduction. Other things such as human resource development for the poor people is widely seen as a necessary component, alongside economic growth, as an effective strategy for fighting poverty. Also, important according the authors is the level of income inequality and population growth. Poverty reduction transcends mere increase in economic growth. It is suggested that prevalent illiteracy, growing vulnerability to hunger and diseases, environmental deteriorations, among others, affect human welfare outside of income (Streeten, 1994; World Bank, 1990).

Other scholars, Lübker *et al.* (2000, p. 2) critiqued the works of Dollar and Kraay (2002) on the grounds that their findings are flawed by the following; (i) that the empirical work used in the study is based on theoretically unsound equations; (ii) that the data are seriously flawed; and (iii) the policy variables are not defined appropriately and are tested in an inconsistent manner. Thus, implying that the policy conclusion of the authors is unsafe. Thus, economic growth may be necessary for poverty reduction and not a sufficient condition. Policy measures targeted at the poor could help in uplifting persons/households out of poverty. For example, government policies, targeted on the sectors that are dominated by the poor individual/households could help in poverty reduction.

Aside economic growth as the major source of poverty reduction, Dreze and Sen (1995) advocates the need for effective government intervention in favour of the poor through social welfare policies as means of poverty alleviation. Similarly, the World Bank (1997) suggests that poverty reduction depends not only on rapid economic growth, but also on the basic human development, that is, the level of social indicators, literacy, life expectancy and health facilities. Dreze and Sen (1995) and the World Bank (1997) positions seem to have, among others, raised some pertinent issues regarding the role of economic growth alone in achieving poverty reduction. For instance, why has economic growth achieved poverty reduction in some countries than others and what are responsible for driving such achievements in poverty reduction?

Edwards (1995) submits that economic growth can reduce poverty through two channels; (i) where there is increase in employment and improvement in the opportunities for productive activities among the poor. He suggested that growth enhancing labour-intensive strategy is generally more effective in reducing poverty; (ii) where economic growth is associated with increase in productivity, it will improve wages and under most circumstance, the poor segments of the society will experience improvement in their living condition. In addition, Ravallion (1997) and Timmer (1997) suggest the need for reducing the widening initial income inequality among the citizenry. They note in a cross-country distributional data that higher initial income inequality entails a lower (absolute) elasticity of poverty to growth in average incomes (Ravallion, 1997; Timmer, 1997). Hence, a country with a Gini index of 0.25 could expect a growth elasticity of the headcount index of around negative 3.3, while for a country with a Gini index of 0.60, the elasticity is negative 1.8 (Ravallion, 1997).

Also important for poverty reduction is the composition of economic growth. Ravallion and Datt (1996) used reduced-form analysis on time-series data to study the evolution of poverty in India during the period, 1951-91. They linked poverty changes to the value-added growth rates in the three major sectors of economic activity and find that growth in agriculture and services helped to reduce poverty in both urban and rural areas, while industrial growth did not reduce poverty in either of the areas. Ravallion and Chen (2004) notes that growth in agriculture emerges as far more important than growth in secondary or tertiary sectors for the purpose of poverty alleviation in China over 1980 - 2001. In Indonesia, Suryahadi *et al.* (2009) modeled poverty as a function of economic growth. They differentiated economic growth into their sectoral compositions in urban-rural location. The study reveals that rural services growth reduces poverty in all sectors and locations, whereas the rural agriculture growth strongly reduces poverty in the rural areas. Impliedly, it is not every sector of the economy that is growth-enhancing - reduces poverty by increasing employment and higher real wages.

The sectoral growth impact of poverty reduction is further confirmed in an India study. Agrawal (2015) estimates the drivers of incidence of poverty in India, using the long-run equation derived from the auto-regressive distributed lag (ARDL) co-integration procedure proposed by Pesaran *et al.* (2001). He points out that the ARDL is valid for non-stationary variables as well as for a mixture of I(0) and I(1) variables. Furthermore, given the small sample size of about 40 annual observations, he suggested it was not sufficient for Johansson and Juselius (1990)-type vector error correction procedure. His growth-poverty model outcome shows that higher growth rates were associated with faster decline in poverty. He asserts that growth helped to increase employment and real wages, which contributed to poverty reduction. Also, he suggested that the increase in government social expenditure contributed significantly to poverty alleviation.

Some studies on the impact of economic growth on poverty reduction in Africa aligned with the importance of economic growth in reducing poverty. For example, Young (2012) uses growth of real consumption to investigate changes in poverty in 29 Sub-Saharan and 27 other developing countries. He finds standard of living in SSA countries have improved during the last two decades, which invariably leads to poverty reduction. Similarly, Anyanwu (2013) used the growth-poverty model in a panel study, with data from 43 African countries for the period, 1980-2011. He modeled poverty as a function of income inequality (Gini-coefficient), real GDP per capita and other control variables, He found higher real GDP per capita has negative effect on poverty in Africa, and thus good for poverty reduction and inclusive growth in the continent.

However, the results of Young (2012), Anyanwu (2013) and Agrawal (2015) vary with some country studies in Africa. In Nigeria, Aigbokhan (2000) carried out an empirical study on the relationship among poverty, inequality and economic growth for the period 1986 to 1996, and found a significant and positive relationship between economic growth and poverty, an indication the growth of economy from 1986-1996 did not yield an improvement in the level of poverty. His findings suggest that the so-

called “trickle down” phenomenon, underlying the view that growth improves poverty and inequality, is not supported by Nigeria’s data. Consequently, he notes that it might well be due to the nature of growth pursued, and the macroeconomic policies that underlie it.

Also, Bakare and Ilemobayo (2013) aligned with Aigbokhan (2000). They modelled incidence of poverty as a function of gross domestic product rate, unemployment rate and literacy rate for the period, 1980 to 2008. They used Ordinary Least Square (OLS) to estimate a multivariate regression. Their findings show significant and positive relationship between economic growth rate and incidence of poverty in Nigeria. Implying that economic growth rate does not reduce poverty in Nigeria. However, unemployment rate has appropriate sign (i.e. positive) and is statistically significant and in support of it’s a *priori* expectations. Corroborating Aigbokhan (2000) and Bakare and Ilemobayo (2013), Okoroafor and Chinweoke (2013) used the OLS technique to examines the relationship between economic growth and poverty in Nigeria for the period 1990–2011. They observe no evidence of a correlation between poverty and economic growth.

Similarly, Ijaiya *et al.* (2011) applied a time series data from 1980 to 2008 in Nigeria, and modeled household consumption expenditure (measure of poverty reduction) as a function of Gross National Income (GNI) per capita income (measure of economic growth). They used a multiple regression analysis based on the model proposed by Grootaert, *et al.* (1995, p. 4). They took into consideration a time subscript (t) and a difference-in-difference estimator that describes poverty reduction as a function of economic growth and changes in economic growth. The result indicates that the initial level of economic growth did not reduce poverty, while a positive change in economic growth reduces poverty. They noted that to improve and sustain the rate of economic growth in Nigeria, from which poverty could be reduced, measures such as, stable macroeconomic policies, huge investment in agriculture, infrastructural development and good governance are required.

2.6 Inference Drawn from Theoretical and Empirical Literature

The inferences drawn from the review of literature on public expenditure impact on growth are fourfold. First, literature on economic growth is dominated by the neoclassical and endogenous growth models. In the neoclassical growth model, public policy (public expenditure) has no impact on the long run economic growth, whereas in the endogenous growth model, it does have an effect.

Second, the neoclassical Solow growth model was improved upon with the introduction of human capital development as one of the explanatory variables in the model by Mankiw, Romer and Weil (1992), and this has been popularised as the augmented Solow growth. Several studies on the augmented Solow model have either incorporated one form of public policy (public expenditure/components) into the model in modelling the endogenous growth model (Temple and Johnson, 1998; Bajo-Rubio, 2000; Milbourne *et al,* 2001; and Barro & Sala-i-Martin, 2004).

Third, the theoretical models' prediction (Barro, 1990; Bajo-Rubio, 2000; Milbourne *et al,* 2001; and Barro & Sala-i-Martin, 2004) that the impacts of public expenditure on economic growth differ between developing countries (associated with small size of government) and developed countries (associated with large size of government). For example, positive effect of public expenditure impact on growth is expected to be found in the developing countries with small size of government, whereas it is negative for the developed countries with large size of government at certain threshold.

Fourth, research methodology and outcome; there appears to be significant differences among study methodologies and outcomes on the impact of public expenditure on economic growth. These different scholarly positions could be informed by the choice of methodology in the respective studies - here, we consider the nature of data set, econometric technique and measurement of variables as well as country specifics. For example, in comparing the findings between Ram (1986) and Landau (1986), Rao (1989) attributed the sharp contrast in both studies to

significant differences in their models and in the specification of government size variables. He observed that Ram's model has a better theoretical foundation compared with the multiple-regression approach of Landau. Furthermore, he notes that Landau used a variety of government expenditure components as against aggregate government consumption used by Ram.

In addition, most studies on the impact of economic growth on poverty are conducted, using data from the developing countries, where poverty are suspected to be prevalent. Some of these studies confirmed the importance of sustained economic growth in reducing poverty, as well as the need for social development factors to play complementary role. The studies are conducted, using mainly state-level data for the panel and cross-sectional analysis. The reason for these could be attributed to the dearth of long-term time series annual data on poverty in developing countries.

Studies show that the composition of economic growth could have different impacts on poverty reduction. The effectiveness of economic growth is important for reducing poverty, especially in the developing countries – quality, and its spread among the sectors and not really on the magnitude (rate of growth). For example, a relatively low economic growth rate of 2.0 per cent per annum could have a greater development impact (more inclusive) than a narrowly based high growth rate of say 4.0 per cent or more per annum.

Thus, most studies reviewed in the literature focuses on the impact of public expenditure/components on economic growth. Some are on the impact of economic growth on poverty reduction. In the instant study, we shall focus on the impact of public expenditure on economic growth and poverty reduction in Nigeria during the period, 1981-2015. We will achieve this, using two regression models; variants of augmented Solow model by Mankiw, Romer and Weil (1992) for the estimation of growth-public expenditure relations and growth-poverty model by Ravallion and Chen (1997), Anyanwu (2013) and Agrawal (2015) for the estimation of growth-poverty relations. In addition, we shall tie public expenditure impacts on economic

growth and poverty reduction through policy simulation exercise, using public expenditure as the policy variable.

2.7 Conclusion

The chapter attempts a survey of literature on the building block of the study, public expenditure, economic growth and poverty. We noted that the neoclassical Solow growth model provides the foundation for understanding growth model. Further, the augmentation of neoclassical Solow growth model with the introduction of the human capital development element in the model by Mankiw, Romer and Weil (1992), and the generalisation, involving the use of fiscal policy variables (public expenditure or taxes) generates the endogenous growth model. The empirical studies on public expenditure-growth relationship seem to be dominated by these growth models; neoclassical and endogenous. Fiscal policy (public expenditure) is noted to play very important role in determining long run economic growth in the latter, unlike in the former.

However, empirical literature is inconclusive on the impacts of public expenditure on economic growth both in the developed and developing countries. Studies show non-monotonic relationship between public expenditure and economic growth in the long run - government finances its public expenditure through revenue/taxes and this exerts pressure on the private agents and impedes economic growth. Also, the theoretical underpinnings are that public expenditure would have positive impact on growth in the developing, where the size of government is considered small compared with the developed countries, where there is large public sector presence. The outcomes of various studies are influenced by the different methodologies/techniques used by authors as well as the different data set or country specific situations.

Also discoursed, is the issue of poverty. Poverty is one of the major challenges facing both the developed and developing countries, though most prevalent in the latter. Poverty could be multifaceted and results in degradation of human values. To ascertain the strength/pervasiveness of poverty, various methods have been advanced

in literature for measuring it. Economic growth is considered very crucial for poverty reduction, yet its pervasiveness among the developing countries, puts to doubt the vulnerability of economic growth alone to reduce poverty.

Studies suggest that country could experience high economic growth, yet with high level of poverty. Poverty reduction requires complementing economic growth with social development factors; reduction in income inequality and increase government social sector expenditure, such as health, education, welfare programs and social security. Accordingly, reduction of poverty is essential for the provision of a dignified life to all citizens of the country. There is need for study to establish the impact of public expenditure on economic growth and poverty reduction. The study covers the period 1981-2015 and adopts two regression models; variants of augmented Solow model by Mankiw, Romer and Weil (1992) for the growth-public expenditure relations and growth-poverty relations by Ravallion and Chen (1997), Anyanwu (2013) and Agrawal (2015) for estimations of the models parameters. Thereafter, the estimates will be used for policy simulation, using public expenditure as the policy variable.

CHAPTER THREE
Public Expenditure, Economic Growth and Poverty in Nigeria

3.0 Introduction

Public expenditure could play very important role in the development of any economy. It ensures resource allocation, regulation of financial markets, establishment of rules and regulations guiding the conduct of the society, provision of infrastructure and stabilization of the economy. Through the foregoing interactions, public expenditure encourages economic growth and poverty reduction. Studies, however, indicate that public expenditure could be productive or non-productive (Barro and Sala-i-Martin, 1992), and that its composition may be more relevant than the level (Kneller *et al.*, 1999, p. 173 and Nijkamp and Poot, 2004, p. 107).

In this regard, the chapter provides stylised facts on the interaction of public expenditure, economic growth and poverty reduction in Nigeria. The chapter is divided into five (5) sections. Section 3.1 is public expenditure, trend and composition. Sections 3.2 and 3.3 evaluate the composition of Nigeria's gross domestic product and public expenditure, economic growth and poverty, respectively. Section 3.4 highlights the possible causes and consequences of poverty in Nigeria, while section 3.5 concludes the chapter.

3.1 Public Expenditure Trend and Composition

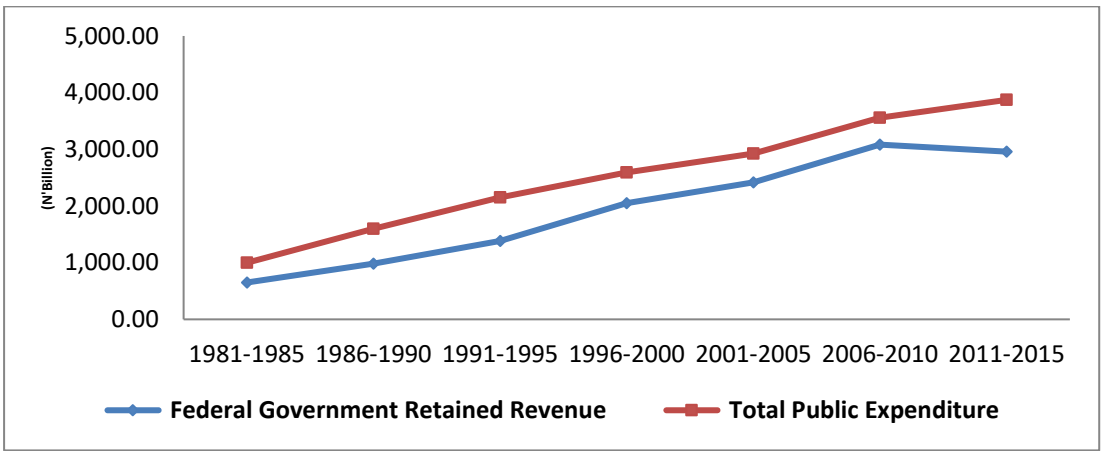
3.1.1 Public Expenditure Trend

Public expenditure is financed through the government retained revenue in Nigeria. The major source of government retained revenue is foreign exchange earnings generated from the sale of crude oil. Figure 1 shows that movement in the public expenditure mimics movement in the federal government retained revenue during the study period. For example, the sharp decline in the international oil prices in the early1980s that negatively affected the levels of government retained revenue is reflected in the public expenditures decline, during the same period[49]. For example,

[49] There was slump in the international crude oil price from about US$41.0 in 1981 to around US$11.0 per barrel in July 1986,

the 5-year average annual government retained revenue and public expenditure slowed from ₦3,581.5 billion and ₦4,027.9 billion in 1976-1980 to ₦650.5 billion and ₦998.3 billion in 1981-1985, respectively. Thus, the sudden decline in the 5-year average annual government retained revenue prompted the government to introduce series of austerity measures in 1982 to cushion the effects of the dwindling oil prices, and lull in the level of economic activities[50].

Figure 1: Movements in the Average Annual Federal Government Retained Revenue and Total Public Expenditure, 1981 – 2015



Source: Computed by the author, using data from the CBN Statistical Bulletin, 2016.

However, with the increase in the 5-year average annual government retained revenue from ₦650.5 billion to ₦983.7 billion between 1981-1985 and 1986-1990, public expenditure increased from ₦998.3 billion to ₦1,598.9 billion during the same periods. Similarly, in 1991-1995, the 5-year average annual government retained revenue increased to ₦1,384.0 billion from ₦983.7 billion in 1986-1990, while public expenditure increased to ₦2,149.0 billion from ₦1,598.9 billion during the same period.

The increases in the 5-year average annual government retained revenue and public expenditure continued throughout the study period, until between 2006-2010 and

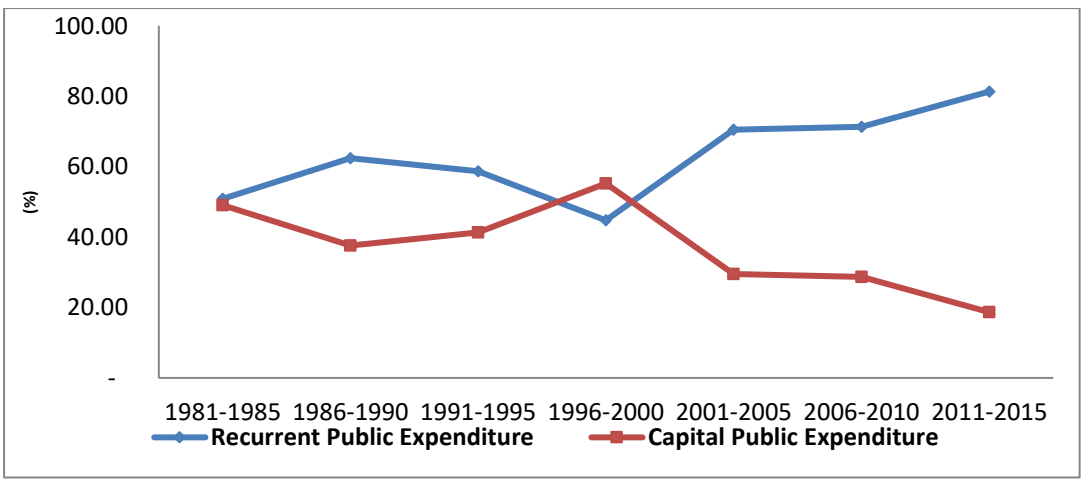
[50] These were budget-tightening austerity measures of the 1982 and the subsequent Structural Adjustment Programme (SAP) of 1986.

2011-2015. During these periods, the 5-year average annual government retained revenue declined from ₦3,083.1 billion to ₦2,961.1billion, whereas the public expenditure increased from ₦3,556.5 billion to ₦3,872.3 billion, respectively. The decline in the government retained revenue could be attributed to the fall in the crude oil prices, following the gradual recovery of world economies after the financial crises of 2007/2008.

3.1.2 Composition of Public Expenditure by Economic Classification

During the study period, the disaggregated 5-year average annual public expenditure by economic classification shows that, it is dominated by the recurrent public expenditure, except for the period 1996-2000. For example, the average annual recurrent public expenditure/total public expenditure ratio is 51.0, 62.0, 59.0, 71.0, 71.0, and 81.0 per cent for the period 1981-1985, 1986-1990, 1991-1995, 2001-2005, 2006-2010 and 2011-2015, respectively. For the period 1996-2000, the average annual recurrent public expenditure/total public expenditure ratio is 45.0 per cent, while capital public expenditure ratio is 55.0 per cent (Figure 2).

Figure 2: Movement in the Average Annual Recurrent and Capital Expenditures/Total Public Expenditure (%), 1981 – 2015



Source: Computed by the author, using data from the CBN Statistical Bulletin, 2016.

Accordingly, the average annual recurrent public expenditure/total public expenditure ratio throughout the study period is 62.8 per cent, while the capital public expenditure

is 37.2 per cent. It is an indication that the public expenditure in Nigeria is dominated by recurrent public expenditure. The domination of public expenditure by recurrent public expenditure in Nigeria's public expenditure profile may have negative implications for the economic growth of the country. Though, some studies have suggested otherwise[51]. Nevertheless, theoretically, capital public expenditure is known to be growth-enhancing.

In addition, Figure 2 indicates two noticeable periods in the public expenditure profile of Nigeria during the study period, namely, 1981-1999 and 2000-2015. The periods correspond to what could be considered a public expenditure-switching era between ratios of recurrent and capital expenditures to total public expenditure. That is, it corresponds to the military government dominated era (1981-1999) and civilian government era (2000-2015). The military government era (1981-1999) is characterised with an average annual recurrent public expenditure/public expenditure ratio of 53.6 per cent, while the capital public expenditure/public expenditure ratio is 46.4 per cent. On the other hand, the civilian government era (2000-2015) is mostly dominated by recurrent public expenditure, with an average annual recurrent public expenditure/public expenditure ratio of 73.8 per cent, while the average annual capital public expenditure/public expenditure ratio is 26.2 per cent.

3.1.3 Composition of Public Expenditure by Functional Classification

Table 5 shows further disaggregation of the public expenditure by functional classification. It indicates that as a ratio of the total public expenditure, transfers dominated the total public expenditure throughout the review period, except for the periods, 1996-2000 and 2006-2010, respectively. During these periods, it has 5-year average annual values of 30.9 and 28.7 per cent, respectively compared with the economic services public expenditure/total public expenditure ratio of 36.9 per cent for 1996-2000 and the general administration public expenditure/total public

[51]Ogiogio (1995) observed contemporaneous government recurrent expenditure has more significant effect than the capital expenditures, while the five-year lag of capital expenditures are more growth inductive. Odedokun (2001) notes that capital expenditure has a negative impact on growth, just as current expenditure on goods and services. However, expenditure on wages and salaries is growth-promoting.

expenditure ratio of 32.9 per cent for 2006-2010. Aside these periods, the 5-year average annual transfers public expenditure/total public expenditure ratio is 53.7, 59.0, 62.2, 34.5 and 38.5per cent for the period, 1981-1985, 1986-1990, 1991-1995, 2001-2005 and 2011-2015, respectively.

Table 5: Functional Classification of Public Expenditures/Total Public Expenditure Ratio (%), 1981 – 2015

Period/Year	General Administration	Social and Community Services	Economic Services	Transfer
1981-1985	15.0	11.4	19.9	53.7
1986-1990	20.3	9.8	11.0	59.0
1991-1995	17.1	7.6	13.0	62.2
1996-2000	22.5	9.7	36.9	30.9
2001-2005	30.5	13.6	21.4	34.5
2006-2010	32.9	15.4	23.0	28.7
2011-2015	28.8	18.9	13.8	38.5

Source: Computed by the author, using data from the CBN Statistical Bulletin, 2016.

Following the transfers public expenditure/total public expenditure ratio, is the general administration public expenditure/total public expenditure ratio. It has a 5-year average annual ratio of 15.0, 20.3, 17.1, 22.5, 30.6, 32.9 and 28.8 per cent for 1981-1985, 1986-1990, 1991-1995, 1996-2000, 2001-2005, 2006-2010 and 2011-2015, respectively. However, the economic services public expenditure/total public expenditure ratio and social and community services public expenditure/total public expenditure ratio have the least 5-year average annual per cent during the study period.

The domination of the Nigeria's public expenditure by transfers and general administration during the study period could be an indication of a textbook example of a country bedeviled with large bureaucracy and debt service regimes. For example, transfer includes public debt servicing, pensions and gratuities, contingencies/subventions, and general administration is defense, internal security and National Assembly. Channeling most of the public expenditure to transfers and

general administration rather than on the social and community services; education, health and other social community services, and economic services; agriculture, transportation and communication could have negative effects on the economic growth and poverty reduction in the country. Though, empirical literature shows varied results on the impact of the different components of public expenditure on economic growth. It is expected that social sector expenditures; education, health and other social community services could be more growth-enhancing and poverty reduction inclined.

3.1.4 Economic Growth and Social Sector Public Expenditure

Table 6 shows the ratios of public expenditure on education, health, agriculture, transport and communication and other social and community services to the total public expenditure did not exhibit progressive movement in their 5-year average annual expenditure, respectively. They are characterised with periods of high and low spending. For instance, the ratio of 5-year average annual public expenditure on agriculture to total public expenditure is the highest among the social public expenditure in 1981-1985. During that period, it is 20.0 per cent compared with 8.5, 5.0, 4.6 and 1.8 per cent for transport and communication, social and community services, education and health, respectively.

Table 6: Social Sector Public Expenditures/Total Public Expenditure (%), 1981 – 2015

Period/Year	Education	Health	Agriculture	Transport and Communication	Other Social and Community Services
1981-1985	4.6	1.8	20.0	8.5	5.0
1986-1990	4.9	1.4	6.2	2.7	2.3
1991-1995	4.0	1.5	3.5	1.4	0.9
1996-2000	6.3	2.2	4.7	1.9	1.1
2001-2005	6.8	4.3	4.3	3.0	2.6
2006-2010	6.8	4.6	5.2	3.3	3.5
2011-2015	8.4	5.5	2.8	1.4	6.6

Source: Computed by the author, using data from the CBN Statistical Bulletin, 2016.

Further, it is the highest in 1986-1990, with 5-year average annual ratio of 6.2 per cent, while the ratios of education, transport and communication, other social and community services and health are 4.9, 2.7, 2.3 and 1.4 per cent during the same period, respectively. Thereafter, the ratio of 5-year average annual public expenditure on education to total public expenditure topped the table throughout the remaining study period. It is 4.0, 6.3, 6.8, 6.8 and 8.4 per cent for 1991-1995, 1996-2000, 2001-2005, 2006-2010 and 2011-2015, each.

Table 7 indicates the social sector public expenditure as a percentage of GDP. The 5-year average annual social sector public expenditures to GDP ratio ranged between approximately 1.0 and 3.0 per cent over the last three decades. Within these decades, the average annual real GDP grew from -2.6 to 4.7 per cent between 1981-1985 and 2011-2015. The ratios of 5-year average annual social sector public expenditure on education and health to GDP increased from 0.3 to 0.5 and 0.1 to 0.3 per cent between the periods, 1981-1986 and 2011-2015, respectively, whereas agriculture and transport and communication decreased from 1.4 to 0.2 and 0.6 to 0.1 per cent, during the same period. The other social and community services remained at 0.4. Generally, the ratios of 5-year average annual social sector public expenditure as a percentage of GDP declined from 2.8 to 1.5 per cent between 1981-1985 and 2011-2015.

Table 7: Average Annual Real GDP Growth Rate and Social Sector Public Expenditures as Percentage of GDP (%), 1981 – 2015

Social Public Expenditure as % of GDP	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	2006-2010	2011-2015
Education	0.3	0.5	0.4	0.7	0.6	0.5	0.5
Health	0.1	0.1	0.2	0.3	0.4	0.4	0.3
Agriculture	1.4	0.6	0.4	0.6	0.4	0.4	0.2
Transport and Communication	0.6	0.3	0.2	0.2	0.3	0.3	0.1
Other Social and Community Services	0.4	0.2	0.1	0.1	0.2	0.3	0.4
Total	**2.8**	**1.6**	**1.2**	**1.9**	**2.0**	**1.8**	**1.5**
Average Annual Real GDP Growth (%)	**-2.6**	**1.5**	**0.5**	**3.3**	**11.2**	**7.2**	**4.7**

Source: Computed by the author, using data from the World Bank database and CBN Statistical Bulletin, 2016.

Table 8 shows most of the components of social sector public expenditure per capita have not made remarkable progresses, except for health public expenditure per capita. For example, the 5-year average annual public expenditure on health per capita level progressed throughout the study period. For example, it is ₦228.0, ₦244.8, ₦325.9, ₦500.1, ₦944.2, ₦1,072.4 and ₦1,241.0 for 1981-1985, 1986-1990, 1991-1995, 1996-2000, 2001-2005, 2006-2010 and 2011-2015, respectively. Similarly, the 5-year average annual education public expenditure per capita levels maintained an upward movement, except for 1991-1995.

Table 8: Real GDP Per Capita and Social Sector Public Expenditure per Capita, 1981-2015

Social Public Expenditure Per Capita	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	2006-2010	2011-2015
Education	596.8	878.2	833.2	1,369.7	1,499.3	1,560.9	1,901.1
Health	228.0	244.8	325.9	500.1	944.2	1,072.4	1,241.0
Agriculture	2,589.3	1,029.8	686.4	1,130.3	958.1	1,220.1	639.3
Transport and Communication	1,147.3	462.5	297.4	396.2	674.9	820.6	325.3
Other Social and Community Services	691.1	399.3	205.6	261.9	554.5	877.1	1,512.8
Total	**5,252.5**	**3,014.5**	**2,348.5**	**3,658.2**	**4,631.1**	**5,551.1**	**5,619.4**
Average Annual Real GDP Per Capita (N)	229,251.0	189,560.8	194,030.9	191,411.4	234,427.10	321,819.10	372,470.40

Source: Computed by the author, using data from the World Bank database and CBN Statistical Bulletin, 2016.

Apart from the periods of 1981-1985 and 1986-1990, other social and community services per capita maintained an upward trend throughout 1991-1995, 1996-2000, 2001-2005, 2006-2010 and 2011-2015. Its 5-year average annual per capita is ₦205.6, ₦261.9, ₦554.5, ₦877.1 and ₦1,512.8, apiece. However, the 5-year average annual public expenditure on agriculture per capita and transport and communication per capita did not show upward trend. For example, expenditure on agriculture per capita ranged between ₦2,589.3 and ₦639.3 between 1981-1985 and 2011-2015, while transport and communication ranged between ₦1,147.3 and ₦325.3, during the same period. The overall social sector public expenditure per capita increased from ₦5,252.5 to ₦5,619.4 between 1981-1985 and 2011-2015.

Increases in the social sector public expenditures per capita are expected to increase the real GDP per capita, and by so doing, reduces the incidence of poverty. Social sector public expenditure on education, health and welfare provides an important transmission channels through which poverty could be reduced. For example, education and health are among the necessities that give value to human life. The two are very necessary for workplace productivity and cornerstone of human capital (Dreze and Sen, 1995 and Sen, 1996). Education equips people with the basic knowledge and skills needed to have improved quality of life. Policies and programmes of government that are channeled at increasing the citizens' access to education and the effective utilization of educational opportunities assist greatly in poverty reduction. Countries with high level of education are most likely to develop faster than countries with low levels of education[52].

Table 9: Access and Quality of Education in Nigeria

Indicator	1980	1985	1990	1995	2000	2005	2010	2015
School enrollment, primary (% gross)	94.82	106.25	86.44	89.24	98.64	101.32	85.07	-
School enrollment, secondary (% gross)	13.67	29.32	24.71	-	24.59	34.94	44.20	-
School enrollment, tertiary (% gross)	1.84	3.41	-	-	6.12	10.48	9.57	-
Pupil-teacher ratio, primary	35.82	39.99	41.00	37.21	42.90	36.91	37.55	-
Pupil-teacher ratio, secondary	41.91	36.16	22.11	-	30.89	40.16	23.20	-
Average Years of Schooling	6.60	8.40	6.50	6.50	7.70	9.00	9.00	10.00

Source: World Bank Database and World Development Indicators.

Table 9 indicates that the average number of years of schooling in Nigeria has improved from 6.6 per cent in 1980 to 10.0 per cent in 2015, an improvement in educating the population. However, the school enrollment rate at primary, which increased from 94.8 to 101.3 per cent between 1980 and 2005, declined to 85.1 per

[52]World Bank (2004) notes that individuals with low levels of literacy are much less likely to secure employment than their more skilled contemporaries. For example, it found that the average earnings of workers with complete primary education were about 1.7 times that of illiterates. Workers with secondary education had average earning of about 1.6 times the level of primary school graduate and about 2.7 times that of illiterates, while university graduates had average earnings about 12 times the level of illiterates and about 4.5 time the level of secondary school graduate. In addition, it asserts that the income disparity between primary and secondary school graduates was about 50.0 per cent, while the disparity between secondary school and university graduates was about 60.0 per cent.

cent in 2010. The secondary school enrollment was 13.7 per cent in 1980, it improved to 34.9 per and 44.2 per cent for 2005 and 2010, respectively. School enrollment at the tertiary level improved from 1.8 per cent in 1980 to 10.8 per cent in 2005, before declining to 9.6 per cent in 2010. The pupil-teacher ratio, a very important indicator for measuring the quality of education, increased from 35.8 in 1980 to 36.9 in 2005 and further 37.6 in 2010 for the primary school. Thus, indicating a decline in the pupil-teacher ratio of primary education in Nigeria. Secondary school pupil-teacher ratio recorded improvement. For example, it reduced from 41.9 in 1980 to 40.2 in 2005 and further 23.2 in 2010. Lowering the pupil-teacher ratio enhances the quality of education and strengthens the capacity of human resources.

Table 10: Access and Quality of Health in Nigeria

Indicator	1980	1985	1990	1995	2000	2005	2010	2015
Life expectancy at birth, total (years)	45.50	45.90	45.60	45.10	46.30	49.00	51.40	53.10
Hospital beds (per 1,000 people)	0.87	-	1.67	-	1.20	-	-	-
Physicians (per 1,000 people)	0.11	0.19	-	-	0.27	0.28	0.40	-
Mortality rate, infant (per 1,000 live births)	127.00	124.50	126.20	123.60	112.30	96.50	81.10	69.00
People using at least basic drinking water services (% of population)	-	-	-	-	16.77	18.46	19.31	19.40
People using at least basic sanitation services (% of population)	-	-	-	-	36.46	34.95	33.67	32.60
Human Deveopment Index	-	-	-	0.38	0.40	0.43	0.46	0.53

Source: World Bank Database and World Development Indicators.

Table 10 reports some of the indicators of access to health from 1980-2015. It shows that some indicators of access to and quality of health have improved, whereas some have not. For example, life expectancy at birth improved from 45.5 to 50.8 years between 1980 and 2010, and further 53.0 years in 2015. These improvements do not really depict a good picture, compared with some other SSA countries. In 1980, the life expectancy at birth in Nigeria was 45.5 years and falls short of the average SSA level of 48.2 years, and that of South Africa, Ghana and Egypt with 57.7, 52.3 and 58.3 years, respectively. Also, in 2010, life expectancy in Nigeria was 50.8 years, whereas, it was 56.9, 55.9, 60.9 and 70.4 years for the average Sub-Saharan African, South Africa, Ghana and Egypt, respectively. Furthermore, it was 53.1 years for 2015

in Nigeria, an improvement to the 2010 level, though still low compared with the average Sub-Saharan African, South Africa, Ghana and Egypt levels of 59.9, 61.5, 62.4 and 71.3 years, respectively (UNDP, 2016).

The number of physicians (per 1000 people) has made improvement from 1980 to 2010. Also, infant mortality per 1,000 live births showed improvement. It reduced from 127.0 in 1980 to 69.0 in 2015. However, the percentage population of people, using at least basic sanitation services declined from 36.5 to 32.6 per cent, whereas, people using at least basic drinking water services increased from 16.8 to 19.40 per cent, during the same period (Table 10). Good health condition is very important for poverty reduction. Poor health condition could limit the ability of household to work and generate income. With reduced income and increased expenditure on medicals, owing to ill-health, savings become difficult. Some studies have shown that poor health has a negative impact on the household's income and economic growth (Barro, 1996 and Bhargava, 2001).

Nigeria, however, recorded marginal increases in her human development index (HDI)[53]. For example, Nigeria's HDI in 1995 was 0.38 and marginally increased to 0.40 in 2000. A decade later, between 2000 and 2010, its level increased from 0.40 to 0.50. Furthermore, it increased to 0.53 in 2015. Comparatively, except for 2000, this is barely higher than the average Sub-Saharan African levels of 0.42, 0.49 and 0.52 for 2000, 2010 and 2015, respectively. Nevertheless, they are lower than the South Africa, Ghana and Egypt levels. South Africa was 0.63, 0.64 and 0.67, while Ghana was 0.49, 0.55 and 0.58 and Egypt 0.61, 0.67 and 0.69 for 2000, 2010 and 2015, respectively (UNDP, 2015 and 2016).

In terms of ranking of the human development index (HDI) among countries by the various UNDP reports, Nigeria's position has not been very encouraging for the

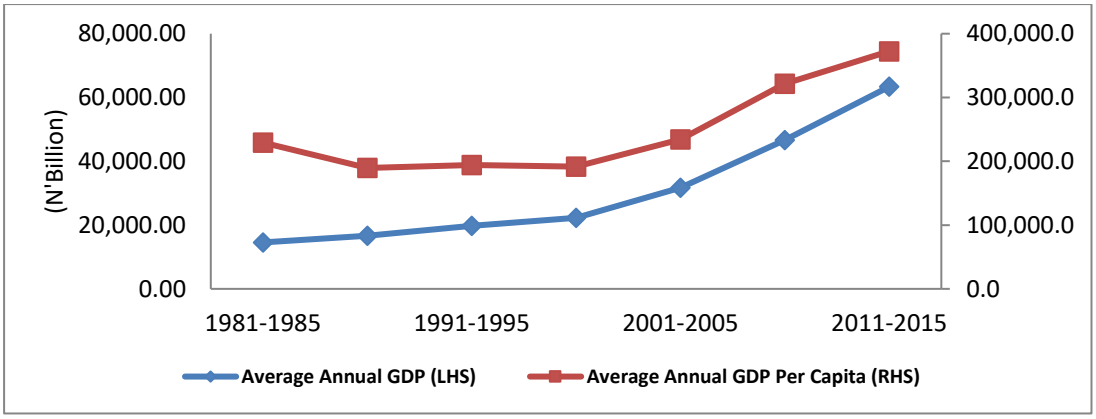
53HDI is considered a better measure of a country's progress than income growth, and a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living" (UNDP, 2013).

period between 2010 and 2015. For example, with the HDI of 0.46, it ranked 158th among 182 countries in 2010 and with 0.47 in HDI for 2012, it ranked 153rd out of 187 in the list of countries with the lowest HDI (UNDP, 2013). Also, the UNDP Report (2014) puts Nigeria's HDI value for 2013 at 0.50, which was in the low human development category – thereby, placing the country at 152nd out of 187 countries. Furthermore, it ranked 151st out of 188 countries and 152nd out of 188 countries for 2014 and 2015, respectively (UNDP, 2015 and 2016).

3.2 Real Gross Domestic Product Trend and Composition

3.2.1 Gross Domestic Product Trend

Figure 3: Movement in the Average Annual Real Gross Domestic Product and Real GDP per Capita, 1981 – 2015



Source: Computed by the author, using data from the World Bank database.

Figure 3 shows the upward movement in the Nigeria's real GDP for the period, 1981-2015. The 5-year average annual real GDP maintained an upward movement throughout the study period. For example, it increased from ₦14,565.2 billion in 1981-1985 to ₦16,663.5 billion and ₦19,815.9 billion in 1986-1990 and 1991-1995, respectively. Furthermore, it increased from ₦22,287.5 billion to ₦31,686.0 billion between 1996-2000 and 2001-2005. For 2006-2010 and 2011-2015, the real GDP maintained the upward movement from ₦46,679.5 billion to ₦63,367.3 billion, respectively.

Similarly, the 5-year average annual real GDP per capita has upward movement, except for the period 1986-1990, during which Nigeria implemented the structural adjustment programme. For example, it decreased from ₦229,251.0 in 1981-1985 to ₦189,560.8 in 1986-1990, before increasing to ₦194,030.9 in 1991-1995. Further, it increased from ₦191,411.4 to ₦234,427.1 between 1996-2000 and 2001-2005. For 2006-2010 and 2011-2015, the real GDP per capita increased from ₦321,819.1 to ₦372,470.4, respectively.

3.2.2 Real Gross Domestic Product by Activity Sector

Nigeria's GDP consists of forty-six (46) sub-sectors. These sub-sectors are categorised under the following activity sectors;

(i) Agriculture; crop production, livestock, forestry and fishing,
(ii) Industry; crude petroleum, solid minerals and manufacturing,
(iii) Building and Construction,
(iv) Trade (Wholesale and Retail), and
(v) Services; transport, information and communication, utilities, accommodation and food services, finance and insurance, real estate and human health and social services

The composition of the GDP shows that it has changed in value/volume since the Nigeria's independence in 1960. For example, the agriculture activity sector used to be the dominant sector of the GDP. Statistics show that agriculture output accounted for 63.0 and 54.0 per cents of the GDP, during the periods 1960-1964 and 1965-1969. It, however, declined significantly from the 1970s, following the oil-boom of the period. From 5-year average annual level of 54.0 per cent for the period 1965-1969, it dropped to 33.2 per cent for the period 1970-74, and further 30.2 in 1975-79 (Aigbokhan, 2001).

Table 11: Composition of 5-year Average Annual Real Gross Domestic Product by Sectors (%), 1981 – 2015

	Agriculture	Industry	Building and Construction	Trade	Services
1981-1985	16.8	41.3	4.1	12.1	25.7
1986-1990	19.1	41.3	2.4	12.2	25.0
1991-1995	19.0	40.7	2.5	12.1	25.7
1996-2000	20.1	38.1	2.7	11.5	27.6
2001-2005	24.8	33.3	2.5	11.1	28.3
2006-2010	25.0	24.8	2.7	15.4	32.1
2011-2015	23.3	20.9	3.6	16.7	35.5

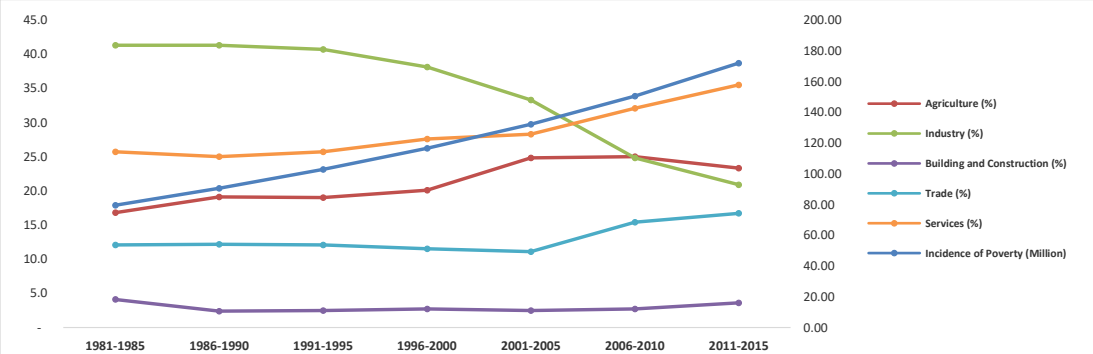
Source: Computed by the author, using data from the CBN Statistical Bulletin, 2016.

Table 11 shows from 1981-1985, the 5-year average annual agriculture sector contribution to the GDP further went down to 16.8 per cent from 30.2 per cent in 1975-1979. Comparatively, it was 16.8 and 19.1 per cent during the periods 1981-1985 and 1986-1990, while the 5-year average annual industry and services are 41.3 per cent apiece and services sector was 25.7 and 25.0 per cent, respectively. The least contributor was the building and construction sector, with 4.1 and 2.4 per cent, during the same period. The industry and services activity sectors domination of the GDP continued till 2001-2005. Thereafter, the services and agriculture activity sectors become very prominent compared with other sectors for the remaining period of the study. The service sector contributed 32.1 and 35.5 per cent of the GDP for 2006-2010 and 2011-2015, respectively, whereas the agriculture sector is 25.0 and 23.3 per cent during the same periods.

Statistics shows that despite the increased presence of the industry activity sector of the GDP from the 1980s, the sector's contribution to the GDP over the 5-year average annual period has been on the downward trend (Table 11). For example, the industry sector declines as follows; 41.3, 41.3, 40.7, 38.1, 33.3, 24.8 and 20.9 per cent for the period, 1981-1985, 1986-1990, 1991-1995, 1996-2000, 2001-2005, 2006-2010 and 2011-2015, respectively. The decline in the sector may be attributed to the worsening infrastructure; transport, roads, electricity/power generation, that have increased the costs of doing business, and perhaps led to many industries relocating from the

country. On the other hand, the services sector experienced upward movement of 25.7, 25.0, 25.7, 27.6, 28.3, 32.1 and 35.5 per cent of the GDP for 1981-1985, 1986-1990, 1991-1995, 1996-2000, 2001-2005, 2006-2010 and 2011-2015, respectively. The building and construction activity sector are the least contributor to the GDP. It is 4.1, 2.4, 2.5, 2.7, 2.5, 2.7 and 3.6 per cent for the period, 1981-1985, 1986-1990, 1991-1995, 1996-2000, 2001-2005, 2006-2010 and 2011-2015, respectively.

Figure 4: Movement in the Average Annual Incidence of Poverty and Real Gross Domestic Product by Sectors, 1981 – 2015



Source: Computed by the author, using data from the CBN Statistical Bulletin, 2016.

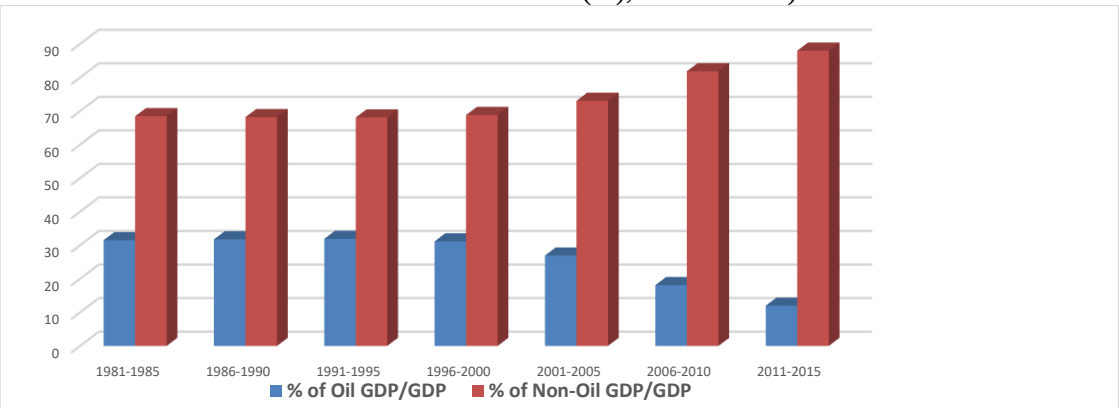
Increase in the growth of real GDP overtime is expected to increase the real GDP per capita as well as reduce the level of poverty in the country. Figure 4 shows that the 5-year average annual level of incidence of poverty (in population million) increased throughout period, alongside some of the sectors of the real GDP. For example, both the agricultural and service sectors show signs of improvement throughout the study period, though the incidence of poverty maintained an upward trend. On the other hand, the industry sector, which is predominantly crude oil and gas sub-sectors, has a downward trend.

3.2.3 Oil and Non-Oil Real Gross Domestic Product

The composition of Nigeria's real GDP could be classified according to oil and non-oil sectors, given the prominent role of crude oil and gas as the major source of foreign exchange earnings in the country. The non-oil GDP dominated the Nigeria's GDP during the study period. However, it recorded decline in levels during the period,

1981-85, 1986-90 and 1991-95 compared with the oil GDP. Figure 5 shows that the 5-year average annual non-oil GDP experienced a downward movement within the period, 1981-85, 1986-90 and 1991-95, respectively. During these periods, it was 68.5, 68.2 and 68.1 per cent, while the oil GDP was 31.5, 31.8 and 31.9 per cent, respectively. However, the downward trend of the non-oil GDP was reversed throughout the remaining period of the study, an indicator that the sector is expanding either in terms of price, volume or both compared with the oil sector. It was 68.9, 73.1, 81.9 and 88.0 per cent for 1996-2000, 2001-2005, 2006-2010 and 2011-2015, respectively.

Figure 5: Movement in Real Average Annual Oil and Non-oil Gross Domestic Product to Gross Domestic Product (%), 1981 – 2015)



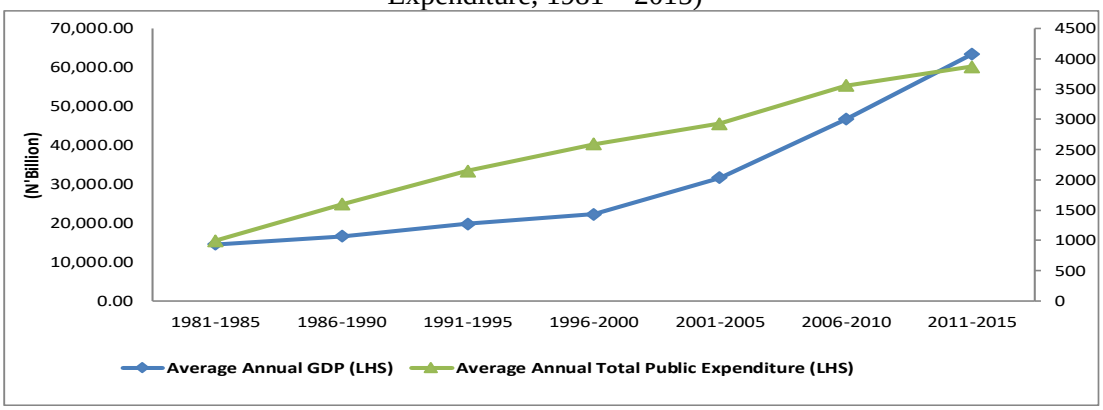
Source: Computed by the author, using data from the CBN Statistical Bulletin, 2016.

3.3 Stylised Facts on Public Expenditure, Economic Growth and Poverty in Nigeria

Over the years, government policy in Nigeria was focused on the achievement of rapid economic growth and development. These could be explained by the increase in her public expenditure profile and other development programmes. For example, between 1981 and 2015, the average annual real public expenditure has soared. It was ₦998.3 billion, ₦1,598.9 billion, ₦2,149.0 billion, ₦2,589.4 billion, ₦2,927.3 billion, ₦3,556.5 billion and ₦3,872.3 billion for the period, 1981-1985, 1986-1990, 1991-1995, 1996-2000, 2001-2005, 2006-2010 and 2011-2015, respectively (Figure 6).

The post-1980s witnessed the Fourth National Development Plan (1981-1985), Structural Adjustment Programme (1986), as well as 3-year rolling plans between 1990 and 1998. Between 2003 and 2007, a poverty reduction strategy programme, the National Economic Empowerment and Development Strategy (NEEDS) was implemented[54] . Also, within the period, 2000-2015 Nigeria was a signatory to, and implemented the Millennium Development Goals programme of the United Nations.

Figure 6: Movement in Average Annual Real Gross Domestic Product and Real Public Expenditure, 1981 – 2015)



Source: Computed by the author, using data from World Bank database and the CBN Statistical Bulletin, 2016.

Presently, there are various Medium-term Expenditure Framework programmes (MTEF) and the Vision 20:2020, a perspective plan, aimed at making Nigeria a fully developed economy by the year, 2020. The increase in the public expenditure and other development programmes were aimed at the improvement of economic growth and development in Nigeria. For example, during the study period, the average annual real GDP growth rate increased to 1.5 per cent in 1986-1990 from a negative annual average growth rate of 2.6 per cent in 1981-1985. However, between 1991 and 1995, the average annual real GDP growth rate fell to 0.5 per cent, owing to the political and economic uncertainties that trailed the country, following the annulment of the Presidential election (June 12, 1993) and violation and abuse of human rights by the then, military Head of State, General Ibrahim Babangida, Thus, resulted in series of economic and political sanctions on Nigeria by the international community.

[54] Within the first two decades of Nigeria's independence in 1960, the 5-year annual average real public expenditure maintained an upward trend of ₦518.3 billion, ₦935.9 billion, ₦2,596.5 billion and ₦4,027.9 billion for the period, 1961-1965, 1966-1970, 1971-1975 and 1976-1980, respectively. Also, were the First National Development Plan (1962-68), the Second National Development Plan (1970-74) and Third National Development Plan (1975-80).

The average annual real GDP growth, however, increased to 3.3 per cent between 1996 and 2000. The modest increase could be attributed to the lifting of the pariah nation status on the country in 1998, following the sudden death of then Head of State, Gen. Sanni Abacha and the subsequent improvement in the economic activities, as well as the re-emergence of democratic government in 1999. Between 2001 and 2015, the average annual real GDP growth rate was 11.2, 7.2 and 4.7 per cent during the period, 2001-2005, 2006-2010 and 2011-2015, respectively.

Table 12: Average Annual Real Gross Domestic Product Growth Rate, Real Public Expenditure/GDP Ratio and Incidence of Poverty, 1981 – 2015

	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	2006-2010	2011-2015
Average Annual Real GDP Growth (%)	-2.6	1.5	0.5	3.3	11.2	7.2	4.7
Average Annual Real Total Public Expenditure/GDP (%)	6.8	9.5	10.9	11.6	9.4	7.6	6.2
Average Annual Incidence of Poverty (%)	39.2	45.0	50.0	69.3	70.9	57	71.9

Source: Computed by the author, using data from the World Bank database, CBN Statistical Bulletin 2016 and National Bureau of Statistics Reports.

Consequently, the average annual real GDP growth of 7.7 per cent attained in the past 15 years (2001-2015), could be due largely to the economic reform programmes of government and the seemingly political stability, occasioned by the emergent of civilian democratic government in the country (Table 12).

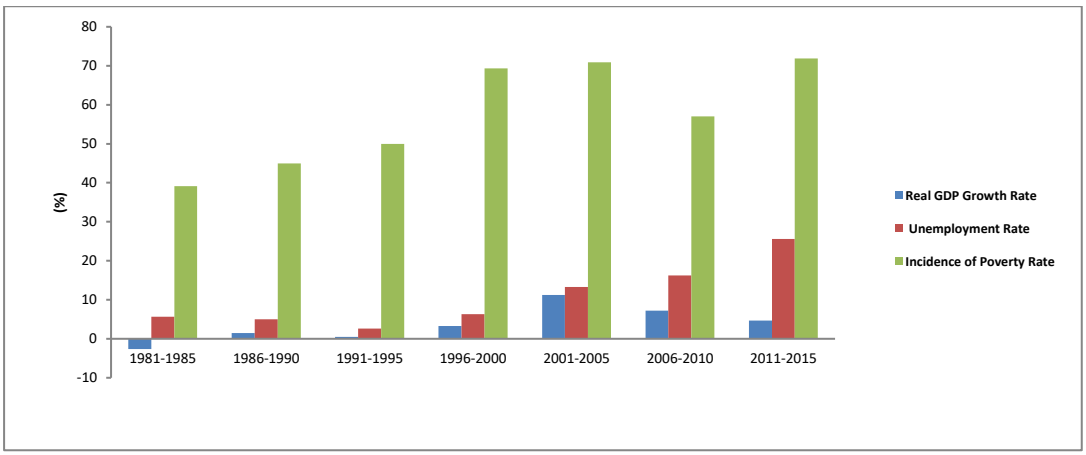
Nigeria's economic reform programmes are designed among others to unlock the economic potentials and engender growth and development; improve the standard of living of the people by reducing the incidence of poverty and income inequality in the country[55]. In this regard, government initiated several policy measures to infuse the distributional effects of growth in the economy in order to halt the rising effects

[55] Nigeria's economic miseries of the early 1980 and the subsequent challenges that confronted it, precipitates governments' attention to the pervading issues of poverty and the need for poverty alleviation programme.

of poverty[56]. For instance, Committees were inaugurated and charged with the responsibility of addressing the challenging issues of poverty in the country.

The Poverty Alleviation Programme Development Committee (PAPDC) was inaugurated in 1994 by the Government and charged with the responsibility of advising Government on the design, coordination and implementation of poverty alleviation programmes in the country. Others are Community Action Programme for Poverty Alleviation (CAPPA) established in 1996, Universal Basic Education (UBE) Programme established in 2000, Poverty Alleviation Programme (PAP) established in 2000 and the National Poverty Eradication Programme (NAPEP) in established in 200. The NAPEP was established to replace the Poverty Alleviation Programme of 2000. It is an integral part of the nation's poverty reduction strategy paper (PRSP), called the National Economic Empowerment and Development Strategy (NEEDS) 2004-2007 and the FSS-2020.

Figure 7: Average Annual Real GDP Growth, Unemployment Rate and Incidence of Poverty (%), 1980 – 2015



Source: Computed by the author from World Bank database and the National Bureau of Statistics Reports.

[56] (Ogwumike (2002) notes government policy on poverty in Nigeria were focused on the following: economic growth, basic needs and rural development strategies. The economic growth approach focused on rapid economic growth as measured by the rate of growth in the real per capita GDP or per capita national income, price stability and declining unemployment rate among others, while the basic need approach emphases the basic necessities of life, such as food, health care, education, shelter, clothing, transport, water and sanitation, which could enable the poor live a decent life. The rural development approach focused on the total emancipation and empowerment of the rural sector.

Notwithstanding the increased public expenditure, improvement in the economic growth performance and the various anti-poverty initiatives of government and United Nations MDGs, statistics from the National Bureau of Statistics (NBS) indicates that the levels of unemployment rate and incidence of poverty appears to be on the increase, rather than declining (Figure 7). Statistics on the unemployment rate indicates that it maintained a single digit level from 1981 to 1999. Thereafter, it became double digit throughout the remaining period of the study. Nigeria's unemployment rate slightly decreased from annual average of 5.7 per cent in 1981-1985 to 5.0 per cent in 1986-1990, and further 2.6 per cent in 1991-1995. After 1991-1995, it maintained an upward movement throughout the remaining part of the study. For example, it increased by 6.3, 13.3, 16.2 and 25.6 per cent in 1996-2000, 2001-2005, 2006-2010 and 2011-2015, respectively.

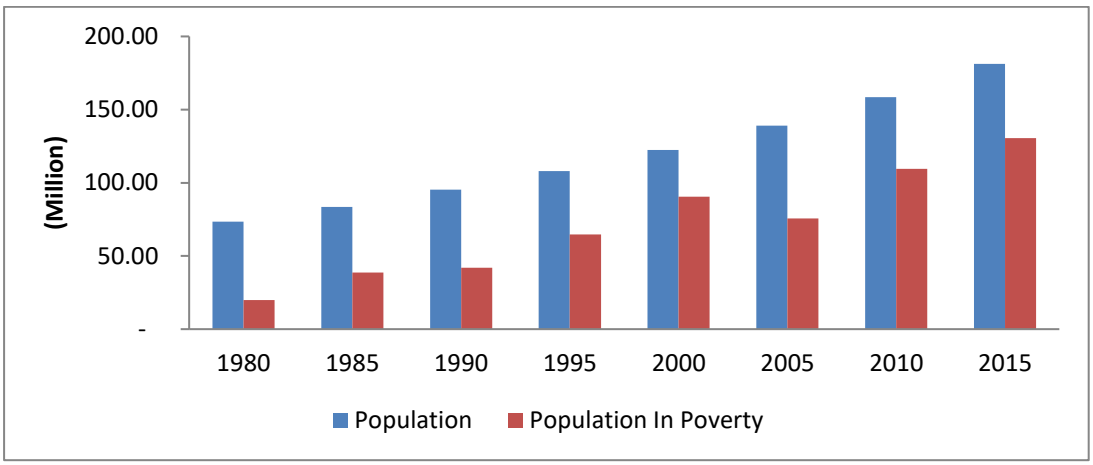
Similarly, the annual incidence of poverty remains unabated[57]. The 5-year average annual incidence of poverty maintained an upward movement throughout the study period, except for the period 2006-2010. For instance, the average annual incidence of poverty increased by 39.2, 45.0, 50.0, 69.3, 70.9 and 71.9 per cent for the period 1981-1985, 1986-1990, 1991-1995, 1996-2000, 2001-2005 and 2011-2015, respectively. As noted by the National Bureau of Statistics (NBS, 2012, p. 11) "Despite the fact that Nigerian economy is paradoxically growing, the proportion of Nigerians living in poverty is increasing every year ... the proportion of the population living below the poverty line increased significantly from 1980 to 2004". Furthermore, Nigeria ranked among the highest in global poverty; with over 70.0 per cent of its population said to be living below the poverty line (USAID, 2011).

In 1980, the Nigerian population in poverty was 20.0 million, whereas her population was 74.5 million. Two decades after, in 2010, the Nigeria population in poverty was

[57] This is defined as the proportion of the population, for whom consumption expenditure, including food and non-food items fall below poverty line. It is also called headcount poverty. Poverty line is a measure that divides the poor from non-poor. The NBS (2012) used the mean per capita household expenditure in calculating the level of poverty. It indicates that one-third of it gives (separate) the extreme or core poor from the rest of the population, while two-third of the mean per capita expenditure separate the moderate poor from the rest of the population.

109 million, while her population was 158.6 million. Furthermore, by 2015, it went up to 130.1 million out of population of 181.2 million people (Figure 8).

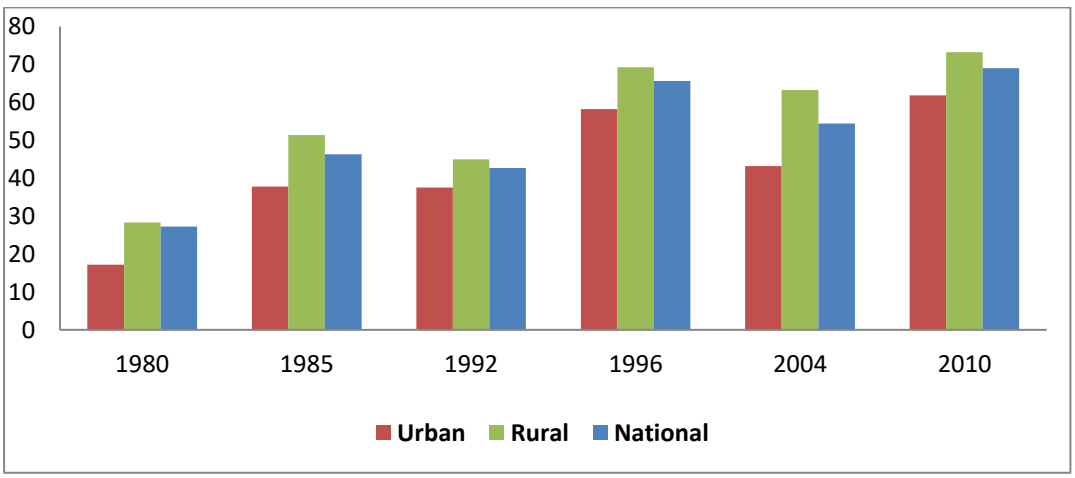
Figure 8: Nigeria's Population and Population in Poverty (Million), 1980 – 2015



Source: Computed by the author from the National Bureau of Statistics Report.

Further insight into the poverty profile, shows that it affects both the urban and rural communities in Nigeria. For instance, in 1980, the incidence of poverty in the rural communities was 28.3 per cent compared with 17.2 per cent in the urban areas. Between 1985 and 2010, the poverty levels in the rural communities increased from 51.4 to 73.2 per cent compared with 37.8 to 61.8 per cent for the urban areas, during the same period (Figure 9).

Figure 9: National, Urban and Rural Incidence of Poverty (%), 1980 – 2010



Source: National Bureau of Statistics (2012).

Table 13: Geo-political Distribution of the Incidence of Poverty and Income Inequality in Nigeria1980-2010

Geo-political Zones	Incidence of Poverty By Geo-political Zone (%)						Income Inequality (GNI)		
	1980	1985	1992	1996	2004	2010	2004	2010	% Change from 2004 to 2010
South South (SS)	13.20	45.70	40.80	58.20	35.10	63.80	0.3849	0.4340	12.8
South East (SE)	12.90	30.40	41.00	53.50	26.70	67.00	0.3760	0.4442	8.1
South West (SW)	13.40	38.60	43.10	60.90	43.00	59.10	0.4088	0.4097	0.2
North Central (NC)	32.20	50.80	46.00	64.70	67.00	67.50	0.4459	0.4220	-5.4
North East (NE)	35.60	54.90	54.00	70.10	72.20	76.30	0.4114	0.4468	8.6
North West (NW)	37.70	52.10	36.50	77.20	71.20	77.70	0.4028	0.4056	0.7

Source: National Bureau of Statistics (NBS) Nigeria's Poverty Profile, 2012.

Table 13 indicates the spread of poverty within the six (6) geo-political zones, namely, South South (SS), South East (SE), South West (SW), North Central (NC), North West (NW) and North East (NE). The incidence of poverty increased in all the geopolitical zones during period, between 1980 and 2010. For example, the incidence of poverty in the South South (SS), South East (SE), South West (SW), North Central (NC), North West (NW) and North East (NE) increased from13.2, 12.9, 13.4, 32.2, 35.6 and 37.7 per cent in 1980 to 63.8, 67.0, 59.1, 67.5, 76.3 and 77.7 per cent in 2010, respectively.

Comparatively, the incidence of poverty appears to be more in the northern zones of the country than in the southern zones. Also, the Gini-coefficient, which varies across the geo-political zones indicate that their levels between the period, 2004 and 2010 is higher in the northern zones than in the southern zones. Between the period, 2004 and 2010, the southern zones reduced their level of income inequality more than the northern zones.

3.4 Causes and Consequences of Poverty

The statistical depiction of unemployment rate and poverty in Nigeria shown in section 3.3 seemed worrisome, given the enormous natural and human resources the country is endowed, hence the paradox 'Poverty in the Midst of Plenty'. More disturbing is magnitude of poverty in both the rural and urban areas of the country. One, however, may be concerned with the question, 'Why is Nigeria poor?' Analysis

or discourse on why Nigeria is poor may seem very complex and inexhaustible. It may be complex in that, tracing poverty to a single cause poses challenge[58]. So, we shall limit our discussion on the probable causes of poverty in Nigeria. Though, the list may not be exhaustive, however, it would provide a guide to appreciate their consequences and manifestations.

(i) Low Economic Growth Rate

Nigeria's economy enjoyed high positive economic growth within the first decade of her post-independent. For example, its 5-year annual average real economic growth rate was 4.5 and 5.6 per cent for 1961-1965 and 1966-1970, respectively. During these periods, her incidence of poverty was low compared with their subsequent levels. For example, the incidence of poverty in the country that was 15.0 per cent in 1960 increased to 27.2 per cent, two decades later. Furthermore, the economic woes of the 1980s, especially at the first half of that decade, led to a negative impact on the economic growth and rise in the incidence of poverty. For example, in 1981, 1982, 1983 and 1984, the real GDP growth rate was -13.1, -1.8, -7.6 and -0.5 per cent, respectively. During the same period, the incidence of poverty increased progressively. It was 32.0, 35.5, 39.0 and 43.0 per cent, respectively. However, the economic growth made a rebound, and was mostly positive in the 1990s and 2000s, though alongside worsening incidence of poverty.

Low economic growth could lead to increase in poverty. Countries require sustained economic growth rate to be able to tackle poverty challenges. Aghion, *et al.* (1999) suggests that economic expansion would lead to increased income, which reduces poverty and income inequality. Also, Klasen (2005) notes that economic growth is the basis for increasing national income, though it does not necessarily result in better distribution or poverty reduction. Policies that merely concentrate on growth may only be looking at part of the development problem. Rather, he advocated for pro-poor policies that centers on combining economic growth and social policies.

[58] As noted by Umoh (2012, p. 28) "chances are high that each single incidence of poverty is traceable to many causes and that, what appears as a cause may be an effect and what is an effect may be a cause".

(ii) Low Level of GDP Per Capita Income

GDP per capita is very important in determining the growth of any country's economy. It is envisaged that the higher the level of a country's GDP per capita, the more the citizens are enabled to improve their livelihood. Nigeria's GDP per capita for the period, 1981-2015 is ₦229, 251, ₦189,560.8, ₦194,030.9, ₦191,411.4, ₦234,427.1, ₦321,819.1 and ₦372,470.4 for 1981-1985, 1986-1990, 1991-1995, 1996-2000, 2001-2005, 2006-2010 and 2011-2015, respectively.

Comparatively, the Nigeria's 5-year average annual real GDP per capita (expressed in the US$) level is low and not progressive compared with some developing and developed countries levels. For example, it is US$1,525.3, US$1,261.2, US$1,291.0, US$1,273.6, US$1,559.6US$2,124.2 and US$2,478.2 for 1981-1985, 1986-1990, 1991-1995, 1996-2000, 2001-2005, 2006-2010 and 2011-2015, respectively. However, for some developing countries, it is US$6,317.7, US$5998.2, US$5,530.2, US$6706.6, US$6,208.8, US$7,167.4 and US$7,516.5 for South Africa. For some of the developed countries, it is US$30,107.3, US$34,907.8, US$37,246.2, US$42,353.0, US$46,630.0, US$48,973.8 and US$50,219.1 for the USA, during the same period, respectively[59] (Table 14).

Table 14: Average Annual Real Gross Domestic Product per Capita of Selected Countries 1981-2015 (US dollar)

Country/Region	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	2006-2010	2011-2015
Nigeria	1,525.3	1,261.2	1,291.0	1,273.6	1,559.8	2,124.2	2,478.2
South Africa	6,317.7	5,998.2	5,530.2	5,706.6	6,208.8	7,167.4	7,516.5
Egypt, Arab Rep.	1,340.5	1,489.3	1,596.7	1,826.0	2,031.2	2,426.9	2,610.3
Brazil	7,593.3	8,282.7	8,131.6	8,665.2	9,083.2	10,485.9	1,666.2
United States	30,107.3	34,907.8	37,246.2	42,353.0	46,630.0	48,973.8	50,219.1
United Kingdom	22,981.6	27,367.3	29,253.9	33,485.8	38,021.2	39,888.8	40,209.7
Sub-Saharan Africa	1,352.6	1,252.4	1,156.5	1,167.8	1,256.4	1,497.0	1,624.8
South Asia	442.3	512.2	584.7	702.8	837.8	1,117.7	1,444.7

Source: Computed by the author from the World Bank database; World Development Indicators. GDP Per Capita in Constant 2010 US dollar.

[59]The slow growth in the Nigeria's real GDP per capita relative to some developing and developed countries could be as a result of slow growth in the GDP (numerator) and increasing population (denominator). The growth rate of the Nigeria's population is about 2.8 per cent and, this could continue to catapult the population. It is, however, envisaged that with such population explosion, if there is no robust improvement in the country's GDP, the GDP per capita will be declining, while the incidence will continue to increase.

(iii) Poor Development Plan

Problem identification and choice of the right strategy are central to progress of any development plan. It is, however, possible to identify a problem, while the choice of a wrong strategy impairs the solution to that problem. Equally, important is the sincerity of purpose in identifying the problem(s) and its implementation. Wolfang Stolper in his book titled 'Planning without Facts: Lessons in Resource Allocation from Nigeria's Development' pointed out the implications of lack of factual knowledge in the general approach to development planning (and development theory). According to him, they are as follows; (a) acquiring the necessary knowledge of the situation should be of the highest priority (b) the development planner should come to terms with his starting situation, (c) recognition of the time, it takes to test in reality the knowledge acquired or thought to be acquired, (d) lack of detailed knowledge requires that decision making be decentralised and delegated, (e) lack of facts impedes the manner in which development planning can proceed. According to him, these are some of the challenges that have befell Nigeria and conspicuously contributed to the Nigeria's low economic development and the high incidence of poverty.

(iv) Good Governance and Leadership Deficits

This encompasses the exercise of authority in the management of country resources through the private and public sector institutions[60]. Good governance structure elicits confidence in the citizens, and this affects the quality of their lives and reduces poverty. For instance, good governance entails; transparency and accountability, observance of rule of law, zero tolerance to corruption, government effectiveness in terms of service delivery etc. Absence of good governance breeds all forms of social vices that negatively affect the living standard of the people. As noted by Umo (2012), there exists a plausible hypothetical positive relationship between governance deficit and poverty in Africa.

[60] Kaufmann *et al*. (2010) notes that political stability, the absence of terrorism and violence, proficient government policy formulation and implementation, improved regulatory mechanisms, reduced corruption and ensuring the rule of law can be recognised as high governance qualities.

Also, associated with good governance and leadership deficit is the issue of corruption. Corruption is rife in Nigeria and seems to have become part of culture of the people. It manifests in both private and public transactions, and most especially at the latter; both at the conceptualisation, design and implementation of projects/programmes. According to the Transparency International Corruption index (TICI), corruption has been high in Nigeria compared with some other African countries of Namibia, Botswana, South Africa, Ghana and Mauritius. For example, Nigeria has consistently been identified as belonging to the group of countries with the worst records of corruption. It has occupied the following positions as itemised in the TICI tables, 54th out of 54 countries, 90th out of 90 countries, 152nd out of 158 countries, 134th out of 178 countries and 136th out of 167 countries for the period, 1996, 2000, 2005, 2010 and 2015, respectively[61].

(v) Income Inequalities and Opportunities

Income distribution inequality could be high in developing countries, where the incidence of poverty is high compared with the developed countries. In a study of developing countries, Ncube *et al.* (2013) suggests that higher levels of income inequality tend to increase poverty in Africa and therefore, bad for poverty reduction and inclusive growth in the continent. Also, OECD (2014) linked the widening gap of income distribution inequality to lack of inclusive growth. It notes that inclusive growth is attained when the gap between low and high-income earners is less pronounced and the benefits of growth are shared evenly, such that it improves the standard of living.

In Nigeria, income inequality is still high, despite some marginal improvements. It cuts across both the urban and rural areas of the country - varies among the six-geopolitical zones of the country (Table 13). As noted by Umo (2012), growth and development are threatened by social unrest in societies exacted with high income inequality by social forces seeking to achieve equity in the allocation of resources. Thus, high income inequality limits opportunities and impairs growth and engenders

[61] Various reports from Transparency International Corruption index (TICI)

poverty. Umo (2012 p. 12) notes the following; "it asphyxiates investment opportunity and reduces economic growth, it inhibits one's ability to fully participate on other economic activities and politics – thereby limiting his choices on issues concerning his welfare, it limits women economic progress in the society by imposing gender inequality issues that demeans their self-esteem and it incubates social friction among the rich and the poor, thereby affecting the development of the society".

(vi) Low Economic Diversification and Industrialisation

Low economic diversification could imply high economic dependency, and it predisposes an economy to the development shocks caused by the vagaries of international trade on primary product, e.g. crude oil and primary agricultural products. Economic diversification entails departure from a mono-cultured product economy (especially, primary products) into a finished product (secondary or manufactured product). This is very important for the industrialisation and economic growth of any country. Nigeria signifies an example of a country that may have suffered greatly from low economic diversification, and its attendant impacts on economic growth and development.

With the emergent of crude oil as the major source of Nigeria's foreign exchange earnings since the early 1970s, the shocks in the international oil price has haunted government revenue, thereby, affecting the execution of government budgets/progrmammes. Thus, Nigeria's quest for industrialisation may be impaired, if the presently primary-product-dominated economy is not reversed, as this would continue to affect her international trade position vis-à-vis that of other developed nations. Hans Singer and Raul Prebisch thesis discovered a long run tendency for the terms of trade of a country producing/exporting primary product in relation to a country involved in manufacturing to fall.

(vii) Poor Infrastructure Development

The provision of infrastructure services by government fall within the context of public goods, natural monopolies, merit goods and externalities (Musgrave and Musgrave, 1989). Public goods have unique features that once provided becomes

available to all (non-rivalry in consumption), whether or not payments are made for the services, example, law and order, defence etc. Lack of infrastructure development in the developing countries is one of the challenges of growth. UN-Habitat (2011) notes lack of modern infrastructure is an impediment to economic development and a major constraint not only on poverty reduction, as well as the attainment of the Millennium Development Goals (MDGs) in SSA countries. Also, Ondiege, *et al.* (2013) attributed the rise in the transaction costs of business in most African countries to inadequate infrastructure development.

In Nigeria, economic growth has been seriously impaired by poor and inadequate infrastructure development. It adds to the cost of doing business in Nigeria and this affects productivity and economic growth. For example, the electricity consumption in Nigeria is affected by frequent power outage and this has resulted in the manufacturing sector less dependent on the electricity supply through the national grid, which is cheaper and affordable. According to the World Bank (1988, p. 144) "…frequent power outages and fluctuations in voltage affect almost every industrial enterprise in the country. To avoid production losses as well as damages to machinery and equipment, firms invest in generators…. One large textile manufacturing enterprise estimates the depreciated capital value of its electricity supply investment as USS$400 per worker…. Typically, as much as 20 per cent of the initial capital investment for new plants financed by the NIDB is spent on electric generators and boreholes".

Infrastructure challenges in Nigeria include poor electricity supply, poor transportation system (bad network of roads, poor telecommunication and near absence of functional railways. Olaseni and Alade (2012) as well as Sanusi (2012) argue that infrastructural development is critical to the achievement of the Vision 20:2020, which is a vision set to make Nigeria one of the top 20 economies in the world by 2020, with a minimum GDP of $900 billion, and a per capita income of not less than $4,000 per annum. According to the African Development Bank (2012), improved infrastructure will increase competitiveness and productivity, lower cost of

doing business and facilitate trade and foreign direct investment as well as create employment opportunities and spread the benefits of growth across the country.

(viii) Low Investment and Financial Intermediation

Economic theory provides unique roles for savings and investments, given that increasing savings rate would increase economic growth through investment channels, which by implication leads to reduction in poverty[62]. Thus, there exists a positive relationship between savings and investments. However, the realisation of this could be very challenging in less developed countries/regions, where people are impoverished and savings culture low.

Nigeria has most of her population poor, and this could affect their ability to save. With poor savings culture and challenges of financial intermediation, securing loans for investment purposes becomes very challenging. Such could affect productivity and growth potentials of an economy. For example, the rate of poverty is high in the SSA countries and this could be responsible for impairing their savings ability. With very low savings in the region, the rate of investment is likely to be low and productivity hindered.

In a study, that compares investment and growth among SSA, East Asia and OECD countries, Barro & Sala-i-Martin (2004, p. 23) notes that in a cross-country data from 1960 to 2000, the average annual growth rate of real per capita GDP for 112 countries was 1.8 per cent, while the average ratio of gross investment to GDP was 16.0 per cent. Nonetheless, for the 38 SSA countries, the average growth rate was barely 0.6 per cent, with an average investment ratio put at 10.0 per cent, compared with nine East Asian 'miracle' economies with average growth rate of 4.9 per cent, and average investment ratio of 25.0 per cent. On the other hand, with the 23 OECD countries, the average growth rate was 2.7, whereas the average investment ratio was 24.0 per cent.

[62] This is the underpinning factor behind the Harrod-Domar growth model. It indicates that rate of growth of an economy is equal to the savings rate divided by the capital-output ratio. It shows that once the capital-output ratio is determined and the savings ratio known, the growth rate of an economy could be determined.

(ix) Low Human Capital Formation and Utilization

Human capital development is part of the capital accumulation process, that underscores the need for knowledge and skill acquisition through education (primary, secondary, tertiary and vocational) (De la Fuente and Ciccone, 2002). Romer (1990) refers to it as an important factor of productivity. Thus, human capital development is very important for the growth of any nation. Nigeria is known for abundant human and material resources. However, its growth and development have been hindered by shortages and wastages of the human capital. For example, the harsh economic realities of the 1980s witnessed the mass exodus of the Nigeria's skilled labour, migrating into Europe and America, thereby, denying the country of a large spectrum of her professionals/experts that would have otherwise contributed to her economic growth (Umo, 2012).

3.5 Conclusion

The 5-year average annual real public expenditure and real GDP per capita shows upward trends during the study period. Statistics indicates that public spending is channeled more to the recurrent than capital items, and this could pose threat to the development of infrastructure and economic growth in the country. Disaggregated public expenditure by the social sector expenditure revealed that increases in their 5-year average annual levels do not exhibit progressive trend, except for public expenditures on health and education. The social sector public expenditure on education became progressive after the decline in1991-1995.

The composition of real GDP indicates that industry and services activity sectors are more prominent than any other sector. However, the contribution of the industry sector to the GDP has been on the downward trend, whereas the services' is on the upward trend. Nevertheless, there existed increases in real public expenditure and real GDP per capita in their respective levels as well as various poverty alleviation programmes, during the study period, while the unemployment rate and incidence of

poverty continue to worsen, rather than abating. In addition, probable causes and consequences of poverty are discussed.

CHAPTER FOUR
Methodology

4.0 Introduction

This chapter provides the procedure for investigating the impacts of public expenditure on economic growth and poverty reduction in Nigeria, using quantitative method of analysis. The method relies on the existing economic theory and empirical literature on public expenditure, economic growth and poverty relation to specify the different models used in the study. Two different models adopted in the study are presented in this chapter. First, a variant of the augmented Solow model by Mankiw, Romer and Weil (1992), that includes, especially private capital investment, human capital development, rate of population growth, depreciation and technological progress and public expenditure as inputs. The second is growth-poverty model by Agrawal (2015)[63] that includes both economic growth and differences in income as explanatory variables. Also, there will be simulation analysis, involving the use of estimates from the two models and policy variable, public expenditure.

In this regard, the chapter is divided into eight sections. Section 4.1 is the sources of data, while Section 4.2 is the theoretical framework. Sections 4.3 and 4.4 present the growth-public expenditure and growth-poverty models, respectively. Section 4.5 is policy simulation, while section 4.6 is description and measurement of variables. Section 4.7 shows the estimation method for the regression models. Section 4.8 is the conclusion. E-views, Version 9.5 econometric software solution would be used for the estimation.

4.1 Sources of Data

The study draws largely from the publications of the National Bureau of Statistics (NBS), a statutory body in Nigeria assigned with the responsibility of publishing government statistics and social indicators data and the Central Bank of Nigeria Statistical bulletin and Annual Reports and Statement of Accounts of various years.

[63] Some other authors have applied the growth-poverty models; Ravallion and Chen (1997, Dollar and Kraay (2002), Anyanwu (2013) and Agrawal (2015).

Also, the study benefited from the World Bank database, especially on the issues of real GDP, population growth rate, net official development assistance received. The annual data used for the estimation and simulation is from 1981 – 2015. The use of annual data in the study is informed by the dearth of quarterly data on the social indicators; incidence of poverty, employment rate, literacy rate. In addition, Nigeria experiences peculiar seasonal nature of government budget implementation that tends to lump public expenditures towards the end of the year.

4.2 Theoretical Framework

The theoretical framework of the research is that public expenditure has positive impact on economic growth, especially in the developing countries [64] and by implication reduction in poverty. Nigeria is a developing country; it is expected that public expenditure would have positive impact on the economic growth. One of the models used in literature to explain economic growth is the Solow growth model. As noted by Romer (2012, p. 12), the study of Solow growth model provides an insight into what most economists have used in comparing other growth models. The model is anchored on the existence of rate of technological progress, capital stock depreciations and the population growth.

On the other hand, Romer (1986) and Lucas (1988) in their studies on knowledge and human capital development provide attempts to explain the endogenous growth model. The endogenous growth models of (Barro, 1990 and Barro & Sala-i-Martin, 1992 and 2004) posit that fiscal policy affects the long run economic growth through government policies on taxes and expenditure[65]. Similarly, Romer (2012) notes that government policies on taxes and expenditure affects investment decisions in human

[64] It is predicted that in developing countries, public expenditure impacts positively on economic growth (Barro, 1990; Barro and Sala-i-Martin, 1992; Oscar Bajo-Rubio, 2000; Milbourn et al, 2003 and Chamorro-Narvaez, 2012).

[65] Jalilian *et al.* (2003, p. 12) captured that "An important advantage of endogenous over traditional growth models is that, through the assumption of constant or increasing returns to a factor input, in particular human capital, it is possible to explain a lack of growth and income convergence between countries and helps account more fully for the residual factor in Solow-type analyses. The "growth accounting" exercises, popularised by Barro and others (Barro, 1991, 2000; Barro and Salai-i-Martin, 2004) fall within the generalised Solow-type growth model. An important characteristic of this approach is the inclusion of various indicators of economic structure."

capital, knowledge and research, which constitute the nucleus of economic growth in the endogenous growth model.

Studies in the economic growth and public expenditure relationship have applied variants of the neoclassical Solow growth model to explain the determinants of economic growth. Among the pioneering studies is the augmented Solow model by Mankiw, Romer and Weil (1992). MRW study improved the efficiency of the Solow growth model by adding human capital development to the process of growth. They pointed out that the inclusion of human capital development alters the analysis of cross-country difference in the Solow model, where it was mislaid. Some other studies have added public expenditure/components into the production function within the Solow growth model framework, namely; Barro (1990), Temple and Johnson (1998), Bajo-Rubio (2000), Milbourne *et al.* (2003), Carboni and Medda (2011) and Chamorro-Narvaez (2012) to explain the determinants of long run economic growth.

Public expenditure and its components, which is the primary focus of the present study, has no role in determining the long run economic growth in the Solow growth model. It, however, has role in determining the long run economic growth in the endogenous growth model. In view of the above, and given the aim of our study, that is, to investigate the impact of public expenditure on economic growth and poverty reduction in Nigeria during the study period, 1981 to 2015. We adopt two different models and conduct policy simulation exercise in sections 4.3, 4.4 and 4.5 respectively in order to achieve the aim of the study.

In section 4.3, the study toes the line of the following studies; Mankiw, Romer and Weil (1992), Bajo-Rubio (2000), Milbourne *et al.* (2003), Carboni and Medda (2011) and Chamorro-Narvaez (2012) to develop a model (herein referred to as growth-public expenditure model). The model will help us to estimate the first objective of the study, the growth effects of public expenditure/components during the study period. In section 4.4, we adopt a model by Ravallion and Datt (1996), Ravallion and

Chen, 1997; Agrawal, 2008; Anyanwu, 2013; and Agrawal, 2015), (herein referred to as growth-poverty model). The model will help us to estimate the second objective of the study, that is, poverty reduction effects of economic growth during the study period. Also, in section 4.5, we conduct a policy simulation exercise, using estimates of the two models discussed in sections 4.3 and 4.4 to evaluate the third objective of the study, that is, the effects of public expenditure shocks on economic growth and poverty reduction in Nigeria.

4.3 Growth-Public Expenditure Model

The underlying theoretical framework is based on the position of some economic growth literature that suggests public expenditure has positive impact on economic growth, especially in the developing country (Barro, 1990; Barro and Sala-i-Martin, 1992; Oscar Bajo-Rubio, 2000; Milbourn et al, 2003 and Chamorro-Narvaez, 2012). To evaluate this, we adopt a variant of the augmented Solow model by MRW (1992). The model includes different categories of public expenditure as additional inputs in the assumed Cobb-Douglas production function. There is the assumption of no diminishing returns to reproducible capital at the aggregate level but increasing returns to scale in the production process.

Romer (1986) pointed out the constant returns to scale with the introduction of knowledge in his endogenous growth model. Similarly, Lucas (1988) notes the presence of diminishing returns to human capital development in his model would change considerably the results, given that it would not be possible to generate permanent growth. Therefore, our model is basically a variation of the augmented Solow model introduced by MRW (1992) that incorporates different components of public capital as additional explanatory variables in the assumed Cobb-Douglas production function[66]:

$$\mathrm{Y_t} = \mathrm{K}_t^{\propto} H_t^{\beta} [\frac{Gi_t}{K_t}]^{\theta_i} \dots [\frac{Gm_t}{K_t}]^{\theta_m} (A_t \mathrm{L}_t)^{1-\propto-\beta-\sum_{i=1}^{m}\theta_i} \quad (4.1)$$

Chamorro-Narvaez (2012)

Equation (4.1) shows Y, the total output depends on the accumulation of private capital K, human capital H, Gi is the stock of public investment of type i, where $i = 1 \dots m$, L the size of labour, A is the rate of labour-augmenting technological progress and $'t'$ is the time. Returns to scale are assumed to be constant. With $L\ and\ A$ assumed to grow exogenously at the rate $n\ and\ g$.

Where,

$$\mathrm{L}_t = L_0 e^{nt} \quad (4.1.1)$$

$$\mathrm{A}_t = A_0 e^{gt} \quad (4.1.2)$$

Let the proportion of private output be saved and invested, devoted to human capital development be s_k (the fraction of income invested in private capital) and s_h (fraction of income invested in human capital), and the constant share in the public expenditure be $s_{Gi}, \dots, s_{Gm}$ invested in different types of government capital. Thus, the assumption that the accumulation of the reproducible factors:

Accumulation equations of Inputs

$$\dot{K} = s_K (I - \tau)Y - \delta K \quad (4.1.3)$$

$$\dot{H} = s_H (I - \tau)Y - \delta H \quad (4.1.4)$$

$$\dot{G}_i = s_{Gi}(\tau)Y - \delta G_i, \forall_i = 1, \dots, m \quad (4.1.5)$$

Where δ is the depreciation rate and assumed to be common for every category of capital stock and constant over time, τ is the size of the public sector, particularly the share of public sector to the total output. Following the procedure used by MRW (1992), Oscar Bajo-Rubio (2000), Milbourne *et al.* (2003) and Chamorro-Narvaez (2012), that is, rates of change in the stocks of reproducible factors, in efficiency terms and equating same to zero, as well as substituting in equation (4.1) and taking logs, gives an equation for per capita income in equation (4.1.6).

$$In\left[\frac{Y(t)}{L(t)}\right] = \quad InA(0) + gt + \frac{\alpha-\sum_{i=1}^{m}\theta i}{1-\alpha-\beta-\sum_{i=1}^{m}\theta i} In[(s_k) - (n+g+\delta)] +$$

$$\frac{\beta}{1-\alpha-\beta-\sum_{i=1}^{m}\theta i} In[(s_h) - (n+g+\delta)] + \frac{\theta i}{1-\alpha-\beta-\sum_{i=1}^{m}\theta i} In[(s_{Gi}) - (n+g+\delta)] +$$

$$\cdots + \frac{\theta m}{1-\alpha-\beta-\sum_{i=1}^{m}\theta i} In[(s_{Gm}) - (n+g+\delta)] + \frac{\sum_{i=1}^{m}\theta i}{1-\alpha-\beta-\sum_{i=1}^{m}\theta i} ln\tau +$$

$$\frac{\alpha+\beta-\sum_{i=1}^{m}\theta i}{1-\alpha-\beta-\sum_{i=1}^{m}\theta i} \ln(1-\tau) \qquad (4.1.6)^{67}$$

The equation shows that the steady state income per capita depends on population growth, labour-augmenting technological progress rate, depreciation rate accumulation of private and public physical capital, human capital, the size of the public sector to total output (τ). The term $(1-\tau)$ in the equation represents a detrimental aspect of public spending, since it is the only fraction of the total output that remains to influence production. The model assumes that g, the labour-augmenting technological progress is 0.02, while the δ, the rate of depreciation is 0.03, and their sum is constant, equal to 0.05 (Mankiw, Romer and Weil, 1992).

However, Jalilian and Odedokun (2000, p. 290) note that the assumption that all countries are currently in their steady state as in equation (4.1.6) could be a very strong assumption. They pointed out the assumption may, however, not be necessary for a developing country and can be relaxed. Thus, we relax the steady state assumption of the model, given that we are applying the model on a developing country, like Nigeria. Also, Mankiw, Romer and Weil (1992) note the quantitative prediction of convergence to steady state assumes that y^* be the steady state level of income per effective worker given by equation (4.1.7) and let y_t be the actual value at time (t). Approximating around the steady state, the speed of convergence is in the following form;

$$\frac{dln(y_t)}{d_t} = \Lambda[ln(y^*) - \ln(y_t)] \qquad (4.1.7)$$

[67] Equation (4.1.6) is the steady-state, "defined as when the capital stocks per effective unit of labour, for example K_t/A_tL_t are constant" Milbourne *et al.* (2003, p. 5). This implies that the levels of all capital stocks and output grow at the exogenous rate *n and g*.

Where; $\Lambda = (n + g + \delta)(1 - \alpha - \beta)$ is the convergence rate and this implies that $ln(y_t) = \left(1 - e^{-\Lambda t}\right) ln\,(y^*) + e^{-\Lambda t} ln\,(y_0)$, where y_0 is income per effective worker at some initial date. Subtract y_0 from both sides, we have

$$ln(y_t) - ln(y_0) = \left(1 - e^{-\Lambda t}\right) ln\,(y^*) - \left(1 - e^{-\Lambda t}\right) ln\,(y_0) \qquad (4.1.8)$$

With $y^* = \left[\frac{Y(t)}{L(t)}\right]$ being the steady state as in equation (4.1.6), substitute (y^*) into equation (4.1.8);

$$ln(y_t) - ln(y_0) = \left(1 - e^{-\Lambda t}\right) \{lnA(0) + gt + \frac{\alpha - \sum_{i=1}^{m} \theta i}{1 - \alpha - \beta - \sum_{i=1}^{m} \theta i} In[(s_k) - (n + g + \delta)] + \frac{\beta}{1 - \alpha - \beta - \sum_{i=1}^{m} \theta i} In[(s_h) - (n + g + \delta)] + \frac{\theta i}{1 - \alpha - \beta - \sum_{i=1}^{m} \theta i} ln[(s_{Gi}) - (n + g + \delta)] + \cdots + \frac{\theta m}{1 - \alpha - \beta - \sum_{i=1}^{m} \theta i} ln[(s_{Gm}) - (n + g + \delta)] + \frac{\sum_{i=1}^{m} \theta i}{1 - \alpha - \beta - \sum_{i=1}^{m} \theta i} ln\tau + \frac{\alpha + \beta - \sum_{i=1}^{m} \theta i}{1 - \alpha - \beta - \sum_{i=1}^{m} \theta i} ln(1 - \tau)\} - (1 - e^{-\Lambda t}) ln(y_0) \qquad (4.1.9)$$

Equation (4.1.9) becomes our non-steady state growth rate of income per worker. It shows income per worker growth, that is, between periods; $ln(y_t) - ln(y_0)$ depends on private capital, human capital and each of the m components of the public investment $(s_{Gi,\ldots,}s_{Gm})$, adjusted by the factor $(n + g + \delta)$, the size of the public sector (τ) and the initial level of income per worker $ln(y_0)$. Equation (4.1.9) constitute the basis of our theoretical framework of the study, given that it avails us the opportunity to achieve one of the objectives of the study, which is to estimate the growth effects of public expenditure and its components in Nigeria over the period, 1981-2015.

4.3.1 Control Variables Included in the Growth-Public Expenditure Model

In our growth-public expenditure model, our major variable of interest is the public expenditure and its components. We, however, consider other variables that could affect the GDP per worker growth rate as well as ensure that the estimates of our target variable could be extricated enough from the imprecision, owing to errors of

omitted variables[68]. Hence, we modeled real GDP per worker growth rate as a function of private capital investment, investment in human capital, different components of public investment, effective population growth rate, productivity growth, rate of depreciation, trade openness, terms of trade and initial level of income per worker.

4.3.1.1 Private Capital Investment

Private investment is perceived in many countries, including Nigeria, as one of the engines of growth. Private investment could affect economic growth through the activities of government policy decisions, either through public expenditure or taxes. Given the saying that government is wasteful and as well has 'no business in doing business', the protagonists professes the usefulness of the private capital investment in enhancing economic growth. Khan (1996) separated total investment into private and public investments and estimated their respective impacts on economic growth. He founds private investment has a much more significant macroeconomic influence than public investments.

In Kenya, M'Amanja and Morrissey (2005) in their study finds private investment to be a positive and significant determinant of growth. Also, Makuyana and Odhiambo (2018) in their study on the relative impact of public and private investments on economic growth and the crowding effect between the two components of investment in South Africa, using annual data from 1970 to 2017 found private investment has a positive impact on economic growth both in the long-run and short run. However, the measurement and composition of private investment has been contentious in the growth literature, especially among the developing countries where there is dearth of data (M'Amanja and Morrissey, 2005). It is suggested that one measure is derived by deducting the government investment from gross fixed capital formation (GFCF).

[68] Also, we use control variables in the model so that we could achieve some policy and external environment variables that are useful in explaining growth models as explained in literature (Barro & Sala-i-Martins, 1995, 2004; Odedokun, 2001).

Government investment in their study is proxied by total capital budget of the government (Ibid.).

4.3.1.2 Human Capital Development

Investment in the human capital development is very important for economic growth. A higher level of human capital would engender technological diffusion in the economy, thereby, increase productivity and economic growth. Nelson and Phelps (1966) explains that people's educational attainment may have a significant influence on their ability to adapt to changes, introduction of new technologies. Similarly, Lucas (1988) modeled human capital and economic growth and posits it is good for economic growth. The model considers human capital as the engine of growth, because human capital accumulation raises the productivity of both labour and physical capital. Thus, changes in the human capital creeps into the model as a catalyst for technological progress. Romer (1990) went beyond the adoption of existing technologies to the creation of new ones. The implication could be that technological progress and growth depends on the stock of human capital.

However, different proxies have been used in literature to measure human capital development, namely, primary and secondary schools' enrolments. For example, Barro (1991) used primary and secondary school enrolment rates as proxy for human capital development. He found primary and secondary education have positive and significant impact on the growth rate of GDP per capita. Also, Sianesi and Reenen (2000) note that primary and secondary skills are more suitable for growth in the poorest and intermediate developing countries respectively, while tertiary skills are important for growth in OECD countries. In addition, M'Amanja and Morrissey (2005) used primary and secondary school enrolment, as proxy for human capital development/labour force growth and found a positive relationship with economic growth.

4.3.1.3 Population Growth Rate, Depreciation and Technological Progress

In the augmented Solow model by Mankiw, Romer and Weil (1992), the sign of the population growth coefficient is negative, meaning that increase in the population growth is detrimental to the real GDP per capita growth. However, increase in the population growth could be positive, where such growth leads to increase in the real GDP per capita.

In a surplus-labour economy like Nigeria that relies on agriculture in the rural area, increase in the labour could lead to increase in the real GDP per capita, given that more hands will be involved in agriculture and earnings therefrom. However, the values of capital depreciation and rate of labour-augmenting technological progress $(\delta + g)$ are held constant as in Mankiw, Romer and Weil (1992). Thus, we assume the depreciation rate (δ) to be equal to every category of capital stock and technological progress (g) are summed to be 5.0 per cent or .05 in the model. The reason for the assumption is partly, owing to the dearth of data on the rate of technical progress and capital stock depreciation for country.

4.3.1.4 Trade Openness

This is a measure of the degree of openness of the economy. Its impact on the economic growth looks contentious in the literature. Some studies show that trade openness has significant positive effect on economic growth (Echekoba *et al*, 2015 and Muhammad and Akanegbu, 2018). However, Fosu and Mold (2008) in their study, support the postulation that African countries cannot expect substantial gains from further multilateral liberalization. They pointed the sharp contraction of import-competing sectors in response to trade liberalisation in many African economies as well as the insufficient compensation through labor market adjustments in other sectors, the crucial impact on poverty reduction is likely to be small or even negative. In our study, trade openness is assumed to have positive relationship with real GDP per capita.

4.3.1.5 Terms of Trade

Terms of trade is an index and used as a proxy for external shock. It is measured by the ratio of a country's exports and imports. Also, it can be looked at by comparing the domestic exports with the prevailing international imports, which is referred to as net barter terms of trade (Wang and Zhang, 2009). A country that enjoys a high term of trade tends to grow faster than country with low term of trade. Increasing terms of trade is expected to increase economic growth and reduce poverty. Favourable terms of trade accelerate economic growth (Frourie, 2001 and Kreinin, 2006).

There are theories that provide links between terms of trade and economic growth. One of these theories is the Hans Singer and Raul Prebisch, known as the Singer-Prebisch thesis. The Singer-Prebisch thesis discovered a long-run tendency for the terms of trade of countries producing primary products in relation to countries involved in manufacturing to fall. Another theory is the Jagdish-Bhagwati thesis, it posits that the increase in output caused by technical progress and the increase in factor accumulation may make terms of trade disadvantageous to the countries, which are growing (Wang and Zhang, 2009). In addition, there is the Heckscher-Ohlin postulation that international and inter-regional differences in production costs occur because of the differences in the supply of factors of production.

4.4 Growth-Poverty Model

Poverty poses serious threats to government policies, especially in the developing countries. Its typology is such that impedes growth and development. Economic growth, however, is noted to be very important for reducing the level of poverty in a country - sustained economic growth raises the income of members of a society over a long period of time, and in turn, reduces the level of poverty and income inequality (Ravallion and Datt, 1996; Ravallion and Chen, 1997; Agrawal, 2008; Anyanwu, 2013; and Agrawal, 2015).

The idea that economic growth reduces poverty, especially in the developing countries has come under criticism by some studies (Roemer and Gugerty, 1997).

Also, attaining high economic growth rates in developing countries do not translate into poverty reduction. Rodrick (2000) contends that a country could enjoy a high average growth rate without any benefit to its poorest households, if the income disparities grew significantly – with the rich getting richer, while the income of poor get stagnated or declined. Collaborating Rodrick (2000), World Bank (2013) observes that many countries in the developing world have achieved impressive economic growth rates in recent years, but the poverty levels in those countries have in general not reduced significantly.

To estimate the poverty reduction effects of economic growth in Nigeria during the study period[69], we adopt a variant of the model by Ravallion and Chen, (1997); Datt and Ravallion, 2002; Anyanwu, 2013; and Agrawal, 2015. They used the growth–poverty model to demonstrate the relationship between economic growth and poverty. In their models, poverty was modeled as a function of income inequality, measured by Gini-coefficient and growth of real GDP per capita growth as well as other control variables[70]. The growth-poverty model will enable us to achieve the second of objective of our study; the impact of economic growth on poverty reduction.

Following Ravallion and Chen, (1997); Datt and Ravallion, 2002; Anyanwu, 2013; and Agrawal (2015), we have our growth-poverty model in the form:

$$P_t = \alpha_t + \beta_1 Z_t + \beta_2 Y_t + \varepsilon_t \qquad (4.2)$$

Where,

P_t = Measurement of Poverty in the country at time (t), β_1 = Elasticity of poverty with respect to income inequality given by Gini-coefficient, Z_t = Income inequality (Gini-coefficient) at time (t), β_2 = the growth elasticity of poverty with respect to real

[69] We use the annual data on incidence of poverty by the National Bureau of Statistics (NBS). Grootaert, *et al*, (1995, p. 1) notes "empirical investigations of poverty in developing countries have tended to focus on the incidence of poverty at a particular point in time. This is largely dictated by the available data source, usually a household income or expenditure survey, which provides a snapshot picture of household welfare and poverty (at most over a one-year reference period)".

[70] He notes the model has both economic growth and income distributional impact effects on poverty. Ravallion and Chen (1997) and Anyanwu (2013) used panel data for the growth-poverty model analysis.

per capita GDP given by Y, Y_t = Real GDP per capita at time (t) and ε_t = an error term that includes errors in the poverty measure.

Incidence of Poverty

The study uses the National Bureau of Statistics (NBS) measure of incidence of poverty (NBS, 2012b). It is measured by the mean per capita household expenditure; that one-third of it gives (separate) the extreme or core poor[71] from the rest of the population, while two-third of the mean per capita expenditure separate the moderate poor from the rest of the population[72]. The choice of the incidence of poverty measure, as provided by the NBS in the study is influenced by the availability of time series data for the period of the study. Also, its basket of measure captures such factors as, total food expenditure on consumption, education share, health share, rent share, non-food Share.

Studies have shown the importance of using incidence of poverty as measure of poverty[73]. Grootaert *et al.* (1995, p. 1) notes "empirical investigations of poverty in developing countries have tended to focus on the incidence of poverty at a particular point in time. This is largely dictated by the available data source, usually a household income or expenditure survey, which provides a snapshot picture of household welfare and poverty (at most over a one-year reference period)".

4.4.1 Control Variables Included in the Growth-Poverty Model

In the growth-poverty model, incidence of poverty is modeled as a function of economic growth, measured by real GDP per capita. The control variables are introduced in the model to have some policy and external environment variables that could be useful in explaining growth–poverty model as explained in literature[74]. In

[71]Extremity of poverty indicates the condition in which an individual does not afford the necessities of life, food, clothing, shelter, basic education etc. and could sometime be referred to as abject poverty. It looks at persons or group of person's annual income vis-à-vis their poverty threshold or poverty line.

[72] There could be other measures of poverty. For example, there is the international absolute poverty figure, and could be expressed in terms of US$1, US$1.9 or US$2.00 per day measurement as well as the Gini Coefficient for measuring the income inequality.

[73]Anyanwu (2013) and Agrawal (2015) used incidence of poverty as measure of poverty.

[74]M'Amanja and Morrissey (2005) and Anyanwu (2013),

this regard, we include income inequality, measured by Gini coefficient, unemployment rate, inflation rate, literacy rate and population growth.

4.4.1.1 Income Inequality

Kuznet hypothesis provides an early study on the relationship between income and income inequality. According to him, an inverted-U relationship exists between income and inequality. This implies that the degree of inequality would increase first, especially at the early stage development, and then decrease with the level of income or economic growth. Notwithstanding, there exist different scholarly positions about economic growth, poverty and income inequality. Some studies suggest that income inequality fashioned economic growth (Galor and Zeira, 1993 and Alesina and Rodrick, 1994), whereas some others suggest that economic expansion would lead to increased income, which reduces poverty and income inequality (Aghion, *et al.* 1999). Yet, some others posit that economic growth even result in higher income inequality and increase poverty profile (Ravallion, 2001).

Some studies in the developing countries have either confirmed the foregoing propositions. For example, Fosu (2008) indicates that poverty reduction in the SSA has been less efficient, owing to the poor distributional mechanism of income in the region. Ncube *et al*. (2013) suggests higher levels of income inequality, among others tend to increase poverty in Africa and therefore, bad for poverty reduction and inclusive growth in the continent. In an economy, where income inequality is persistently low, the poor tends to obtain a higher share of the gains from growth than where it is high. As the differences in the income inequality widens, poverty increases and the less effective growth would be to reduce poverty (Lustig *et al*, 2000 and McKay, 2013).

4.4.1.2 Unemployment Rate

Unemployment is one of the major challenges of developing countries[75]. High levels of unemployment rate contribute to widespread poverty and income inequality in a country. Kingdon and Knight (2007) underscore some of the economic and social implications of unemployment in a country to include, erosion of human capital, social exclusion, protests, increased crime rates and morbidity. Countries, however, strive to achieve low levels of unemployment rate as this is considered very important for economic growth.

In Nigeria, the attainment of high and sustainable output growth with low levels of unemployment rate is at the forefront of major macroeconomic policy objectives of the various national development plans. Nigeria's unemployment became manifest after the collapse of oil boom in the 1970s and has increased, since the early 1980s. The growth of GDP is assumed to be positively related to employment generation and by implication, reduction in poverty, and inversely related to unemployment. In a study of the unemployment and economic growth in Nigeria from 1980-2013, Onwioduokit (2013) posits that Okun's Law cannot be confirmed. The coefficient of unemployment rate was properly signed, though not statistically significant at conventional level[76].

4.4.1.3 Inflation Rate

In the monetary economics literature, money supply is linked to the output (GDP) in the Quantity Theory of Money. The theory posits that increase in money supply increases output. Increase in money supply (M2) or broad money increases inflation, where such increase is not as a result of increase in output but increase in prices. Therefore, when the M2 grows faster than the output, the inflation rate is increased, and this could affect aggregate demand, which in turn affects income and increase the level of poverty. During the period of high inflation, wage earners and pensioners are

[75]Unemployment in Nigeria is defined as the proportion of labor force that was available for work but do not work in the week preceding the survey period for at least 39 hours (NBS, 2012).

[76] The Okun's law is very useful theory in studying the relationship between unemployment and economic growth. It states that a unit reduction in the unemployment rate would increase approximately 3.0 per cent of output.

affected badly as their purchasing power become eroded (Ijaiya, 2000). In a recent study, Oladapo *et al.* (2015) determines the effects of inflation and interest rates on economic growth in Nigeria from 1981-2014. The result of their findings indicates that Inflation has a negative effect on economic growth.

4.4.1.4 Literacy Rate

Education equips people with basic knowledge and skills needed to have improved quality of life. Governments in Nigeria have made attempts to increase the number of those who can read and write through various educational programmes. This involves the establishment of model nomadic education centers in some states of the country. The numbers of nomadic schools have grown from 2,870 in 2010 to 3,535 in 2013 and nomadic student's enrolment from 484,694 in 2010 to 519,018 in 2013 (Federal Ministry of Education, 2014).

Further, special education programs like girl-child education progromme, adult and youth literacy programme, boy-child vocational school programme and Almajir educational programme were established to encourage the less social and economic inactive population to be educated and learn any form of skill acquisition. Policies and programmes of government that are channeled at increasing citizens' access to education, and the effective utilization of educational opportunities, support greatly in poverty reduction. For example, Plamer-Jones and Sen (2003) and Anyanwu (2012) found poverty among the rural households in India and Nigeria that do not have formal education or up to primary school education, respectively compared with those with secondary school education and beyond.

Anyanwu (2012) indicates that, it is only general post-secondary education that significantly reduces poverty in Nigeria, while having no education significantly increases the level of poverty in the country. Similarly, Tilak (2007) observes that literacy and primary education are positively related to poverty ratio in India. Implying that as literacy increases, poverty increases. However, he pointed out that, it is only when people have at least completed middle/upper primary level of

education, that the relationship between education and poverty is negative and important. In addition, he posits the negative relationship becomes stronger as the level of education is raised up to secondary (and above). So, the middle level education (secondary level) may serve as a threshold level for education to influence poverty.

4.4.1.5 Overseas Development Assistance

Foreign aid/grants are part of development planning in developing countries. It could be in the form of financial, commodity/food technical assistance and equipment. Foreign aid is expected to reduce the incidence of poverty, where it is well utilised by providing the necessary funding-gap required by the recipient nation to facilitate economic growth. However, the position of literature is varied in this regard. For example, Alvi and Senbeta (2012) posit that foreign aid has a significant poverty-reducing effect even after controlling for average income. Also, foreign aid is associated with a decline in poverty as measured by the poverty rate, poverty gap index and squared poverty gap index (Anyanwu, 2013).

In contrast, M'Amanja and Morrissey (2005) find a negative relation between foreign aid and economic growth in Kenya. They suggested that grants to Kenya are either fungible, discourage private investment, or tied to donors' desires, thereby creating adverse effects on growth. Similarly, Sunkanmi and Abayomi (2014) find that foreign aid has a positive relationship with the level of poverty in Nigeria. They posited that increase in foreign aid to Nigeria increases the level of poverty. This shows that most of the foreign aid being sent to Nigeria for poverty reduction tends to increase the level of poverty, rather than reduce it.

4.4.1.6 Population Growth Rate

Population growth is very important factor for development planning purposes. High population growth could have both social and economic implications on an economy. It could lead to exertion of pressure on a nation's existing infrastructure and available resources, reduces private and public capital formation, and impedes economic

growth. On the other hand, high population growth could result to large number of labour force and good for economic growth, especially where such is very productive.

In the augmented Solow model discussed earlier in the study, increase in the rate of population is considered a burden on the economy and disincentive for growth and poverty reduction - not supportive to the growth of real GDP per capita. However, some studies suggest that high population growth could be growth-enhancing. For example, Tartiyus *et al*. (2015) evaluated the impact of population growth on economic growth in Nigeria from 1980 to 2010. Their study indicates the presence of a positive relationship between economic growth (proxy by GDP growth) and population. Similarly, Ogunleye *et al* (2018) indicated that population growth has a positive and significant effect on economic growth in Nigeria. However, in Uganda, Klasen and Lawson (2007) examine the link between population and per capita economic growth and poverty. The findings suggest that the high population growth exerts considerable pressure on the per capita growth prospects in Uganda. It contributes significantly to low achievement in poverty reduction and is associated with households being persistently poor and moving into poverty.

4.5 Policy Simulation

We shall use the outcome of results generated from the two regression models, equations (4.1.9) and (4.2) to conduct policy simulation, using Microsoft Excel. Prior to that, we shall conduct some tests to confirm the robustness of the two models to be used for the simulation exercise. They test includes plotting and evaluation of the actual against simulated values of the endogenous variables. In addition, we shall use the forecast statistic; Theil's inequality coefficient (U), Root Mean-Squared Percent Error $(RMSPE)$ and correlation metrics of the actual against simulated values of the endogenous variables [77]. For the model simulation analysis, we use the outcome of

[77] Olofin *et al.* (2014) note that the value of U ranges between 0 and 1. Simulated values are either the worst possible when $U = 1$ or the best possible when $U = 0$. In the case of the RMSPE, smaller values represent better forecast performance of the model.

the estimated values of the dependent variables; real GDP per capita and incidence of poverty[78]:

(a) We assume that policy changes would be affected by the government, using its policy variable (public expenditure). Considering the period of estimation, 1981 - 2015, our policy simulation period would be from 2016 - 2020. The 5-years forecast horizon is on the presumption that there would be conscious effort on the part of government to consistently increase its annual public expenditure;

(b) We forecast for all other exogenous variables. The exogenous variables other than the policy variable are expected to follow their natural pattern (Do nothing). To forecast for the exogenous variables, we use the Simple Moving Average Method (SMAM) for their respective trend, 2016-2020; and

(c) The SMAM forecasts the next period, for example, period $T + 1$ shall be equal to the average of a specified number of the most recent observations, while each of the observation receive the same emphasis (weight). For example, we have;

(i) $Y_{T+1} = (Y_T + Y_{T-1} + Y_{T-2})/3$

(ii) $Y_{T+2} = (Y_{T+1} + Y_T + Y_{T-1})/3$

(iii) $Y_{T+n} = (Y_{T+n-1} + Y_{T+n-2} + Y_{T+n-3})/3$

In our study, we are using 5-year annual moving average, and the following simulation scenario shall be conducted:

[78] Barro (1990, p. 120) noted that "the hypothesised effects of government policy is easier to assess if the government's actions can be treated as exogenous. That is, the results are simple if governments randomise their actions, and thereby generate useful experimental data".

Baseline: Allowing the policy variable (public expenditure) to follow its natural path; we intend to examine what would be the impact of such on the endogenous variables; real GDP per capita and incidence of poverty;

Optimistic: Increase the level of policy variable by 10.0 per cent; we intend to examine what would be the impact of such policy action on the endogenous variables; real GDP per capita and incidence of poverty; and

Pessimistic: Decrease the level of policy variable by 10.0 per cent; we intend to examine what would be the impact of such policy action on the endogenous variables; real GDP per capita and incidence of poverty.

4.6 Description and Measurement of Variables

In section 4.3, the growth-public expenditure model indicates that the real GDP per capita growth is modeled to depend on private capital investment, series of public investment, human capital development, growth rates of population, technological progress, depreciation, public sector, initial level of real GDP per capita and other control variables. Similarly, section 4.4, discusses the growth-poverty model. It shows that the incidence of poverty is modeled to depend on real GDP per capita, income inequality, unemployment rate, inflation rate, literacy rate, overseas development assistance/GDP ratio and rate of population growth.

The variables unit of measurement and *a priori* expectation used in the growth-public expenditure model are shown in Appendices 1 and 2, while Appendices 3 and 4 represent the variables unit of measurement and *a priori* expectation used in the growth-poverty model. All the variables in the Nigeria naira (~~₦~~)/(N), expressed in real values to accommodate for the effect of inflation, by using the gross domestic product (GDP) deflator at 2010 constant prices to divide each of them[79]. The variables

[79] Fan *et al.* (2004) used the GDP deflator to deflate all the variables expressed in nominal values in their study of the Public Expenditure, Growth, and Poverty Reduction in Rural Uganda.

used in the estimations of growth-public expenditure model and growth-poverty model are shown in Appendices 5 and 6.

4.7 Estimation Method for the Regression Models

This section explains the descriptive statistics in subsection 4.7.1. The descriptive statistics are on the key variables of interest in the study, namely, real GDP per capita growth rate (Y_PERCAP), real public expenditure to the GDP ratio (ESP_GDP) and incidence of poverty (POVT_POP). Subsection 4.7.2 is the Unit Root Test. In subsections 4.7.3 and 4.7.4, we explain correlation matrix among some of the disaggregated variables in the models and Autoregressive Distributed Lag (ARDL) Model. The ARDL will be used to estimate the regression models discussed in equations (4.1.9) and (4.2) of sections 4.3 and 4.4, respectively.

4.7.1 Descriptive Statistics

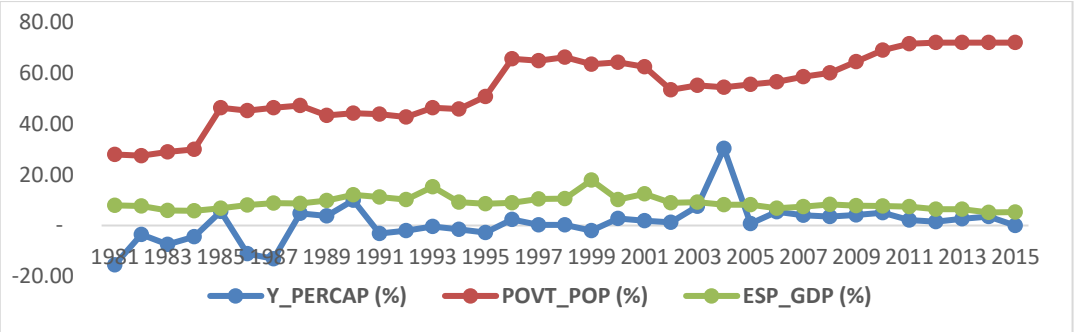
An overview of the annual Nigeria's real GDP per capita growth rate (Y_PERCAP) expressed at 2010 constant prices during the study period, shows that it does not have an upward movement. Rather, its movement fluctuates with periods of high and low growth troughs (Figure 10). It has maximum growth value of 30.4 per cent, while the minimum is negative 15.5 per cent. The average growth rate is I.0 per cent and the median, 1.5 per cent. It has a standard deviation and skewness of 7.5 and 1.2, respectively. With a skewness of 1.2, it is far from zero[80]. The kurtosis is 8.6, and more than the normal threshold of 3.0 (Table 15).

Also, the graph of the annual real public expenditure to the GDP ratio (ESP_GDP) expressed at 2010 constant prices did not exhibit upward movement throughout the study period (Figure 10).The ratio of public expenditure to the GDP maintained downward trend from 2008 until 2015, when it slightly inched up. Its descriptive statistics shows a mean value of 8.9 per cent, while the median, minimum and maximum has values of 8.3, 5.2 and 17.9 per cent, respectively. Its standard deviation is 2.6. The skewness and kurtosis are 1.5 and 5.8, respectively (Table 15).

[80]A normal distribution has a skewness of zero, implying a perfectly symmetrical around the mean and a kurtosis of three

The graph of incidence of poverty (POVT_POP) gallops upward, indicating that the incidence of poverty in Nigeria has been progressive for the greater period of study (Figure 10). The descriptive statistics shows a mean value of 54.0 per cent, while the median, minimum and maximum values of 55.2, 27.5 and 72.0 per cent during the study period, respectively. Its skewness and kurtosis are negative 0.4 and 2.3, respectively. The kurtosis is less than the normal threshold of 3.0, while the standard deviation is 13.4, and higher than the real GDP per capita and real public expenditure/GDP ratio values of 7.5 and 2.6, respectively (Table 15).

Figure 10: Movement in the Real GDP per Capita, Total Public Expenditure/GDP Ratio and Incidence of Poverty (%), 1981 – 2015



Source: Author's estimation using EViews 9.5 and data from World Bank database, CBN Statistical Bulletin, 2016 and National Bureau of Statistics Reports.

Table 15: Group Statistical Evaluation of the Major Variables; Real Gross Domestic Product per Capita, Real Public Expenditure and Incidence of Poverty, 1981-2015

	Y_PERCAP (%)	ESP_GDP (%)	POVT_POP (%)
Mean	1.03	8.85	54.02
Median	1.52	8.28	55.20
Maximum	30.36	17.86	72.00
Minimum	(15.45)	5.15	27.50
Std. Dev.	7.48	2.63	13.37
Skewness	1.18	1.46	(0.41)
Kurtosis	8.63	5.79	2.28
Sum	36.10	309.59	1,890.60
Sum Sq. Dev.	1,901.22	235.62	6,075.49
Observations	35.00	35.00	35.00

Source: Author's estimation using EViews 9.5 and data from World Bank database, CBN Statistical Bulletin, 2016 and National Bureau of Statistics Reports.

4.7.2 Unit Root Test

The study takes cognizance of the challenges of (non-stationarity/unit root) that may arise with econometric modeling, using a time-series data. Result from regression exercise involving non-stationary data is observed to be spurious (Granger and Newbold, 1974 and Granger, 1981). Therefore, using such data for empirical analysis requires, testing whether a stochastic process is stationary or non-stationary and the order of integration of the individual data series under consideration[81].

In this regard, we shall use the Augmented Dickey-Fuller (ADF) test due to Dickey and Fuller (1979, 1981) and Phillip-Perron (PP) due to Phillips (1987) and Phillips and Perron (1988) for each of the data series in both the growth-public expenditure model and growth-poverty model. The outcome of the unit root test for the data series in the growth-public expenditure model is shown in Table 16.

Table 16: Result of Unit Root Test for Series in the Growth-Public Expenditure Model

S/N	Variable	Augmented Dickey-Fuller		Order of Integration	Phllips-Perron		Order of Integration
		Test Statistics With Constant	Critical Value		Test Statistics	Critical Value	
1	DLOGY_PERCAP	-4.3454	-3.6463	I(1)	-4.3312	-3.6463	I(1)
2	DLOGPCI_GDP	-9.2272	-3.6463	I(1)	-9.1802	-3.6463	I(1)
3	DLOGHCD	-4.6821	-3.6463	I(1)	-4.8802	-3.6463	I(1)
4	DLOGPLN_DEPRE_TECH	-4.7092	-3.6463	I(1)	-4.3778	-3.6463	I(1)
5	DLOGESP_GDP	-8.6838	-3.6463	I(1)	-8.6838	-3.6463	I(1)
6	DLOGREC_GDP	-7.7699	-3.6463	I(1)	-7.7763	-3.6463	I(1)
7	DLOGCAP_GDP	-7.2689	-3.6463	I(1)	-7.2689	-3.6463	I(1)
8	DLOGGA_GDP	-8.7305	-3.6463	I(1)	-9.5189	-3.6463	I(1)
9	LOGSCS_GDP	-3.7042	-3.6394	I(0)	-3.7055	-3.6394	I(0)
10	DLOGES_GDP	-6.9619	-3.6463	I(1)	-6.9619	-3.6463	I(1)
11	DLOGTS_GDP	-8.1182	-3.6463	I(1)	-9.1715	-3.6463	I(1)
12	LOGSOC_GDP	-4.0983	-3.6394	I(0)	-4.0597	-3.6394	I(0)
13	LOGTRC_GDP	-3.6164	-2.9511	I(0)	-3.4946	-2.9511	I(0)
14	DLOGAGR_GDP	-8.6495	-3.6463	I(1)	-9.9136	-3.6463	I(1)
15	DLOGHEL_GDP	-5.3408	-3.6702	I(1)	-5.3408	-3.6702	I(1)
16	LOGEDU_GDP	-3.9086	-3.6394	I(0)	-3.8951	-3.6394	I(0)
17	LOGOSC_GDP	-3.8090	-3.6394	I(0)	-3.9563	-3.6394	I(0)
18	LOGTOT	-3.7516	-3.6463	I(0)	-5.5367	-3.6463	I(1)
19	DLOGTOO_GDP	-7.4771	-3.6463	I(1)	-7.5979	-3.6463	I(0)
20	DLLOGY_CAP_0	-5.6564	-3.6463	I(1)	-5.6564	-3.6463	I(1)

Note: Based on Data in Appendix 1. At 1.0% and 5 % ADF and PP Critical Values for the Test is -3.6463 and -2.9540 and -3.6463 and -2.9540, respectively.

Similarly, the outcome of the unit root test for the data series in the growth-poverty model is shown in Table 17. The results of the Augmented Dickey-Fuller (ADF) and

[81]One of the criticisms of Aschauer (1989) is the non-stationarity of the data used in his study. Sturn and De Haan (1995) revisited the results found by Aschauer (1989) and suggested different conclusion using the same data, but different econometric techniques. They found the variables in the production function were supposed to be estimated in first differences, rather than on levels as used by Aschauer. Among their conclusion is that the positive relation between public investment and GDP discovered by Aschauer was overvalued.

Phillip-Perron (PP) tests in the two models indicate the existence of unit roots/non-stationarity in some of the series. However, some series did not show the presence of unit root. With the presence of unit root, the series are differenced and thus, become stationary after their first difference. Implying that they are integrated of order I(1), while others are stationary at levels and integrated of order I (0). Hence, we have a combination of I(0) and I(1) in the data series (Tables 16 and 17).

Table 17: Result of Unit Root Test for Series in the Growth-Poverty Model

S/N	Variable	Augmented Dickey-Fuller		Order of Integration	Phllips-Perron		Order of Integration
		Test Statistics With Constant	Critical Value		Test Statistics	Critical Value	
1	DLOGPOVT_POP	-5.5643	-3.6463	I(1)	-5.5713	-3.6463	I(1)
2	LOGGINI_COEFF	-3.9509	-3.6463	I(0)	-3.2540	-2.9511	I(0)
3	DLOGY_PERCAP	-4.3454	-3.6463	I(1)	-4.3312	-3.6463	I(1)
4	DLOGUMP	-4.7836	-3.6463	I(1)	-4.8044	-3.6463	I(1)
5	DLOGINF	-5.5526	-3.6463	I(1)	-9.0752	-3.6463	I(1)
6	DLOGLTR	-4.5651	-3.6702	I(1)	-10.0074	-3.6463	I(1)
7	DLOGODA_GDP	-4.4545	-3.6537	I(1)	-4.3019	-3.6463	I(1)
8	LOGPLN_RATE	-4.7338	-3.7115	I(0)	-4.2820	-3.6463	I(1)
9	DLOGSER_GDP	-4.7172	-3.6463	I(1)	-4.7172	-3.6463	I(1)
10	LOGY_GDP	-3.3787	-2.9540	I(1)	-3.2202	-2.9540	I(1)
11	DLOGAGRI_SECGDP	-6.5130	-3.6463	I(1)	-6.5376	-3.6463	I(1)
12	DLOGIND_GDP	-6.2236	-3.6463	I(1)	-6.2117	-3.6463	I(1)
13	DLOGWRT_GDP	-4.2244	-3.6463	I(1)	-4.1869	-3.6463	I(1)
14	LOGBC_GDP	-3.1484	-2.9511	I(0)	-3.0865	-2.9511	I(0)
15	DLOGOIL_GDP	-5.1428	-3.6463	I(1)	-5.2142	-3.6463	I(1)
16	DLOGN_OIL_GDP	-6.7097	-3.6463	I(1)	-6.7332	-3.6463	I(1)

Note: Based on Data in Appendix 2. At 1.0% and 5 % ADF and PP Critical Values for the Test is -3.6463 and -2.9540 and -3.6463 and -2.9540, respectively.

4.7.3 Correlation Matrix

In the growth-public expenditure model, we have log of public expenditure/GDP ratio as one of the regressors. However, with its disaggregation by functional classification; General Administration/GDP ratio (LOGGA_GDP), Transfers/GDP ratio (LOGTS_GDP), Social and Community Services/GDP ratio (LOGSCS_GDP) and Economic Services/GDP ratio (LOGES_GDP), we have four of these ratios included as regressors in the estimation equation. Table 18 indicates high correlation exists among a number of these ratios, of which a multicollinearity problem could exist. Where, we decided to include all the disaggregated ratios in the model simultaneously, the precision of the estimates of the individual coefficients would be affected. Therefore, we shall report different equation estimates, whereby, each of the ratios shall appear in each equation as discussed in Chapter 5.

Table 18: Correlation Matrix of the Log of Real GDP Per Capita and Log of Real Public Expenditure/GDP Ratio by Functional Classification, 1981 – 2015

	LOGY_PERCAP	LOGY_CAP_0	LOGPCI_GDP	LOGHCD	LOGPLN_DEPRE_TECH	LOGGA_GDP	LOGTS_GDP	LOGSCS_GDP	LOGES_GDP	LOGTOO_GDP	LOGTOT
LOGY_PERCAP	1.00	0.91	0.37	0.44	0.77	(0.00)	(0.68)	0.27	(0.29)	0.13	0.03
LOGY_CAP_0	0.91	1.00	0.51	0.21	0.74	(0.18)	(0.64)	0.16	(0.37)	(0.06)	(0.14)
LOGPCI_GDP	0.37	0.51	1.00	(0.41)	0.47	(0.63)	(0.16)	(0.20)	(0.50)	(0.56)	(0.38)
LOGHCD	0.44	0.21	(0.41)	1.00	0.02	0.59	(0.62)	0.52	0.39	0.65	0.18
LOGPLN_DEPRE_TECH	0.77	0.74	0.47	0.02	1.00	(0.12)	(0.44)	0.21	(0.32)	(0.10)	0.09
LOGGA_GDP	(0.00)	(0.18)	(0.63)	0.59	(0.12)	1.00	(0.16)	0.61	0.53	0.71	0.41
LOGTS_GDP	(0.68)	(0.64)	(0.16)	(0.62)	(0.44)	(0.16)	1.00	(0.34)	(0.16)	(0.15)	0.07
LOGSCS_GDP	0.27	0.16	(0.20)	0.52	0.21	0.61	(0.34)	1.00	0.44	0.36	0.06
LOGES_GDP	(0.29)	(0.37)	(0.50)	0.39	(0.32)	0.53	(0.16)	0.44	1.00	0.44	(0.07)
LOGTOO_GDP	0.13	(0.06)	(0.56)	0.65	(0.10)	0.71	(0.15)	0.36	0.44	1.00	0.42
LOGTOT	0.03	(0.14)	(0.38)	0.18	0.09	0.41	0.07	0.06	(0.07)	0.42	1.00

Notes: Current real GDP per capita (LOGY_PERCAP), Initial real GDP per capita (LOGY_CAP_0), Private Capital Investment/GDP ratio (LOGPCI_GDP), Human Capital Development (LOGHCD), Effective population growth plus an assumed rate of technical progress and rate of capital depreciation (LOG LOGPLN_DEPRE_TECH),General Administration/GDP ratio (LOGGA_GDP), Transfers/GDP ratio (LOGTS_GDP), Social and Community Services/GDP ratio (LOGSCS_GDP) and Economic Services/GDP ratio (LOGES_GDP), Trade Openness (LOGTOO_GDP) and Terms of Trade (LOGTOT).

Also, in the growth-public expenditure model, we have log of the social sector public expenditure/GDP ratio as one of the regressors. We disaggregate the log of this social sector public expenditure/GDP by; Education (LOGEDU_GDP), Health (LOGHEL_GDP), Other Social and Community Services (LOGOSC_GDP), Agriculture (LOGAGR_GDP) and Transport and Communication (LOGTRC_GDP). The disaggregation means, we have five of these sub-sectors included as regressors in the estimated equation.

Table 19: Correlation Matrix of the Log of Real GDP Per capita and Disaggregated Log of Real Public Expenditure/GDP ratio on Social Sector, 1981 – 2015

	LOGY_PERCAP	LOGY_CAP_0	LOGPCI_GDP	LOGHCD	LOGAGR_GDP	LOGEDU_GDP	LOGHEL_GDP	LOGOSC_GDP	LOGTRC_GDP	LOGPLN_DEPRE_TECH	LOGTOO_GDP	LOGTOT
LOGY_PERCAP	1.00	0.91	0.37	0.44	(0.38)	0.09	0.47	0.48	(0.33)	0.77	0.13	0.03
LOGY_CAP_0	0.91	1.00	0.51	0.21	(0.30)	(0.02)	0.31	0.47	(0.27)	0.74	(0.06)	(0.14)
LOGPCI_GDP	0.37	0.51	1.00	(0.41)	0.11	(0.32)	(0.29)	0.34	0.20	0.47	(0.56)	(0.38)
LOGHCD	0.44	0.21	(0.41)	1.00	(0.37)	0.53	0.79	0.07	(0.26)	0.02	0.65	0.18
LOGAGR_GDP	(0.38)	(0.30)	0.11	(0.37)	1.00	0.07	(0.13)	0.08	0.69	(0.15)	(0.47)	(0.27)
LOGEDU_GDP	0.09	(0.02)	(0.32)	0.53	0.07	1.00	0.84	0.22	0.05	0.02	0.34	0.13
LOGHEL_GDP	0.47	0.31	(0.29)	0.79	(0.13)	0.84	1.00	0.32	(0.09)	0.19	0.46	0.11
LOGOSC_GDP	0.48	0.47	0.34	0.07	0.08	0.22	0.32	1.00	0.21	0.64	(0.20)	(0.20)
LOGTRC_GDP	(0.33)	(0.27)	0.20	(0.26)	0.69	0.05	(0.09)	0.21	1.00	(0.10)	(0.28)	(0.34)
LOGPLN_DEPRE_TECH	0.77	0.74	0.47	0.02	(0.15)	0.02	0.19	0.64	(0.10)	1.00	(0.10)	0.09
LOGTOO_GDP	0.13	(0.06)	(0.56)	0.65	(0.47)	0.34	0.46	(0.20)	(0.28)	(0.10)	1.00	0.42
LOGTOT	0.03	(0.14)	(0.38)	0.18	(0.27)	0.13	0.11	(0.20)	(0.34)	0.09	0.42	1.00

Notes: Real GDP per capita (LOGY_PERCAP), Initial real GDP per capita (LOGY_CAP_0), Private Capital Investment/GDP ratio (LOGPCI_GDP), Human Capital Development (LOGHCD), Effective population growth plus an assumed rate of technical progress and rate of capital depreciation (LOG LOGPLN_DEPRE_TECH),Education public expenditure (LOGEDU_GDP), Health public expenditure (LOGHEL_GDP), Other Social and Community Services public expenditure (LOGOSC_GDP), Agriculture public expenditure (LOGAGR_GDP) and Transport and Communication public expenditure (LOGTRC_GDP), Inflation Rate (LOGINF), Literacy Rate (LOGLTR),Trade Openness (LOGTOO_GDP) and Terms of Trade (LOGTOT)

Table 19 shows the existence of correlation between a number of these sub-sectors, and hence the possibility of existence of multicollinearity problem. Where, we decided to include all the sub-sectors simultaneously in the model, the precision of the estimates of the individual coefficients would be affected. Thus, we shall report different equation estimates, whereby, each of the sub-sectors shall appear in each equation as discussed in Chapter 5.

In the growth-poverty model, we have log of real gross domestic product (GDP) as one of the regressors. Disaggregating the log of GDP into various sectors; Agriculture/GDP ratio (LOGAGRI_SECGDP), Building and Construction/GDP ratio (LOGBC_GDP), Wholesale and Retail Trade/GDP ratio (LOGWRT_GDP), Industry/GDP ratio (LOGIND_GDP) and Services/GDP ratio (LOGSER_GDP), we have five of these sectors included as regressors in the estimated equation.

Table 20: Correlation Matrix of the Log of Incidence of Poverty and log of Gross Domestic Product by Sector, 1981 – 2015

	LOGPOVT_POP	LOGGINI_COEFF	LOGAGRI__SECGDP	LOGBC_GDP	LOGIND_GDP	LOGSER_GDP	LOGWRT_GDP	LOGLTR	LOGODA_GDP	LOGPLN_RATE
LOGPOVT_POP	1.00	0.44	0.81	(0.16)	(0.81)	0.83	0.55	0.93	(0.56)	0.22
LOGGINI_COEFF	0.44	1.00	0.38	(0.71)	(0.10)	0.09	0.02	0.30	0.08	(0.06)
LOGAGRI__SECGDP	0.81	0.38	1.00	(0.28)	(0.74)	0.68	0.39	0.84	(0.39)	0.25
LOGBC_GDP	(0.16)	(0.71)	(0.28)	1.00	(0.25)	0.28	0.31	(0.16)	(0.41)	0.39
LOGIND_GDP	(0.81)	(0.10)	(0.74)	(0.25)	1.00	(0.97)	(0.85)	(0.73)	0.59	(0.61)
LOGSER_GDP	0.83	0.09	0.68	0.28	(0.97)	1.00	0.81	0.73	(0.68)	0.49
LOGWRT_GDP	0.55	0.02	0.39	0.31	(0.85)	0.81	1.00	0.42	(0.34)	0.73
LOGLTR	0.93	0.30	0.84	(0.16)	(0.73)	0.73	0.42	1.00	(0.49)	0.12
LOGODA_GDP	(0.56)	0.08	(0.39)	(0.41)	0.59	(0.68)	(0.34)	(0.49)	1.00	(0.11)
LOGPLN_RATE	0.22	(0.06)	0.25	0.39	(0.61)	0.49	0.73	0.12	(0.11)	1.00

Notes: Incidence of poverty (LOGPOVT_POP), Gini Coefficient (LOGGINI_COEFF) Agriculture Sector/GDP Ratio (LOGAGRI_SECGDP), Industry Sector/GDP Ratio (LOGIND_GDP), Services Sector/GDP Ratio (LOGSER_GDP), Wholesale Retail Sector/GDP Ratio (LOGWRT_GDP), Building & Construction Sector (LOGBC_GDP), Literacy Rate (LTR), Overseas Development Assistance/GDP Ratio (LOGODA_GDP) and Population Growth Rate (LOGPLN_RATE)

Table 20, however, shows the presence of high correlation between a number of these sectors and the possibility of existence of multicollinearity problem. Thus, if we decided to include all the sectors simultaneously in the model, the precision of the estimates of the individual coefficients may be affected. We shall report them in different equations, whereby, each of the sectors will appear in each equation as discussed in Chapter 5.

4.7.4 Autoregressive Distributed Lag (ARDL) Model

We will estimate the regression models of equations (4.1.9) and (4.2) in sections 4.3 and 4.4 by formulating an autoregressive distributed lag (ARDL) model co-integration technique 'bound test' proposed by Pesaran *et al.* (2001). The choice of ARDL model instead of a static one is influenced by the need to capture all the dynamic responses in both the dependent and independent variables. Thus, estimating the equations (4.1.9) and (4.2) in their respective long run static forms may deny capturing any immediate short run and long run responses. Some scholars observe that such could engender imprecise coefficient estimates (Banerjee *et al.*, 1993 and M'Amanja and Morrissey, 2005). More so, with Enders (1995) submission that estimates derived from a model that captures all the dynamic responses in both the dependent and independent variable yield valid *t*-statistics, even where some of the right-hand variables are endogenous.

In addition, with the autoregressive distributed lag (ARDL) model co-integration technique 'bound test' proposed by Pesaran *et al.* (2001), we could estimate the regression models of equations (4.1.9) and (4.2), given the order of integration of our data series, which is combination of I(0) and I(1). Also, the scope of our study, which is from 1981-2015 may be small considering the sample size[82]. Makuyana and Odhiambo (2018, p. 92) notes that an ARDL co-integration technique 'bound test' proposed by Pesaran *et al.* (2001) has several advantages compared with the traditional cointegration procedures, such as the residual-based approach by Engle and Granger (1987) and the full maximum likelihood approach by Johansen and Juselius (1990). They capture the advantages in the excerpt below:

[82] M'Amanja and Morrissey (2005) in their study used annual data for the period, 1964-2002 in Kenya. They formulated an autoregressive distributed lag model (ARDL). Similarly, Agrawal (2015) estimated the drivers of incidence of poverty using the long-run equation derived from the auto-regressive distributed lag (ARDL) co-integration procedure proposed by Pesaran et al. (2001). He posited that is valid for small sample size of about 40 annual observations.

> "Firstly, the variables of interest are not restricted to being integrated of the same order – a mixture of the order of integration up to a maximum of one (1) can be employed. Secondly, unlike the traditional cointegration approaches that are sensitive to sample size, the ARDL procedure can be applied even when dealing with small samples. Thirdly, the ARDL procedure can determine a long-run relationship using a reduced form equation, unlike the traditional cointegration procedures, which use a system of equations (Shrestha and Chrowdhury, 2007). Lastly, the ARDL procedure gives valid t-statistics and unbiased long-run estimates (Pesaran and Shin, 1999; Odhiambo, 2008)".

Following Agrawal (2015) and Makuyana and Odhiambo (2018), we present the general ARDL (p,q) in the form;

$$\alpha(L)Y_t = \mu_0 + \beta_i(L)X_{it} + U_t \tag{4.3}$$

Where; $\alpha(L) = \alpha_1 L + \alpha_2 L^2 + \cdots + \alpha L^t$; $\beta(L) = \beta_0 L + \beta_1 L + \beta_2 L^2 + \cdots + \beta_t L^t$; $\mu_0$is a constant; Y_t is the dependent variable; L is the lag operator such that$L^t X_t = X_{t-i}$. In the long-run equilibrium, $Y_t = Y_{t-1} = Y_{t-2} = \cdots Y_0$ and $X_{it-1} = X_{i0}$. Solving for Y in equation (6.3), we have the following long-run relation:

$$Y = a + \sum b_i x_i + \gamma_t \tag{4.3.1}$$

Where:

$a = \frac{\mu_0}{\alpha_0 + \alpha_1 + \alpha_2 + \cdots \alpha_n}$; $b_i = \frac{\beta_{i0} + \beta_{i1} + \beta_{i2} + \cdots \beta_{it}}{\alpha_0 + \alpha_1 + \alpha_2 + \cdots \alpha_t}$ and $\gamma_t = \frac{\mu_0}{\alpha_0 + \alpha_1 + \alpha_2 + \cdots \alpha_n}$

The existence of the long run relationship is confirmed with the help of an F-test, which tests if the coefficients of all explanatory variables are jointly different from zero. The null hypothesis of the F-test states; there is no cointegration existing amongst the variables, while the alternative hypothesis stated the otherwise (Agrawal 2015). Thus, the estimated F-test would be compared with the upper and lower bounds test critical values as compiled by Pesaran *et al*. (2001). Where the estimated F-statistics value exceeds the upper bound critical value, there exists a long run relationship among the variables.

On the contrary, an F-statistics value below the lower bound critical value connotes the absence of cointegration among the variables. It, however, becomes inconclusive when the estimated F-statistics value is between the lower and upper bounds. The error correction (EC) representation of the ARDL method is written as follows;

$$\Delta y_t = \Delta\hat{\alpha}_0 - \sum_{j=2}^{p} \hat{\alpha}_j \Delta y_{t-j} + \sum_{i=1}^{k} \hat{\beta}_{i0} \Delta x_{it} - \sum_{i=1}^{k} \sum_{j=2}^{q} \beta_{i,t-j} \Delta x_{i,t-j} - \alpha(1,p) ECM_{t-1} + \mu_t \quad (4.3.2)$$

Where $ECM_t = y_t - \hat{\alpha} - \sum_{i=1}^{k} \hat{\beta}_{i0} \Delta x_{it}$ the first difference operator; $j, t - jand\ ij, t - j$ are the coefficients estimated from equation (4.3) and $(1, p)$ measures the speed of adjustment. We will use the framework given in equation (4.3) to estimate equations (4.1.9) and (4.2) in sections 4.3 and 4.4, respectively.

4.8 Conclusion

The study adopts a quantitative method of analysis and builds two regression models: growth-public expenditure and growth-poverty relationships. The choice of both the dependents and independent variables in the regression models are steered by economic theory and empirical literature. We estimate the individual regression models by formulating an ARDL (p,q) co-integration procedure proposed by Pesaran *et al.* (2001). The choice of the technique is informed by the characteristics of the data that are integrated of order I (1) and order I(0) as well as the small sample size of the data. Thereafter, the outcomes of the estimated regression models would be used for policy simulation and evaluation of the possible impacts of the changes in policy variable (public expenditure) on the, real GDP per capita and incidence of poverty.

CHAPTER FIVE
Model Estimation Result and Analysis

5.0 Introduction

The chapter shows the estimation results and analyses of growth-public expenditure and growth-poverty models. Our models are variants of the augmented Solow model by Mankiw, Romer and Weil (1992) that includes public expenditure as one of its explanatory variables, equation (4.1.9) in section 4.3 and growth-poverty model by Agrawal (2015), with economic growth as one of its explanatory variables, equation (4.2) in section 4.4. The estimation is done using EViews 9.5.

In addition, there will be policy simulation analysis on the impact of policy variable (public expenditure/GDP ratio) on the economic growth and poverty, using the estimates of the two models: growth-public expenditure and growth-poverty. This simulation exercise will be done under three different scenarios, using Microsoft Excel. Accordingly, the chapter is arranged into four sections. Section 5.1 investigates the growth-public expenditure model. Here, we discuss the growth effects of public expenditure/GDP ratio and other control variables. Section 5.2 is the estimation and analysis of the growth-poverty model - the impacts of economic growth and other control variables on the incidence of poverty. Sections 5.3 and 5.4 are outcome of policy simulation analysis and conclusion.

5.1 Growth-Public Expenditure Model

The section discusses the regression results of growth-public expenditure model, using the short run and long run equations derived from an auto-regressive distributed lag (ARDL) co-integration procedure by Pesaran *et al.* (2001) for the period 1981-2015. Our analyses shall focus on the *a priori* expectation and magnitude of the coefficient estimates between the dependent and explanatory variables. Also, we analyse the model outcome drawing inspirations from the existing literatures and the residual diagnostic properties.

5.1.1 Growth and Public Expenditure

The outcome of the model estimation is shown in Model 1, Appendix 7. It is the impact of real public expenditure/GDP (LOGESP_GDP) ratio on the real GDP per capita (LOGY_PERCAP). The estimation results show the coefficient of LOGESP_GDP is positive, an indication that increase in LOGESP_GDP leads to increase in LOGY_PERCAP during the period of study. It, also, shows that 1.0 per cent increase in the LOGESP_GDP increases the LOGY_PERCAP by about 0.05 per cent. However, the coefficient estimate of LOGESP_GDP is statistically not significant at 5.0 per cent level. In the short run, however, the coefficient of LOGESP_GDP is appropriately signed and statistically significant at 5.0 per cent level. It is an indication that increases in the LOGESP_GDP is statistically significant in explaining the increase associated with the LOGY_ PERCAP in the short run (Appendix 10).

The positive impact of LOGESP_GDP on LOGY_PERCAP achieved in the long run is in line with the theoretical predictions of (Barro, 1990; Cashin, 1995; Bajo-Rubio, 2000; Milbourne *et al.* 2003; and Chamorro-Narvaez, 2012). They predicted that public expenditure has positive impact on economic growth in the long run, especially in developing countries. Also, the result aligns with Agénor and Montiel, 1996; Odedokun, 1997; Fajingbesi and Odusola, 1999; Hemming *et al.*, 2002; and Fosu *et al.* (2011), public investment increases economic growth.

The outcome of our study that increases in public expenditure, increases the real GDP per capita, though statistically not significant could be explained, considering the way public expenditure projects/programmes are chosen and implemented in Nigeria. In a situation, where public expenditure implementation is conducted in a compromised and an inefficient manner, it causes unnecessary bottlenecks and costs on the economy. Such impairs the achievement of goals in the delivery of goods and services, which affects productivity and retards growth.

Lack of efficiency and profitability in the selection and implementation of public investment are potentials for reducing the productivity of such investment, which in turn, over time could reduce the expected positive impacts of such public investment on the growth in developing countries (Odedokun, 2001 and Chamorro-Narvaez, 2012). Similarly, Pritchett (1996) in his 'white elephant' hypothesis suggested that public investment in developing countries are often used for unproductive and inappropriate projects. He reiterates the issue of ineffectiveness and inefficiency that heralds the citing and implementation of public investment in developing countries.

5.1.2 Growth-Public Expenditure and Control Variables

The impacts of control variables on LOGY_PERCAP are shown on Model 1, Appendix 7 estimation result. The control variables discussed are Private Capital Investment (LOGPCI_GDP), Human Capital Development (LOGHCD), Population Growth, Technological Change and Depreciation (LOGPLN_DEPRE_TECH), trade openness (LOGTOO_GDP) and terms of trade (LOGTOT).

5.1.2.1 Private Capital Investment

The coefficient estimate of private capital investment/GDP ratio (LOGPCI_GDP) is appropriately signed and statistically significant at 1.0 per cent level. The positive sign of the coefficient means that an increase in the LOGPCI_GDP, increases the real GDP per capita (LOGY_PERCAP). This is consistent with what we hypothesised earlier in the study. In addition, the result shows that I.0 per cent positive change in the LOGPCI_GDP will induce 0.13 per cent positive change in the LOGY_PERCAP. Its contemporaneous value in the short run model shows, it is appropriately signed and statistically significant at 1.0 per cent confidence level (Appendix 10).

The finding is consistent with the theoretical expectations of MRW (1992) and other studies, such as Khan (1996) and M'Amanja and Morrissey (2005). In Khan (1996), private investment has a much more significant macroeconomic influence than public investments. M'Amanja and Morrissey (2005) found private investment to be positive and significant determinant of growth in Kenya. Similarly, Makuyana and Odhiambo

(2018) found private investment has a positive impact on economic growth both in the short run and long run, while public investment has a negative effect on economic growth in the long run.

5.1.2.2 Human Capital Development

The coefficient estimate of human capital development (LOGHCD) is appropriately signed and statistically significant at 1.0 per cent confidence level. The positive sign of the coefficient implies an increase in the LOGHCD, increases the real GDP per capita (LOGY_PERCAP). This aligned with our hypothesis, stated earlier in the study and conforms to the predictions of economic theory (Lucas, 1988; Barro, 1991; and MRW, 1992). Also, the result shows that I.0 per cent positive change in the LOGHCD, induces 0.20 per cent positive change in the LOGY_PERCAP. Similarly, its contemporaneous level in the short run model shows that, it is appropriately signed, though statistically not significant at 5.0 per cent level (Appendix 10).

The model outcome shows the important role of human capital development in the economic growth of Nigeria. Countries with high levels of human capital development are expected to experience faster growth than those with low human capital development (Lucas, 1988 and MRW, 1992). In an earlier study, Nelson and Phelps (1966) note that people's educational attainment may have a significant influence on their ability to adapt to changes, introduction of new technologies.

In a subsequent study, Lucas (1988) modeled human capital development and economic growth. He posits that the average level of human capital in any economy determines the level of total factor productivity. His model considers human capital as the engine of growth, because human capital accumulation raises the productivity of both labour and physical capital. Similarly, Barro (1991) and Sianesi and Reenen (2000) note human capital development have positive and significant impacts on the growth rate of GDP per capita.

5.1.2.3 Population Growth, Technological Change and Depreciation Rate

The coefficient estimate of the population growth, depreciation rate and technological change (LOGPLN_DEPRE_TECH) indicates that it is positively signed and statistically significant at 5.0 per cent level. The positive sign coefficient of the LOGPLN_DEPRE_TECH implies that, increases in population growth rate increases the real GDP per capita, given that technological progress and capital depreciation are held constant. Also, the short run model indicates that, it is positively signed and statistically significant at 5.0 per cent confidence level.

The research finding is not line with the theoretical underpinning in MRW (1992), where the coefficient of effective population growth was found to be negative. Implying that increases in the population growth is detrimental to the growth of real GDP per capita (with technological progress and depreciation growth are held constant. Nevertheless, our findings could be explained by the nature of Nigerian economy. With surplus-labour economy, where most of the populace lives in the rural area and relies heavily on the agriculture for their means of livelihood, an increase in the effective labour could lead to increase in the real GDP per capita, given that more would be involved in agriculture (farming), and more wealth generated.

5.1.2.4 Trade Openness

The coefficient estimate of the trade openness (LOGTOO_GDP) is positively signed and statistically significant at 1.0 per cent level. Also, the result shows that I.0 per cent positive change in the LOGTOO_GDP will induce 0.17 per cent positive change in the LOGY_PERCAP. Similarly, the coefficient of LOGTOO_GDP is appropriately signed and statistically significant at 1.0 per cent confidence level in the short run. Trade openness could facilitate trade among nations and increases economic growth, which is very important for poverty reduction. The research finding aligns with Anyanwu and Erhijakpor (2010). They show that trade openness has significant positive effect on poverty reduction in Africa. Similarly, Echekoba *et al*, (2015) and Muhammad and Akanegbu (2018) studies show that trade openness has significant positive impact on economic growth in Nigeria.

5.1.2.5 Terms of Trade

The coefficient estimate of the terms of trade (LOGTOT) is negatively signed and statistically significant at 5.0 per cent level. The negative coefficient of LOGTOT indicates that increase in it, reduces the LOGY_PERCAP. Also, it shows that 1.0 per cent positive change in LOGTOT will induce 0.16 per cent negative change in the LOGY_PERCAP. However, in the short run, the coefficient estimate of LOGTOT is found to be appropriately signed and statistically not significant at 5.0 per cent level. The appropriate sign of the coefficient means that increases in it, increases the LOGY_PERCAP. The reason for the short run result may not be far-fetched, given the current account position of the Nigeria's balance of payment (BOP), which is predominantly positive during the study period. It is mostly the exports of crude oil and gas, which is the major source of foreign exchange earnings (thus, making terms of trade to be in Nigeria's favour during the short run).

Nonetheless, the research finding that LOGTOT has a negative coefficient and not growth effective in the long run could be quite revealing. Nigeria is a mono-cultured economy and has relied heavily on the exports of primary product, crude oil and gas, as its major source of foreign exchange earnings for decades. Nigeria enjoys favourable balance of trade for the greater period of the study, and such is based on the exports of primary product. Thus, being a mono-cultured economy, involved in the export of primary product, it is possible for Nigeria's trade balance to have a negative effect on growth in the long run, compared with countries involved in the production of finished/manufactured product. Our findings seem to align with the earlier proposition of Singer-Prebisch thesis. That is, the tendency for the terms of trade of countries producing primary products in relation to countries involved in manufacturing to fall in the long run.

5.1.3 Growth and Public Expenditure by Economic Classification

5.1.3.1 Recurrent and Capital Public Expenditures

Model 2, Appendix 7, shows the estimation result of the real public expenditure/GDP ratio according to economic classification; recurrent (LOGREC_GDP) and capital

(LOGCAP_GDP)/real GDP ratios impact on the real GDP per capita (LOGY_PERCAP). The coefficient estimate of LOGREC_GDP is positively signed and statistically not significant at 5.0 per cent level. The positive sign of the coefficient of LOGREC_GDP indicates that increases in it, increases the level of LOGY_PERCAP in Nigeria during the period of study. That is, 1.0 per cent increase in the LOGREC_GDP, increases the LOGY_PERCAP by about 0.03 per cent in the long run. Also, in the short run, the contemporaneous coefficient estimate of LOGREC_GDP is positively signed and statistically significant at 5.0 per cent level, an indication that it is growth effective (Appendix 11).

In contrast, the coefficient estimate of LOGCAP_GDP is negatively signed and statistically not significant at 5.0 per cent confidence level. The negative sign of the coefficient of LOGCAP_GDP implies that increases in it, decreases the level of LOGY_PERCAP during the period of study in the long run. Similarly, in the short run, its contemporaneous coefficient is negatively signed and statistically not significant at 5.0 per cent confidence level. The negative sign of the coefficients of LOGCAP_GDP both at the long run and short run do not conform to our theoretical expectation. That is, capital expenditure is growth-enhancing and very important for poverty reduction. Further exposition of the short run estimate of the coefficient of LOGCAP_GDP shows that its one-year lag is appropriately signed and statistically significant at 1.0 per cent confidence level. This shows that it takes a period of one-year lag for the growth effect of LOGCAP_GDP to be significantly felt in the short run.

However, our long run research finding that LOGREC_GDP is positively signed is supported empirically by studies in Nigeria and other developing countries. In Nigeria, it conforms to an earlier study by Ogiogio (1995). The study notes that contemporaneous government recurrent expenditure has more significant effect on growth than the capital expenditures, while the five-year lag of capital expenditures are more growth inductive. Also, in some developing countries study, Devarajan *et al.* (1996) found recurrent expenditure to be positively related to the real GDP per

capita, while the capital expenditure had a significant negative association with the growth of real GDP per capita. Likewise, Odedokun (2001) founds public expenditure on wages and salaries, which was classified under recurrent as growth-promoting.

In the contrary, some other studies have found the relevance of capital public expenditure in generating economic growth. For example, the results of Agénor and Montiel, 1996; Odedokun, 1997; and Hemming *et al.*, 2002 were corroborated by Niloy *et al.* (2007). Niloy *et al* (2007) examined the impact of public expenditure on economic growth for 30-52 developing countries in 1970s and 1980s. They assert that the government capital expenditure/GDP ratio has a significant positive impact on economic growth, while the government current expenditure/GDP ratio was shown to be insignificant in explaining the economic growth.

Our findings that the coefficient of LOGREC_GDP has positive sign and growth effective in the long run, could be as result of large bureaucracy (with most expenses in recurrent expenditure going into salary and wages) that gulps very substantial portion of the public expenditure. In this regard, there is need for public expenditure switch, such that would reduce the recurrent expenditure and ensure the reallocation of more funds to capital expenditure. Such measure would help to build-up capital formation in the country. Capital formation is essential for the nation's capacity to produce, which in turn, positively affects economic growth and reduces poverty. Dearth of capital formation could be explained partly responsible for the serious constraint to production and sustainable economic growth in Nigeria.

5.1.4 Growth and Public Expenditure by Functional Classification

In Table 18, we showed the correlation matrix of the coefficients of variables in logarithms involved in the growth-public expenditure model. The public expenditure by functional classification variables are General Administration/GDP ratio (LOGGA_GDP), Transfers/GDP ratio (LOGTS_GDP), Economic Services/GDP ratio (LOGES_GDP) and Social and Community services/GDP ratio (LOGSCS_GDP).

The values of current and initial levels of real GDP per capita are high and positively correlated. Also, correlation of above 0.5 could be found to exist among some of the functional classifications of public expenditure. In this regard, we rearrange the public expenditure by functional classification; instead of including all components simultaneously in a single equation, we include each in different equation for estimation in Models 3, 4, 5 and 6 of Appendix 7. This would help to reduce the effects of multicollinearity and enhance the precision of individual coefficients[83].

5.1.4.1 Growth and Public Expenditure on General Administration

Model 3, Appendix 7 shows the outcome of the shares of general administration public expenditure to GDP (LOGGA_GDP) growth effect. The coefficient estimate of LOGGA_GDP is positively signed and statistically not significant at 5.0 per cent level. The positive sign of the coefficient means that increases in it, contributes to the increases in the real GDP per capita (LOGY_PERCAP) during the study period. In addition, it shows that 1.0 per cent positive change will induce a 0.04 per cent positive change in the LOGY_PERCAP. In the short run, its contemporaneous level indicates a highly statistically significant value of 1.0 per cent level (Appendix 12).

Public expenditure on general administration; defence, internal security and National Assembly could be good for growth, where it serves as inputs/and or complements the private sector production process. For example, the maintenance of law and order (internal security) in the country is part of the government's functions that would positively affect economic growth. Benoit (1978) notes that defence burden has advantages on economic growth in developing countries. He finds a positive relationship between military expenditure and economic growth in developing countries. On the contrary, Masoud and Munadhil (2015) found a negative relationship between military expenditure and economic growth in United States of America for the period, 1970-2011. Though, the importance of increase in public

[83] Jalilian and Odedokun (2000) used this method and disaggregated the total fixed investment/GDP ratio into six ratios of investment/GDP and included them individually in estimated equation to ameliorate the challenges of multicollinearity that could impair the precision of the estimation coefficients. Similarly, Milbourne *et al.* (2003) individually estimated some components of functional classification of public expenditure; transport, agriculture, education, health, housing and industry in an augmented Solow model to improve the precision of their estimated coefficients.

expenditure on military and internal security in developing countries cannot be over emphasised. It could lead to the reallocation of public expenditure that would have been used for other developmental purposes. For example, the resources channeled for amassing military equipment could be alternatively used for developing more infrastructures; transport and communication, schools and hospitals, as well as providing civilian goods and services.

5.1.4.2 Growth and Public Expenditure on Transfers

Model 4, Appendix 7 shows the impact of public expenditure on transfers/GDP ratio (LOGTS_GDP) on the real GDP per capita (LOGY_PERCAP). The coefficient estimate of LOGTS_GDP is negatively signed, an indication that increases in it, contributes to the reduction in the LOGY_PERCAP during the study period. Also, it is statistically not significant at 5.0 per cent level. The result shows that I.0 per cent positive change in LOGTS_GDP will induce a 0.004 per cent negative change in the LOGY_PERCAP. Similarly, the outcome of the short run model shows the coefficient of the LOGTS_GDP to be negatively signed (Appendix 13).

The research finding that government transfers; households, public debt servicing, pensions and gratuities, contingencies/subventions reduces the real GDP per capita both in the short run and long run during the study period, signifies the need for government to reexamine its expense on it. In Nigeria, transfers are major sources of cost on government. They are mostly dominated by public debt servicing. For example, the 5-year annual average to public expenditure ratio is above 50.0 per cent for the periods, 1981-1985, 1986-1990 and 1991-1995. Between 2006 and 2010, it went down to about 29.0 per cent, owing to the debt relief granted to Nigeria in 2005 by her creditors as part of the MDGs programme of the United Nations. However, by 2011-2015, the 5-year annual average transfers to the public expenditure ratio has gone up to about 39.0 per cent (Table 4). This trend constitute burden on the public purse and discourages the allocation of more resources to growth-enhancing sectors like, economic services and social and community services.

Bajo-Rubio (2000), however, noted that transfers could be more detrimental to economic growth in developed countries compared with the developing countries. Transfers that involves the use of social safety nets in the form of income redistribution and wage subsidies in the developing countries could be an instrument for growth. Sala-I-Martin (1997) notes that transfers in form of public welfare programs could serve as devices to prevent crime or social disruption, because they tend to increase the opportunity cost of engaging in crime or disruptive activities. Further, Sala-I-Martin (1997, p. 83) asserts that "It can be persuasively argued that, when the World Bank and the IMF worry about social safety nets in transition economies, they do so, at least partly, to ensure the success of the transition process. If too large a fraction of people become impoverished during the transition, riots, revolutions, or military coups may actually end a program that would have been beneficial in the long run".

Similarly, transfers could be productive and enhances growth, where it enters as inputs in the production process. Cashin (1995) posits that when public transfer payments are introduced as productive inputs into the private production functions, they raise the marginal product of private capital by improving the enforcement of private property rights in the economy and induce the relatively unproductive agents to leave the work force.

5.1.4.3 Growth and Public Expenditure on Economic Services

Model 5, Appendix 7, indicates the coefficient estimate of economic services/GDP ratio (LOGES_GDP) is positively signed. Thus, implying that increases in it, increases the real GDP per capita (LOGY_PERCAP) during the study period. It is, however, not statistically significant at 5.0 per cent level. Also, it shows that 1.0 per cent positive change in the LOGES_GDP will induce 0.02 per cent positive change in the LOGY_PERCAP. In the short run, the contemporaneous coefficient of economic services (LOGES_GDP) is positively signed and statistically significant at 1.0 per cent level (Appendix 14). This indicates that the suit of public expenditure on

agriculture, transport and communication and other economic services that constitute economic services is good for the growth of real GDP per capita in the short run.

The result underscores the need for government to efficiently deploy more resources to the public expenditure on economic services. Agriculture and transport and communication are very crucial for economic growth. For example, increased public expenditure on agriculture could lead to increase in crop production (farming), livestock, forestry and fishing, through improvement in technology and value-chain addition in the sector. In addition, the transport and communication sectors are part of the infrastructure development of any country that are growth-enhancing. In Nigeria, however, the growth of infrastructure has been hampered by many challenges; poor transportation system (bad network of roads and near absence of functional railways), caused by poor maintenance culture and obsolete equipment, and undue interference of supervising ministries in the affairs of utility parastatals. Nevertheless, improvement in the infrastructure facilitates, improves the production of goods and services (output) and economic growth.

5.1.4.4 Growth and Public Expenditure on Social and Community Services

The outcome of social and community services/GDP ratio (LOGSCS_GDP) growth effect is shown in Model 6, Appendix 7. The coefficient estimate of LOGSCS_GDP is positively signed, implying that increases in it, contribute to the increases in the real GDP per capita (LOGY_GDP), during the study period. It is, however, not statistically significant at 5.0 per cent level. In addition, the result shows that 1.0 per cent positive change in the LOGSCS_GDP induces 0.09 per cent positive change in the real LOGY_GDP. Also, in the short run, the contemporaneous coefficient of LOGSCS_GDP indicates that it is positively signed and statistically significant at 5.0 per cent level (Appendix 15).

The positive impact of social and community services; education, health and other social community services on the real GDP per capita in the long run is an indication that it holds sway for economic growth of the country. Health and education provide

the backbones for productive economic activities. Good health condition is very important for economic growth and poverty reduction. In contrast, poor health inhibits growth by eroding the household's income, thereby retarding economic growth (Barro 1996 and Bhargava, 2001). Also, education equips people with the basic knowledge and skills desired to have improved quality of life. Policies and programmes of government that are directed at increasing citizens' access to education, and the effective utilisation of educational opportunities assist greatly in achieving growth.

5.1.5 Growth and Public Expenditure on Social Sector

In Table 19, we showed the correlation matrix of coefficients of variables in logarithms involved in the growth-public expenditure model. The social sector public expenditure/GDP ratio variables; Education/GDP ratio (LOGEDU_GDP), Health/GDP ratio (LOGHEL_GDP), Other Social and Community Services/GDP ratio (LOGOSC_GDP), Agriculture/GDP ratio (LOGAGR_GDP) and Transport and Communication/GDP ratio (LOGTRC_GDP). The current and initial level of real GDP per capita are high and positively correlated. All the components of the public expenditure on social sector are positively correlated with the current levels of the real GDP per capita (LOGY_PERCAP), except for two that are negatively correlated. Correlation of above 0.50 exists among some of the components of public expenditure on social sector/GDP ratio. We, however, reposition the components of social sector public expenditure/GDP ratio, instead of including all the components simultaneously in a single equation. We include each in different equation, for the estimation in Models 8, 9, 10, 11 and 12 (Appendix 8). This would help to check for the effects of multicollinearity and enhance the precision of individual coefficients.

Model 7, Appendix 8 shows the model result of the social sector public expenditure/GDP ratio (LOGSOC_GDP) impact on the real GDP per capita (LOGY_PERCAP). The coefficient estimate of LOGSOC_GDP is appropriately signed, indicating that it increases the real GDP per capita. However, it is statistically not significant at 5.0 per cent level. Similarly, the contemporaneous coefficient

estimate of social sector public expenditure is appropriately signed, but statistically not significant at 5.0 per cent level in the short run (Appendix 16). Thus, the social sector public expenditure/GDP ratio is good for the growth of real GDP per capita. It, however, plays insignificant role in both the short run and long run in Nigeria, during the study period. This reiterates our earlier findings on the impacts of public expenditure by functional classification; economic services and social and community services on the real GDP per capita (Appendix 7). Economic services and social and community services constitute the social sector public expenditure and are found to positively contribute to the real GDP per capita in Nigeria during the study. Though, their impacts are not statistically significant at 5 per cent level.

5.1.5.1 Growth and Disaggregated Public Expenditure on Social Sector

Several studies suggest that certain components of public investment are productive and growth enhancing (Barro. 1990; Easterly and Rebelo, 1993; Milbourne *et al.,* 2001). One of the channels through which these varying impacts could be achieved to reduce poverty is through increased public expenditure on the social sector, such as education, health services and other welfare services for the poor (Drèze and Sen 1995; Bhagwati 2001). In this section, our purpose is to see if public expenditure on disaggregated social sector/GDP ratio impacts differently on the real GDP per capita. Our public expenditure on the social sector/GDP ratio is disaggregated into five sub-sectors; Health/GDP ratio (LOGHEL_GDP), Education/GDP ratio (LOGEDU_GDP), Transport and Communication/GDP ratio (LOGTRC_GDP, Agriculture/GDP ratio (LOGAGR_GDP) and Other Social and Community Services/GDP ratio (LOGOSC_GDP).

Model 8, Appendix 8 shows the impact of health sector public expenditure/GDP ratio (LOGHEL_GDP) on the real GDP per capita (LOGY_GDP). The coefficient estimate of LOGHEL_GDP is positive and appropriately signed. The positive sign of the coefficient estimate indicates that increases in it, increases the real GDP per capita in the long run. However, the coefficient of LOGHEL_GDP is statistically not significant at 5.0 per cent level. Also, the coefficient estimate of LOGHEL_GDP is

appropriately signed and statistically significant at 5.0 per cent levels in the short run (Appendix 17). This means that public expenditure on the health sector is growth enhancing in the short run and long run, though not statistically significant in the latter.

The finding shows that public expenditure on health could be good for growth-enhancement in the long run. It, therefore, underscores the need for increase of public expenditure on health. Healthy condition of the populace is very important for increased productivity, economic growth and poverty reduction. In contrast, poor health condition inhibits productivity, by eroding the household's income and economic growth (Barro, 1996 and Bhargava, 2001). Our research result corroborates Ramirez (2004), who disaggregated public expenditure by its functions and finds that public infrastructure on health, among others positively affects growth in Mexican during the period, 1955 to 1999.

In Model 9, Appendix 8 shows the impact of education social sector public expenditure/GDP ratio (LOGEDU_GDP) on the real GDP per capita (LOGY_GDP). The coefficient estimate is positively signed and conforms to our *a priori* expectation. The positive sign of the coefficient estimate indicates that an increase in it, increases the real GDP per capita (LOGY_GDP). It is, however, statistically not significant at 5.0 per cent level. Similarly, the contemporaneous coefficient is found to be appropriately signed and statistically not significant at 5.0 per cent level in the short run (Appendix 18).

The import of the finding is that public expenditure on education positively affects real GDP per capita, though this is not statistically significant during the study period. This underscores the need for increase in the public expenditure on education. Education is very important for the development of any economy and poverty reduction. It equips people with the basic knowledge and skills acquisition required to have improved quality of life and productivity. Also, policies and programmes of government that are focused at increasing citizens' access to education and the

effective utilization of educational opportunities assist greatly in growth and poverty reduction.

In addition, education provides for human capital development. Human capital development affects economic growth through increase in productivity of workers - greater innovation and the adoption of new technology. The role of human capital development in the production process was made prominent in the augmented Solow growth model by Mankiw, Romer and Weil (1992). Studies on the impact of education on economic growth are varied in literature. Also, the importance of different levels of education attainment to real GDP per capita growth and poverty reduction appears to vary with country/region. For example, Barro (1991) indicates that human capital development has positive and significant impact on the growth rate of GDP per capita. Sianesi and Reenen (2000) note primary and secondary education skills are more suitable for growth in the poorest and intermediate developing countries, respectively. However, acquisition of tertiary skills is important for growth in OECD countries.

Similarly, the World Bank (2004) notes that individuals with low levels of literacy are much less likely to secure employment than their more skilled contemporaries. For example, the average earnings of workers with complete primary education were about 1.7 times that of illiterates. Workers with secondary education had average earning of about 1.6 times, the level of primary school graduate and about 2.7 times that of illiterates. The university graduates have average earnings of about 12 times the level of illiterates, and about 4.5 time the level of secondary school graduate. In addition, it asserts that the income disparity between primary and secondary school graduates was about 50.0 per cent, while the disparity between secondary school and university graduates was about 60.0 per cent.

Model 10, Appendix 8 indicates the impact of transport and communication social sector public expenditure/GDP ratio (LOGTRC_GDP) on the real GDP per capita (LOGY_GDP). The coefficient estimate of LOGTRC_GDP is appropriately signed.

It is an indication that the positive changes in the transport and communication public expenditure leads to increase in the real GDP per capita in Nigeria, during the study period. However, the coefficient is statistically not significant at 5.0 per cent level in the long run. Similarly, the coefficient estimate is appropriately signed and statistically not significant at 5.0 per cent level in the short run (Appendix 19).

Our research finding aligns with Milbourne *et al.* (2001). In their study, public investment share of transport and communication was found to be positive on the real GDP per capita, though statistically not significant at 5.0 per cent level. Similarly, Ramirez (2004) disaggregated public expenditure by its functions and finds that public infrastructure, which comprised transport and communications among others positively affects growth in Mexican, during the period, 1955 to 1999. Also, Easterly and Rebelo (1993) indicate a strong positive relationship between public investment in transportation and communication and economic growth.

Transport and communication are part of infrastructure development that provides for easy movement of goods and services and communication among parties/businesses and organisations in the country. They assist productive activities and enhances economic growth. In Nigeria, transport and communication have been impaired by many challenges; poor transportation system (bad network of roads and near absence of functional railways), caused by poor planning and maintenance culture) and undue interference of supervising ministries in the affairs of facilities. All these lead to inefficiency and high cost of doing business, which in turn reduces economic growth.

Model 11, Appendix 8 shows the regression result of the agriculture public expenditure/GDP ratio (LOGAGR_GDP) impact on the real GDP per capita (LOGY_PERCAP). The coefficient estimate of LOGAGR_GDP is negatively signed, implying that increases in the LOGAGR_GDP leads to reduction in the real GDP per capita during the study period. The coefficient is statistically not significant at 5.0 per cent level. Correspondingly, the coefficient estimate of LOGAGR_GDP is negatively

signed and statistically not significant at 5.0 per cent level in the short run (Appendix 20).

Our research outcome is contrary to our *a priori* expectation. We envisaged a positive impact of agriculture public expenditure on the real GDP per capita, given the place of agriculture in the life of any nation. In Nigeria, rural community constitutes the largest percentage of the population and predominantly peasants that are engaged in one form of agriculture. Anyanwu (1997) posits that most of the 80.0 per cent of the rural population of Nigeria was engaged in one type of agricultural activity or the other, while the bulk of the agricultural export crops (Cocoa, Palm Kernel, Rubber, Cotton, Groundnut, Palm Oil etc.) producers are small-holder farmers.

The profile of public expenditure on agriculture, however, indicates that as a component of the social sector public expenditure, its share of the social sector expenditure has not been progressive (Table 6). With a 5-year annual average share of 20.0 per cent social sector public expenditure in 1981-1985, it nose-dived to 3.5 per cent in 1991-1995 and further 2.8 per cent by 2011-2015. The implication is that public funding of the sector has been on the downward trend since 1980s, and this may have affected productivity of the sector. Aside the funding, agricultural production in Nigeria is still at the subsistence level and these could be responsible for the negative impact of the sector on the real GDP per capita in the long run. Adequate funding and efficient management of the sector would lead to increase in crop production, livestock, forestry and fishing – this could be achieved, through increase in budgetary allocation, access to credit facilities by farmers, improvement in technology (mechanised farming and high yielding crops) as well as agricultural value-chain.

Model 12, Appendix 8 shows the impact of other social and community services social sector public expenditure/GDP ratio (LOGOSC_GDP) on the real GDP per capita (LOGY_PERCAP) during the study period. The coefficient estimate of LOGOSC_GDP is negatively signed. An indication that increases in it, reduces the

LOGY_PERCAP. It is statistically not significant at 5.0 per cent level. Thus, increases in the LOGOSC_GDP does not lead to increases in LOGY_PERCAP. Similarly, in the short run, the coefficient estimates of LOGOSC_GDP is negatively signed and not statistically significant (Appendix 21).

Comparatively, the foregoing results of models 8, 9 and 10 show that increases in the public expenditure on social sectors; health, education and transport and communication are associated with increases in the real GDP per capita, though they are not statistically significant. These are unlike the public expenditure on agriculture and other social and community services that are growth retarding. The positive impacts of public expenditure on health, education and transport and communication on economic growth are highly desirable and good for poverty reduction.

As noted by Jacob Viner in the 1950s, "The first requirements of high labor productivity under modern conditions are that the masses of the population shall be literate, healthy and sufficiently well fed to be strong and energetic" (Viner, 1953, p.100). In addition, increases in social sector expenditure on agriculture and other social and community services (welfare schemes for the poor), could engender economic growth, given the unique place of the sectors in the economic development and poverty reduction of the country.

5.1.6 Growth-Public Expenditure Model with Dummy_1 Variable

The outcome of the estimation of growth-public expenditure model with dummy_1 variable is shown in Model 13, Appendix 8. Our graph of the total public expenditure shows two distinctive periods during the study period. The two periods are identified with the help of intuition and Chow test (Appendix 22). The two periods correspond: (i) predominantly military government era (1981-1999). The military rule era has average annual recurrent public expenditure/public expenditure ratio of 53.6 per cent, while the capital public expenditure/public expenditure ratio is 46.4 per cent. To this period, we assigned the dummy_1 variable, with value one (1) in the estimation. (ii) the other period, the civilian government era (2000-2015), mostly dominated by

recurrent public expenditure. It has an average recurrent public expenditure/public expenditure ratio of 73.8 per cent, whereas the capital public expenditure/public expenditure ratio is 26.2 per cent. We assign the dummy_1 variable, with value zero (0) in the estimation.

The estimation result shows that the coefficient of dummy_1 is appropriately signed, though statistically not significant at 5.0 per cent level in the long run. It is, however, significant at 1.0 per cent level in the short run. This implies that the military government era (1981-1999), characterised with recurrent and capital expenditures/public expenditures ratios of 53.6 and 46.4 per cent increases the real GDP per capita, compared with the civilian government era (2000-2015), characterised with recurrent and capital expenditures/public expenditures ratios of 73.8 and 26.2 per cent, respectively (Appendix 22). However, in Appendix 23, where the total public expenditure/GDP ratio is disaggregated according to recurrent public expenditure/GDP ratio and capital public expenditure/GDP ratio, and included in the model as variables. The estimation result shows the coefficient of dummy_1 variable is appropriately signed and statistically significant at both 5.0 and 1.0 per cent levels in the long and short runs, respectively.

The implication of the finding is that public expenditure yielded growth with increased allocation of public expenditure to the capital public expenditure, compared with the recurrent public expenditure, given the two periods, respectively (1981-1999 and 2000-2015). This reemphasis's the need for government to embark more on capital expenditure rather than recurrent expenditure. Increased capital expenditure enhances capital formation. Capital formation could influence nation's ability to produce, which in turn, affects economic growth.

Some studies have shown the importance of capital formation in enhancing economic growth. Growth models developed by Romer (1986) and Lucas (1988) predict that increased capital accumulation can result in increase in growth rates. In Nigeria, Shuaib and Dania (2015) note the significant relationship between capital formation

and economic growth. They suggest that the results corroborate with the Harrod-Domar model, which proved that the growth rate of national income will directly be related to saving ratio and/or capital formation (i.e. the more an economy is able to save-and-invest-out of a given GNP, the greater will be the growth of that GDP).

5.2 Growth-Poverty Model

The section discusses the regression results of growth-poverty model, using the short run and long run equations derived from an auto-regressive distributed lag (ARDL) co-integration procedure by Pesaran *et al.* (2001) for the period 1981-2015. Our analyses shall focus on the *a priori* expectation and magnitude of the coefficient estimates between the dependent and explanatory variables. Also, we analyse the model outcome, drawing inspirations from existing literatures and the residual diagnostic properties.

5.2.1 Growth–Poverty

The outcome of the model estimation is shown in Model 14, Appendix 9. The estimation result shows that the coefficient estimate of LOGY_PERCAP is not appropriately signed and does not conform to our *a priori* expectation. It is positively signed and statistically significant at 1.0 per cent level. Thus, indicating that increases in the LOGY_PERCAP leads to increases in the incidence of poverty. Also, it shows that 1.0 per cent increase in the GDP per capita is found to increase the incidence of poverty by about 0.88 per cent in Nigeria, during the study period. Similarly, in the short run, the coefficient estimate of LOGY_PERCAP is not appropriately signed and does not conform to our *a priori* expectation (Appendix 24).

Our research outcome corroborates some of the empirical studies on the impacts of economic growth on the poverty reduction in Nigeria. For example, Aigbokhan (2000) carried out an empirical study on the relationship among poverty, inequality and economic growth for the period 1986 to 1996 in Nigeria and found a significant and positive relationship between economic growth and poverty. This implies that the growth of the economy from 1986-1996 could not yield an improvement in the level

of poverty. Similarly, Bakare and Ilemobayo (2013) and Okoroafor and Chinweoke (2013) confirmed the position of Aigbokhan (2000) in their subsequent studies, which showed significant and positive relationship between economic growth and the level of poverty in Nigeria.

In contrast, it does not align with the empirical findings of (Roemer and Gugerty, 1997; Dollar and Kraay, 2002; and Agrawal, 2008; and Agrawal, 2015). Their empirical findings are that increases in economic growth is good for poverty reduction. Sustained economic growth raises the income of members of a society over a long period of time, which in turn, reduces the incidence of poverty. In Kazakhstan, Agrawal (2008) notes provinces with higher growth rates achieved faster decline in poverty. He points out that, it happened largely through growth, which led to increased employment and higher real wages and contributed significantly to poverty reduction. Anyanwu (2013) and Agrawal (2015) in their studies of impact of real GDP per capita on poverty among 43 African countries and India, respectively, confirmed the importance of economic growth in reducing poverty. Also, Agrawal (2015) posits that higher growth rates were associated with faster decline in poverty in India. He asserts that growth helped to increase employment and real wages, which contributed to poverty reduction.

Our research finding, however, seem to confirm that Nigeria may belong to the league of developing countries that have experienced impressive growth, though with high level of poverty[84]. It is an indication that economic growth may not be sufficient to reduce the incidence of poverty in Nigeria. The inability of economic growth to reduce the incidence of poverty in Nigeria could be attributed to the nature of growth achieved; what drives the growth, and the number of the citizenry that participated in the growth process as well as the income inequality level. For the country to achieve economic growth that would reduce the high level of poverty, it has to undertake an aggressive growth policy, that would be sustainable over time and all encompassing,

[84]World Bank (2013) notes that many developing countries have achieved impressive economic growth rates in recent years, but the poverty levels in these countries have in general not reduced significantly.

such that greater number of her citizenry would participate and benefit from it, as well as social sector development - government policies and programmes targeted at poverty reduction should be consciously pursued and implemented.

5.2.2 Growth-Poverty and Control Variables

Our analysis of the coefficient estimates of control variables in the growth-poverty model are on the outcome of Model 14, Appendix 9. The control variables are income inequality (LOGGINI-COEFF), unemployment rate (LOGUMP), inflation rate (LOGINF), literacy rate (LOGLTR), overseas development assistance (LOGODA_GDP) and population growth (LOGPLN_RATE).

5.2.2.1 Income Inequality

The coefficient estimate of income inequality (LOGGINI-COEFF) shows it is positively signed, but statistically not significant at 5.0 per cent level. The positive sign of the coefficient implies that it increases the incidence of poverty (LOGPOVT_POP) during the period of study. Thus, 1.0 per cent increases in the LOGGINI_COEFF increases the LOGPOVT_POP by about 0.37 per cent.

Our research finding shows that increases in income inequality are detrimental to poverty reduction[85]. This aligns with Ravallion and Datt (1999). They note the potential adverse implications of high-income inequality for the rate of economic growth. They pointed out that it is likely responsible for why the same rate of economic growth might be less effective in reducing poverty in one jurisdiction than another. Further, they observed in an economy, where inequality is persistently low, the poor would tend to have a higher share of the gains from growth than in an economy, in which inequality is high. In addition, our research aligns with Ravallion (1997). He posited that a country with a Gini index of 0.25 could expect a growth

[85]Umo (2012) notes development is threatened by social unrest in societies with high income inequality by social forces seeking to achieve equity.

elasticity of the headcount index of around negative 3.3, while for a country with a Gini index of 0.60, the elasticity is negative 1.8. Similarly, Anyanwu (2013) and Agrawal (2015) find a positive relationship between income inequality and real GDP per capita in some selected countries in Africa and India, respectively.

With the high level of income inequality in Nigeria, it may be very challenging to have a declining level of incidence of poverty. By implication, a declining inequality (falling Gini coefficient) is likely to result in decline of poverty for any given level of growth. World Bank (2000) in a study of 88 countries indicate that countries achieved positive per capita GDP growth for a decade, witnessed improved income inequality slightly in about half of the cases and worsened slightly in the other half. As the differences in the income inequality widens, poverty increases and the less effective growth would be to reduce poverty (Lustig *et al,* 2000 and McKay, 2013).

5.2.2.2 Unemployment Rate

The coefficient estimate of unemployment (LOGUMP) indicate, it is positively signed and statistically significant at 1.0 per cent level. This means that increases in it, increases the incidence of poverty (LOGPOVT_POP) during the study period. The result shows 1.0 per cent increase in the LOGUMP will induce 0.19 per cent increase in the LOGPOVT_POP. In the short run, the contemporaneous coefficient of LOGUMP is also appropriately signed and statistically very significant at 1.0 per cent level. This implies that the higher the number of citizens that are unemployed, the higher those without income/wages and the more likely they are plunged into poverty.

The short run and long run results underscore our theoretical position that increases in LOGUMP leads to increases in the incidence of poverty. High levels of unemployment among the citizenry could be a recipe for youth restiveness and all forms of violence crimes. Our research finding corroborates the works of Bakare and Ilemobayo (2013). Their study confirms that unemployment rate has positive and statistically significant relationship with poverty in Nigeria. That is, increase in unemployment rate increases the level of incidence of poverty.

5.2.2.3 Inflation Rate

The coefficient estimate of inflation rate (LOGINF) shows, it is positively signed. This means that increases in it, increases the LOGPOVT_POP during the study period. The coefficient, however, is statistically not significant at 5.0 per cent level. The result shows that I.0 per cent increase in the LOGINF will induce a 0.03 per cent increase in the LOGPOVT_POP. High levels of inflation rate affect the prices of goods and services in an economy and could lead to the erosion of confidence in the economy both by the citizens and prospective investors. In such a situation, money loses its value quickly and ceases to be a good store of value. Thus, its quality and purchasing power rapidly declines, thereby, impoverishing the citizen, especially the poor.

The research outcome tends to support existing studies on the growth and inflation rate relationship in Nigeria. Ijaiya (2000) notes increasing inflation rate has a dire consequence for poverty reduction in Nigeria. He pointed out that the apparent failure to reduce inflation rate has been a continuous increase in the poverty rate, since increase in inflation has eaten deeply into the purchasing power of most people, especially the wage earners and pensioners. Similarly, Oladapo *et al.* (2015) observe inflation has a negative effect on economic growth, which in turn increases the level of poverty.

5.2.2.4 Literacy Rate

Literacy rate (LOGLTR) is hypothesised to have a negative relationship with the incidence of poverty (LOGPOVT_POP) and this is not affirmed by the sign of its coefficient estimate. The coefficient is positively signed and statistically significant at 1.0 per cent level. The positive sign of the coefficient means that increases in it increases the incidence of poverty during the study period. Also, in the short run, the contemporaneous coefficient of LOGLTR is not appropriately signed and statistically significant at 1.0 per cent level.

The research finding that LOGLTR does not reduce LOGPOVT_POP in both the short run and long run portrays the extent to which our citizens' ability to read and write has not assisted poverty reduction in Nigeria. Impliedly, mere ability to read and write does not uplift people out of poverty in Nigeria during the study period but stifles it. In addition, the findings support the position of Tilak (2007). His study indicates that mere literacy and primary education does not reduce poverty in India. Similarly, Anyanwu (2012) notes, it is only general post-secondary education that significantly reduces poverty in Nigeria. Implying that primary and/or mere ability to read and write does not reduce poverty in Nigeria.

Literacy, however, could provide platform for further learning and skill acquisition. A plausible explanation for the place of literacy in improving productivity was ventilated by Romer (2001 p.134). According to him, "in primary school, children are taught basic knowledge (such as literacy), which may not improve their ability to contribute to production by very much. But it may be a prerequisite for the acquisition of productivity-enhancing skills throughout the rest of their education and professional career"

5.2.2.5 Overseas Development Assistance

Overseas Development Assistance (LOGODA_GDP) is hypothesised to have a negative relationship with the incidence of poverty (LOGPOVT_POP). The coefficient estimate of LOGODA_GDP indicates that it is negative and appropriately signed. It is, however, statistically not significant at 5.0 per cent level. The result shows that I.0 per cent increases in the LOGODA_GDP reduces the LOGPOVT_POP by 0.02 per cent. Our result aligns with Anyanwu (2013). He finds overseas development assistance to be useful in reducing poverty in some selected African countries. Similarly, Ncube *et al.* (2013) note that net overseas development assistance has significant negative effect on poverty in Africa and thus good for poverty reduction and inclusive growth in the continent. Overseas development assistance provides stopgap for external financing of government deficits and programmes, especially in developing countries. It could serve as a very useful means

for enhancing productive activities and growth in the recipient country, where it is well managed.

5.2.2.6 Population Growth Rate

The coefficient of population growth rate (LOGPLN_RATE) is negatively signed and statistically significant at 1.0 per cent confidence level. The negative sign of the coefficient does not conform to our *a priori* expectation. It is an indication that increases in it, reduces the incidence of poverty (LOGPOVT_POP). Similarly, in the short run, the coefficient is negative, and statistically significant at 1.0 per cent confidence level. Our short run and long run results support our earlier findings in the growth-public expenditure model (Model I, Appendix 7), in which the coefficient estimates of population growth rate was positive and very significant for the growth of real GDP per capita.

The research result inclines with Tartiyus *et al*. (2015) that found a positive relationship between economic growth and population growth in Nigeria. Also, Ogunleye *et al.* (2018) reveals that population growth has a positive and significant effect on economic growth in Nigeria. The policy implication of this finding is that Nigeria's population growth portends potential for contribution to economic growth and poverty reduction. It, however, behooves on government to ensure that such labour force is continuously undergoing training and retraining, acquainted with technological competences that enhances productivity and economic growth. Aside this, the large population may provide a large domestic market for the purchase of goods and services, which in turn, contributes to output growth.

5.2.3 Growth-Poverty and the Gross Domestic Product

Model 15, Appendix 9 shows the estimation result of the real Gross Domestic Product (LOGY_GDP) impact on the incidence of poverty (LOGPOVT_POP). The coefficient estimate of LOGY_GDP is positively signed and does not conform to our *a priori* expectation. The positive sign of the coefficient implies that increases in the LOGY_GDP increases the LOGPOVT_POP in Nigeria, during the study period. The

coefficient estimate of the LOGY_GDP is statistically very significant at 1.0 per cent level. Also, the result shows that 1.0 per cent increase in LOGY_GDP will induce approximately 0.78 per cent increase in LOGPOVT_POP (Appendix 25)[86].

The result of our finding inclines to some existing literature position on the growth-poverty model in Nigeria. For example, Bakare and Ilemobayo (2013) show the existence of a significant and positive relationship between the real GDP and the level of poverty in Nigeria for the period, 1980 to 2008. Implying that increase in economic growth increases the incidence of poverty in Nigeria during that period of study. Also, Ijaiya *et al.* (2011) used a time series data from the period, 1980 to 2008 and modeled household consumption expenditure (measure of poverty reduction as a function of Gross National Income (GNI) per capita income (measure of economic growth). The result indicates that the initial level of economic growth is not prone to poverty reduction, while positive change in economic growth is prone to poverty reduction.

Notwithstanding the research findings, increases in the growth of real GDP is very important for poverty reduction. Agrawal (2015) notes poverty reduction in India has been made possible by the increased growth in the real GDP. Comparatively, Nigeria has witnessed positive real GDP growth like India during the study period, and this seems insufficient to drive down the incidence of poverty. Until, sustained real GDP growth is diligently pursued and achieved, such that it cuts across the sectors that are mostly people employment driven, triumph over poverty reduction may be an illusion.

5.2.3.1 Growth-Poverty and Oil and Non-Oil Gross Domestic Product

Model 16, Appendix 9 shows the estimation result of the oil real Gross Domestic Product (LOGOIL_GDP) and non-oil real Gross Domestic Product

[86] World Bank (1990) and Ravallion and Datt (1999) note economic growth is not enough for poverty reduction. Other things, like human resource development for poor people, is now widely acknowledged as a necessary component alongside economic growth as an effective strategy for fighting poverty. Also, important according to the authors is the level of income inequality and population growth.

(LOGN_OIL_GDP) impacts on the incidence of poverty (LOGPOVT_POP) during the study period. The coefficient estimate of LOGOil_GDP is negatively signed and does comply with our *a priori* expectation. It is an indication that increases in the LOGOil_GDP decreases the level of LOGPOVT_POP in Nigeria, during the study period in the long run. However, the coefficient is statistically not significant at 5.0 per cent level. In addition, the result shows that in the short run, the contemporaneous coefficient estimates of LOGOil_GDP is negatively signed and does comply with our *a priori* expectation. It means that increases in the LOGOil_GDP decreases the level of LOGPOVT_POP in Nigeria. It is, also, statistically very significant at 5.0 per cent level (Appendix 26).

On the other hand, the coefficient estimate of non-oil real Gross Domestic Product (LOGN_OIL_GDP) is negatively signed and statistically significant at 5.0 per cent level. The negative sign of the coefficient implies that it does comply with our *a priori* expectation. Increases in the LOGN_Oil_GDP decreases the level of LOGPOVT_POP in Nigeria, during the study period. Also, in the short run, the contemporaneous coefficient estimates of non-oil real Gross Domestic Product (LOGN_OIL_GDP) is negatively signed and statistically very significant at 1.0 per cent (Appendix 26).

Comparatively, the non-oil sector is shown to be very important for poverty reduction. Thus, government should strengthen efforts at the development of non-oil sector for economic growth and poverty reduction. The development of the non-oil sector would enhance diversification of the economy away from its primary product domination (Crude oil). Further, the finding tends to reinforce our earlier result on the growth-public expenditure model that shows the negative impact of terms of trade on the real GDP per capita in the long run (Model 1, Appendix 7). Thus, the need for Nigeria to diversify her economy away from crude oil to non-oil sector, such that her terms of trade would be in favour of finished/manufactured product. Prebisch-Singer hypothesis is of the opinion that the terms of trade of countries that are involved in

the production of primary product vis-à-vis manufactured products tends to decline in the long-run and such reduces economic growth.

The import of the finding is the need for Nigeria to diversify her economy away from its present reliance on the sale of crude oil and gas for foreign exchange earnings. For example, Nigeria's reliance on the sale of crude oil and gas as the major sources of foreign exchange earnings predisposes her to the vagaries of international oil price volatility that could affect both the fiscal and monetary policy operations of government[87].

5.2.3.2 Growth-Poverty and Gross Domestic Product by Activity Sector

In Table 20, we showed the correlation matrix of coefficients of variables in logarithms involving the growth-poverty model with disaggregated GDP by activity sector classification. The GDP by activity sector, includes agriculture (LOGAGRI_SECGDP), building and construction (LOGBC_GDP), wholesale and retail trade (LOGWRT_GDP), industry (LOGIND_GDP) and services (LOGSER_GDP). All the components of the sectors of the GDP are positively correlated with the incidence of poverty (LOGPOVT_POP), except for two, that are negatively correlated. Correlation of above 0.5 could be found to exist among some of the sectors, and with four out of five of them having a high correlation of above 0.5 with the incidence of poverty. In this regard, we reorder the appearance of the sectors of the GDP in the model, instead of including all simultaneously in a single equation. We try to include each of the sectors in different equations for estimation in Models 17, 18, 19, 20 and 21 of Appendix 9. This would help to reduce the effects of multicollinearity and enhance the precision of individual coefficients.

The estimation results of the agriculture sector/GDP ratio (LOGAGRI_SECGDP) impact on the incidence of poverty is shown in Model 17, Appendix 9. The coefficient

[87]In terms of fiscal policy operations, it affects all the three tiers of government (central, state and local) public expenditure implementations through their benefits from the monthly disbursed crude oil monetised receipts. On the monetary policy side, it leads to the expansion of broad money (M2) occasioned by the monthly monetisation of oil receipts (in the US dollar), thereby, causing inflation, erosion of confidence on the government and undue hardship on the impoverished masses.

estimate of the sector is positively signed and not in line with our *a priori* expectation. This means that increases in the sector increases the incidence of poverty in Nigeria, during the study period. In addition, the result shows that 1.0 per cent increase in the sector will increase the incidence of poverty by 1.60 per cent. However, in the short run, the contemporaneous coefficient estimate of agriculture sector of the GDP is negatively signed and does conform to our *a priori* expectation. Hence, increases in the sector reduces the incidence of poverty. Also, its coefficient is statistically very significant at 1.0 per cent level (Appendix 27).

In the short run, the research outcome shows the importance of agriculture sector in reducing the incidence of poverty in Nigeria. However, in the long run, the coefficient estimate of the sector is positive. An indication, that it does not reduce the incidence of poverty during the study period but increases it. This tends to support our earlier finding on the growth-public expenditure model (Model 11, Appendix 8) that the social sector public expenditure on agriculture reduces the real GDP per capita in Nigeria during the study period in the long run.

The long run effect of the agriculture sector impact on the incidence of poverty during the study period in Nigeria is daunting and requires the urgent attention of government. Unlike in some developing countries, where agricultural is linked to growth. Ravallion and Datt (1996) note on their study of the evolution of poverty in India during 1951-91, associated poverty changes to value-added growth rates in the three major sectors of economic activity, especially agriculture. That growth in agriculture helped to reduce poverty in both urban and rural areas. Similarly, Ravallion and Chen (2004) in their study of China over the period 1980-2001 found growth in agriculture emerges as far more important than growth in secondary or tertiary sectors for poverty alleviation.

In Nigeria, agriculture sector is considered the mainstay of the economy, given that population in the rural communities rely heavily on it for their subsistence. The rural communities constitute the largest percentage of the population and are

predominantly peasants, engaged in one form of agriculture.[88] Presently, the sector is still not mechanised and there exists a mere or absence of agricultural extension services to farmers or value-chain in the production process that would boost productivity and growth. Intuitively, the dismal performance of the agriculture sector to reduce the incidence of poverty in the long run could be that it is still dominated by peasants, involved in subsistence levels of activities, lack of mechanised farming and excluded from access to the credit facility that could encourage expansion and mechanisation.

The sector, however, holds potential for economic growth and poverty reduction in Nigeria. The place of agriculture cannot be overemphasised in the life of a nation. Wiggins (2006) posits that historical record has shown that no country - city states such as Hong-Kong and Singapore exempted - has ever seen rapid economic growth without substantial growth of its agriculture. He argued in many cases, the improvement in agricultural output have preceded the major expansions of manufacturing. According to him, this was the case for the UK in the 17th and 18th Century, as well as many of the recent East Asian growth countries, China, South Korea, Indonesia, and Taiwan.

Model 18, Appendix 9 shows the estimation result of the industry sector/GDP (LOGIND_GDP) ratio impact on the incidence of poverty (LOGPOVT_POP). The coefficient estimate of the sector is negatively signed and conforms with our *a priori* expectation. This means that increase in the sector reduces the LOGPOVT_POP in Nigeria, during the study period. The coefficient is statistically very significant at 1.0 per cent confidence level. Also, it shows that 1.0 per cent increase in the sector will induce a 3.64 per cent reduction in the LOGPOVT_POP. In the short run, the reverse is the case. The coefficient estimate of the sector is positively signed and does not align with our *a priori* expectation (Appendix 28).

[88] Anyanwu, et al. (1997) posit that most of the 80.0 per cent of the rural population of Nigeria was engaged in one type of agricultural activity or the other, while the bulk of the agricultural export crops (Cocoa, Palm Kernel, Rubber, Cotton, Groundnut, Palm Oil etc.) producers are smallholder farmers.

The research finding that industry sector reduces poverty in Nigeria during the study period shows the importance of the sector to the growth and development of the economy. The sector has the potential of being the industrial hub of the economy and could provide employment opportunities in small, medium, and large business enterprises for the people both in the rural and urban communities. However, activities of the sector could be seriously impaired by inconsistent government policies, unstable foreign exchange rate, poor and inadequate infrastructure. These stifle production and impedes growth.

Model 19, Appendix 9 shows the estimation result of the wholesale retail trade sector/GDP (LOGWRT_GDP) ratio impact on the incidence of poverty (LOGPOVT_POP). The coefficient estimate of the sector is positively signed. This is an indication that increases in the sector increases the LOGPOVT_POP in Nigeria, during the study period. The effect of this increase on LOGPOVT_POP is statistically very significant at 1.0 per cent level. The result shows that 1.0 per cent increase in the sector will induce a 3.06 per cent increase in the LOGPOVT_POP. Similarly, the short run outcome indicates the same with the long run. That, the coefficient estimate of LOGWRT_GDP is positively signed and statistically very significant at 1.0 per confidence level (Appendix 29).

The implication of the finding is that the LOGWRT_GDP does not reduce poverty in Nigeria during the study period but increases it. Wholesale trade in Nigeria is still emerging, whereas the retail outlets are dominated by petty traders; involved in commercial activities of buying and selling of wares, often found in different neighborhoods in the country. It is quite recent that we started having the emergent of large wholesale stores, like the departmental stores.

The estimation results of the services sector to GDP (LOGSER_GDP) ratio impact on the incidence of poverty (LOGPOVT_POP) is shown in Model 20, Appendix 9. The coefficient estimate of the sector is positively signed, an indication that increases in the sector increases the incidence of poverty in Nigeria, during the study period.

The result shows that 1.0 per cent increase in the sector will induce a 1.70 per cent increase in the incidence of poverty (Appendix 30). The research finding indicates that the services sector of the economy, which includes; transport, information and communication, utilities, accommodation and food services, finance and insurance, real estate and human health and social services does not contribute to the poverty reduction in Nigeria, during the study period.

Human health and social services, however, are very essential for the economic growth and poverty reduction in Nigeria. Analysis that accompanied Table 10 shows the indicators of human health services have not fared well in Nigeria compared with other developing countries. These could be responsible for its poor impacts on productivity, growth and poverty reduction in the country. For example, the Nigeria's human development index (HDI) for the period 2000, 2010 and 2015 are 0.40, 0.50 and 0.53, and lower than the South Africa, Ghana and Egypt levels. South Africa was 0.63, 0.64 and 0.67, while Ghana was 0.49, 0.55 and 0.58 and Egypt 0.61, 0.67 and 0.69 during the same period, respectively.

In addition, under the services sector are transport and communication infrastructure. The deplorable state of infrastructure and lack of service delivery for money could be part of the factors inhibiting the growth and poverty reduction effects of the sector. According to African Development Bank (2012), improved infrastructure will increase competitiveness and productivity, lower cost of doing business and facilitate trade and foreign direct investment as well as create employment opportunities and spread the benefits of growth across the country.

Similarly, the Nigeria's financial sub-sector; finance, banking and insurance are not yet well developed, and this could impair the financial intermediation process and limits access to credit. Financial sub-sector is an important platform for savings, credit, payment and risk management needs of an economy. A deepened financial market is expected to positively affect economic growth and reduce poverty. On the other hand, a shallow financial market impedes access to finance and credit facilities

that could elicit growth and reduce poverty. Ajakaiye (2013) notes such could explain why the financial markets in some countries have not engendered growth. In countries with low levels of financial inclusion, households and small firms resort to informal financial services and these could be counter-productive (Collins *et al.*, 2009). In developing countries, governments strive for financial inclusion. Financial inclusiveness benefits the poor and other disadvantaged groups in the society (Demirguc-Kunt and Klapper, 2012).

Model 21, Appendix 9 shows the estimation result of the building and construction sector to GDP (LOGBC_GDP) ratio impact on the (LOGPOVT_POP). The coefficient estimate of the sector is negatively signed. Thus, implying that increases in the sector reduces the incidence of poverty in Nigeria, during the study period. However, the coefficient of the sector is statistically not significant at 5.0 per cent level. Also, the short run outcome indicates that the coefficient of the sector is appropriately signed, though statistically not significant at 5.0 per cent level (Appendix 31).

Our research finding shows that the sector has potential for reducing the incidence of poverty, considering the appropriate sign of the coefficient. Activities of the sector are very vital for socio-economic growth and development of the country. It could serve as source of employment generation, offering job opportunities to millions of skilled, semi-skilled and unskilled work forces in the country. For example, the sector could provide inter-sectoral linkages for employment generation, enhancing growth and development through public and private sector partnership. The sector through these linkages could facilitate infrastructural development (transportation-road, rail, air and sea modes), industrial development (construction of industrial parks and factories), construction of institutional buildings, and provision of accommodation etc. (Adeagbo, 2014).

5.2.4 Growth-Poverty Model with Dummy_2 Variable

In Model 22, Appendix 9, we evaluate the impact of real GDP per capita (LOGY_PERCAP) on the incidence of poverty (LOGPOVT_POP) with a dummy_2 variable for the period, 1981-2015. The Dummy_2 variable represents two distinctive periods within the study as in our earlier estimation of the growth-public expenditure with the dummy_1 variable (Model 13, Appendix 8). In Model 22, we represent where the real GDP per capita is expected to reduce the incidence of poverty (predominantly military government era, 1981-1999) with dummy_2 variable, value of one (1). On the other hand, we represent where the real GDP per capita is not expected to reduce the incidence of poverty (predominantly civilian government era, 2000-2015) with dummy_2 variable, value of zero (0).

The research findings indicate that in the long run, the coefficient estimate of the dummy_2 variable value (1) is negatively signed, though statistically not significant at 5.0 per cent level. An indication, it reduces the LOGPOVT_POP during the study period, 1981-1999 (Appendix 32). This corresponds to the period, where the levels of recurrent public expenditure/GDP and capital public expenditure/GDP ratios are relatively balanced (predominantly military government era, 1981-1999) with ratios of 53.6 and 46.4 per cent, respectively compared with the dummy_2 variable value of zero (0), where they are widely apart (predominantly civilian government era, 2000-2015) with ratio of 73.8 and 26.2 per cent), respectively. It is an indication that more capital formation is good for growth and poverty reduction.

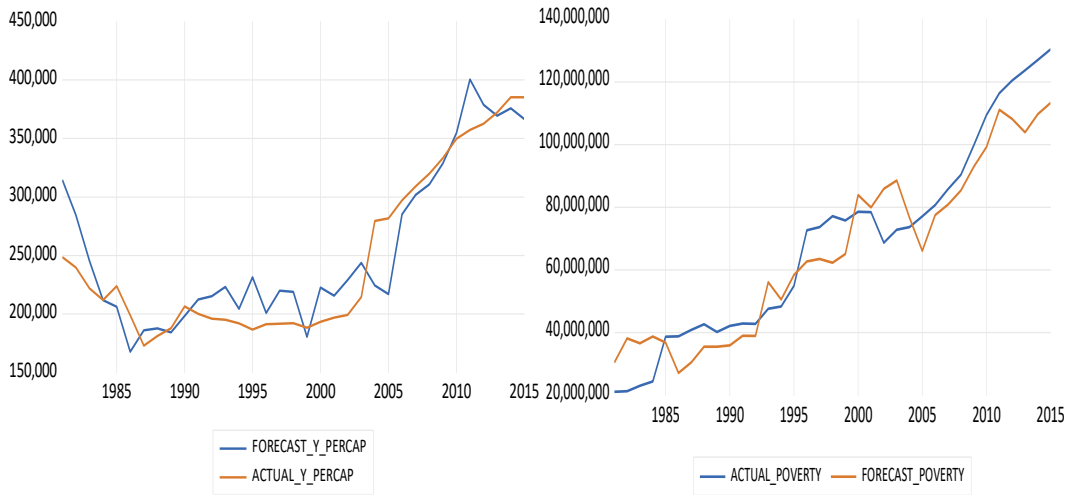
5.3 Model Appraisal and Simulation

5.3.1 Model Appraisal of the Real GDP Per Capita Growth and Incidence of Poverty

The estimates generated from equations (4.1.9) and (4.2) are used to solve for the values of real GDP per capita growth and incidence of poverty, respectively. Also, we conduct a simulation exercise to observe the behaviour of the policy variable, public expenditure/GDP ratio on the real GDP per capita growth and incidence of poverty. In this regard, we conduct within-sample simulations, using the estimates

from the models to predict the movement of real GDP per capita growth and incidence of poverty, respectively.

Figure 11: Graphical Illustration of the Actual and Simulated Values of the real GDP per Capita and incidence of poverty



A cursory look at the graphs in Figure 11, using eyeball metrics and forecast statistics shows that the models track the time-paths and turning-points of the real GDP per capita growth and incidence of poverty reasonably well. The forecast statistics properties of the real GDP per capita under -/+2 S.E indicates that the value of the Thiel Inequality Coefficient (U) is equal to 0.0061, and less than one (1), while the $RMSPE$ is 0.1521. In addition, the correlation metrics between the actual real GDP per capita and its forecast value is 0.92 for the period, 1981-2015. For the incidence of poverty, the forecast statistics properties indicate that the value of the Thiel Coefficient Inequality (U) is equal to 0.0016, and less than one (1), while the $RMSPE$ is 0.0604 during the same period. The correlation metrics between the actual incidence of poverty and its forecast value is 0.95.

Given that the models reasonably track the time-path and turning-points of the actual variables; real GDP per capita and incidence of poverty as well as the forecast statistics, we assume that the models are good indicators that reasonably capture the

workings of the growth-public expenditure and growth-poverty relations in the Nigerian economy, hence suggestive of its suitability for policy simulation.

5.3.2 Model Simulation of the Real GDP per Capita and Incidence of Poverty

We use the estimated coefficients of the equations (4.1.9) and (4.2) to predict all the values of the real GDP per capita growth and incidence of poverty. This is achieved by considering different scenario analyses; introduce shocks on the policy variable and traces their impacts on the real GDP per capita growth and incidence of poverty, respectively. The study focuses on an ex-ante simulation and the forecast horizon is 5-years, from 2016 - 2020. [89]

5.3.3 Scenario Simulation

The study uses one policy variable for the simulation exercise, the real public expenditure/real GDP ratio. The simulation explains the economic consequences that would have resulted on the real GDP per capita and incidence of poverty, respectively from possible changes in the level of real public expenditure/GDP ratio. The effects of the three scenarios are discussed under the following: Scenario 1*:*- (Baseline) a do-nothing policy on the real public expenditure/GDP ratio, given that it follows its natural path; Scenario 2*:*- an increase in the real public expenditure/GDP ratio by 10.0 per cent; and Scenario 3*:*- a decrease in the real public expenditure/GDP ratio by 10.0 per cent.

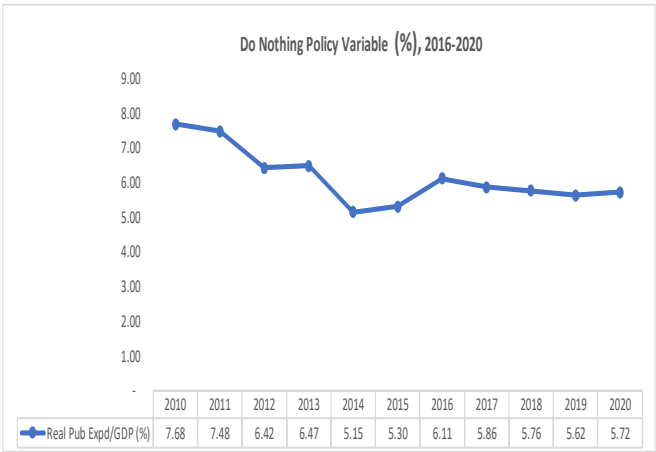
5.3.3.1 Baseline

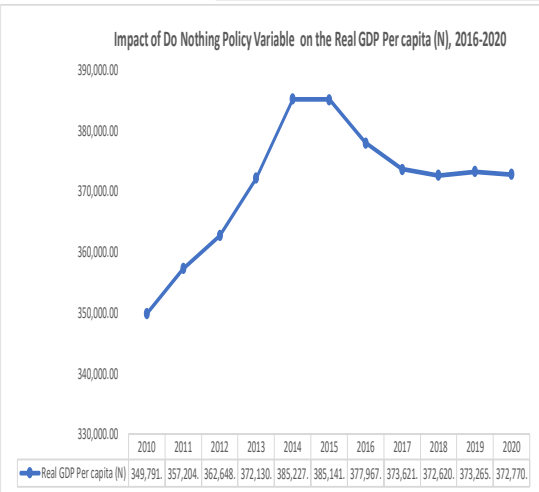
Figure 12: Baseline Scenario of the Simulated Real Public Expenditure/GDP Ratio Impacts on the Real GDP per Capita and Incidence of Poverty

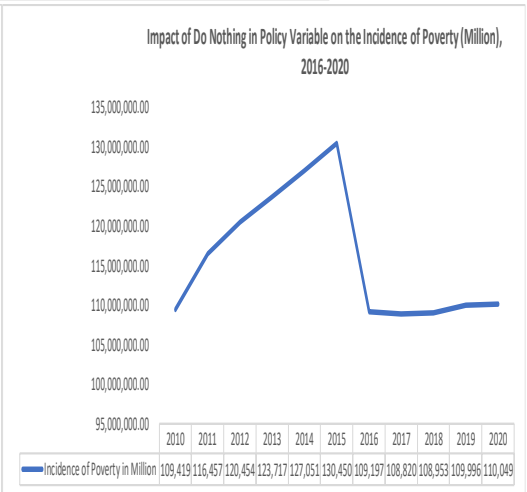
Figure 12 is the do-nothing approach in the annual budget allocation of public expenditure/GDP ratio. Under this, we assume that the annual public expenditure /real GDP ratio is neither increased nor decreased by the government but takes a natural

[89] The ex-ante predicts values of the real GDP per capita growth and incidence of poverty beyond the estimated period, using explanatory variables, whereas an. ex-post forecasts means that the observations on both the real GDP per capita and incidence of poverty and explanatory variables are known with certainty during the forecasting period.

pathway. Thus, we assume a 5-year annual moving average to forecast all the explanatory variables, including the policy variable for the period, 2016-2020. The simulation exercise indicates the annual public expenditure/GDP ratio of 6.11, 5.86, 5.76, 5.62 and 5.72 per cent for the period, 2016, 2017, 2018, 2019 and 2020, respectively.







This results in growth rates of -1.86, -1.15, -0.27, 0.17 and -0.13 per cent for the real GDP per capita (or ₦377,967.16, ₦373,621.63, ₦372,620.51, ₦373,265.80 and ₦372,770.53), respectively. During the same period, the growth rates of incidence of poverty are -16.29, -0.35, 0.12, 0.96 and 0.05 per cent (or population of 109,197,028, 108,820,242, 108,953,019, 109, 996, 274 and 110, 049, 648).

5.3.3.2 Optimistic

Figure 13: Optimistic Scenario of the Simulated Real Public Expenditure/GDP Ratio Impacts on the Real GDP per Capita and Incidence of Poverty

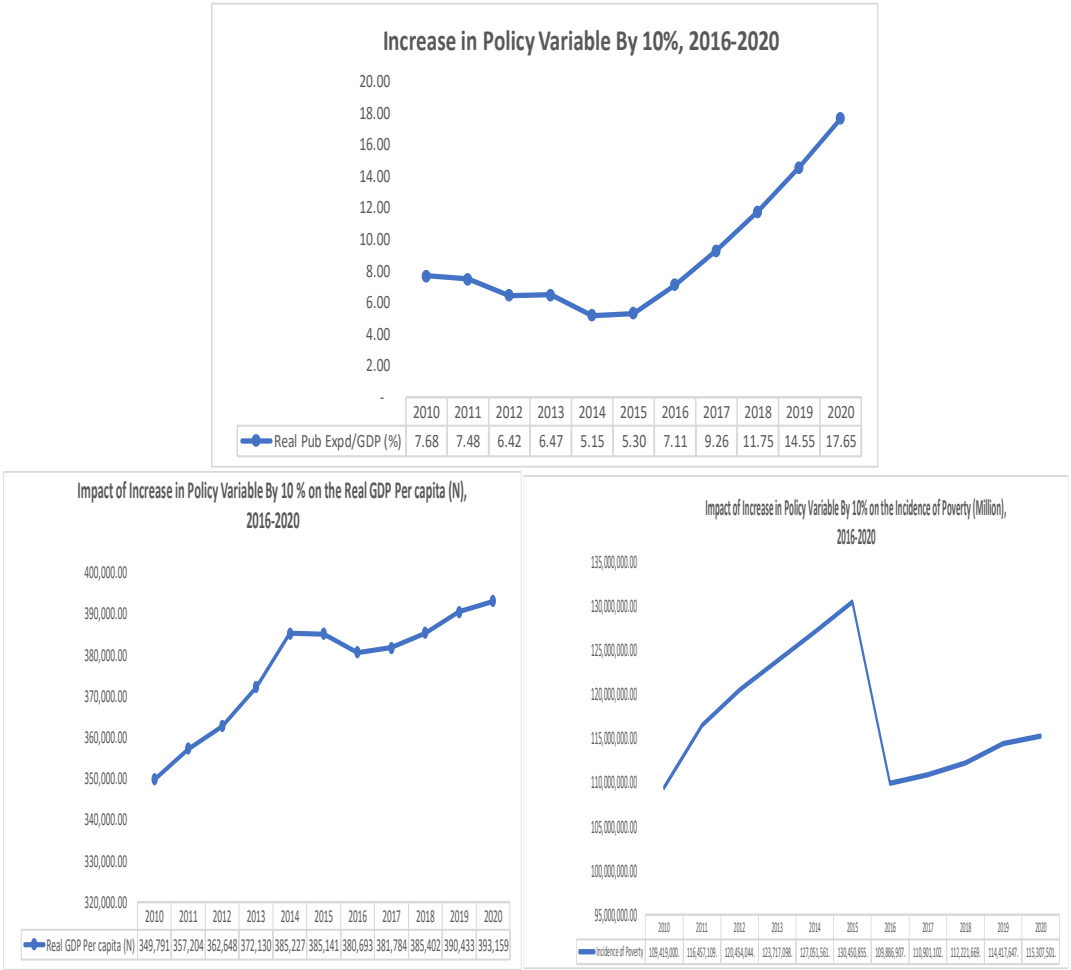


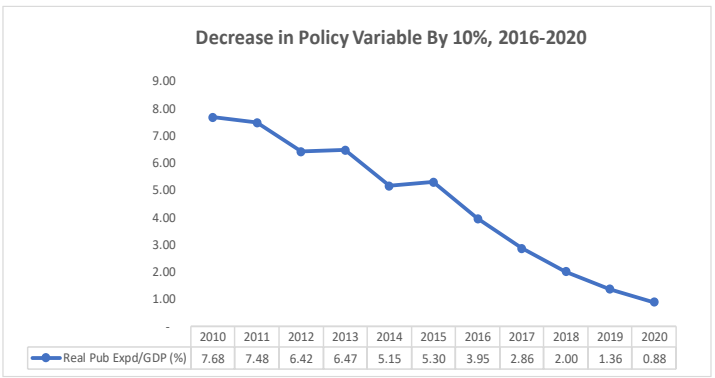
Figure 13 shows the impacts of increase in the annual public expenditure/GDP ratio by 10.0 per cent on the real GDP per capita and incidence of poverty, respectively over a five-year horizon, 2016-2020. The simulation exercise indicates the annual public expenditure/GDP ratio has an upward movement of 7.11, 9.26, 11.75, 14.55 and 17.65 per cent for the period, 2016, 2017, 2018, 2019 and 2020, respectively. Thus, inducing an upward trend in the real GDP per capita growth rates of -1.16, 0.29. 0.95, 1.31 and 0.70 per cent (₦380,693.04, ₦381,784.33, ₦385,402.65, ₦390,433.44 and ₦393,159.74) during the same period, respectively. Similarly, the incidence of poverty grows by -15.76, 0.92, 1.19, 1.96 and 0.78 per cent (or population in poverty of 109,886,908, 110,901,102, 112,221,669, 114,417,648 and 115, 307,502) (Figure

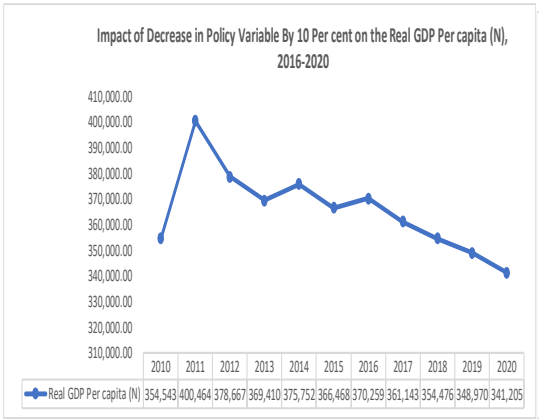
13). This shows that increase in the annual real public expenditure/GDP ratio by 10.0 per cent, given that other variables are held constant, increases the real GDP per capita and incidence of poverty.

This is, however, against our prediction that increases in the annual real public expenditure/GDP ratio increases the real GDP per capita, while the incidence of poverty is reduced. The result aligns with our growth-public expenditure and growth-poverty model outcomes; (i) increases in the real public expenditure/GDP ratio increases the real GDP per capita. (ii) increases in the real GDP per capita increases the incidence of poverty. Further, it aligns with some growth-poverty literature in Nigeria that increases in the economic growth increases poverty (Aigbokhan, 2000; Bakare and Ilemobayo; 2013; and Okoroafor and Chinweoke, 2013).

5.3.3.3 Pessimistic

Figure 14: Pessimistic Scenario of the Simulated Public Expenditure/GDP Ratio Impacts on the Real GDP per Capita and Incidence of Poverty





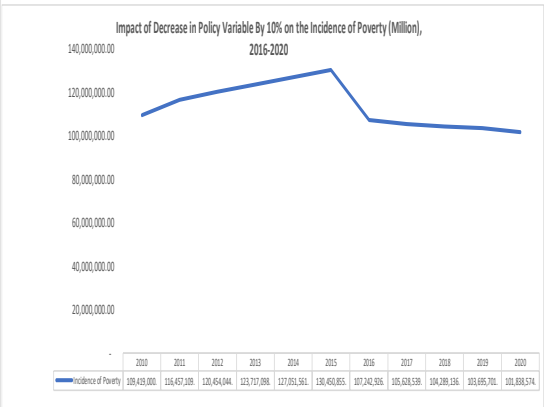


Figure 14 shows the impacts of decrease in the annual public expenditure/GDP ratio by 10.0 per cent on the real GDP per capita and incidence of poverty, respectively over a five-year horizon, 2016-2020. The simulation exercise indicates the annual public expenditure/GDP ratio has downward movement of 3.95, 2.86, 2.00, 1.36 and 0.88 per cent for the period, 2016, 2017, 2018, 2019 and 2020, respectively. Similarly, the real GDP per capita has a downward movement, with growth rates of 1.03, -2.46. -1.85, -1.55 and -2.23 per cent (or ₦370,259.25, ₦361,143.90, ₦354,476.08, ₦348,970.04 and ₦341,205.33, respectively) during the same period. However, the incidence of poverty has negative growth rates of -17.79, -1.51, -1.27, -0.57 and -1.79 per cent (or declining population in poverty of 107,242,927, 105,628,540, 104,289,137, 103,695,701 and 101,838,575). This is, however, against our *a priori* expectation of inverse relationship between the real GDP per capita and incidence of poverty.

5.4 Conclusion

The result of the growth-public expenditure model, using an auto-regressive distributed lag (ARDL) co-integration technique 'bound test' proposed by Pesaran *et al.* (2001) indicates that public expenditure/GDP ratio is growth-enhancing (Model 1, Appendix 7), though statistically not significant. All the control variables in the Model 1, Appendix 7 are appropriately signed, except for terms of trade and effective population growth. However, contrary to our expectation, recurrent public expenditure/GDP ratio is growth-enhancing, while the capital public expenditure/GDP ratio is retarding (Model 2, Appendix 7). All components of the public expenditure by functional classification expressed as ratios of GDP are growth-enhancing (Models 3, 5 and 6, Appendix 7), except for transfers public expenditure/GDP ratio (Model 4, Appendix 7). Public expenditure/GDP ratio on social sector indicates that it is growth-enhancing as well as its disaggregated sectors; health/GDP, education/GDP, transport and communication/GDP ratios (Models; 7, 8, 9 and 10, Appendix 8), except for agriculture/GDP ratio and other social and community services/GDP ratio (Models 11 and 12, Appendix 8).

Notwithstanding, the outcome of agriculture/GDP ratio and other community and social services/GDP ratio, we note the need for their increased funding and supervision. For the agriculture, it is very unique in our national development - increase in budgetary allocation, access to credit facilities by farmers, improvement in technology (mechanized farming and high yielding crops) as well as agricultural value-chain. In addition, our dummy_1 variable result indicates that public expenditure/GDP ratio is growth enhancing during the predominantly military rule era (1981-1999), characterised with recurrent and capital expenditures/total public expenditures ratios of 53.6 and 46.4 per cent, respectively compared with the predominantly civilian era (2000-2015), characterised with recurrent and capital expenditures/total public expenditures ratios of 73.8 and 26.2 per cent, respectively.

In our growth-poverty model, the result of an auto-regressive distributed lag (ARDL) co-integration technique 'bound test' proposed by Pesaran *et al.* (2001) shows that increase in the real GDP per capita, increases the incidence of poverty in Nigeria during the study period (Model 14, Appendix 9). However, all the control variables are appropriately signed, except for the literacy rate and population growth rate, that are positively and negatively signed, respectively (Model 14, Appendix 9). Further, we observe that the real gross domestic product (GDP) increases the incidence of poverty (Model 15, Appendix 9), whereas the disaggregated real GDP indicates that the non-oil GDP is more effective in reducing poverty than the oil GDP (Model 16, Appendix 9).

The disaggregation of the real GDP by sectors indicates that all the sectors; agriculture/GDP ratio, wholesale and retail trade/GDP ratio and services are not good for poverty reduction (Models; 17, 19 and 20, Appendix 9), except the industry/GDP ratio and building and construction/GDP ratio (Models; 18 and 21, Appendix 9). In Model 22, Appendix 9, the dummy_2 variable, with value of one (1) shows that real GDP per capita reduces the incidence of poverty in the long run model, and this corresponds to where the levels of recurrent public expenditure/GDP ratio and capital public expenditure/GDP ratios are relatively balanced (predominantly military

government era, 1981-1999) with recurrent and capital public expenditure ratios of 53.6 and 46.4 per cent, respectively. This compared with the dummy_2 variable, with value of zero (0), where they are widely apart and aligned to the period (predominantly civilian government era, 2000-2015) with recurrent and capital public expenditure ratios of 73.8 and 26.2 per cent, respectively.

The model's appraisal indicates that they reasonably track the time-paths and turning-points of the actual real GDP per capita and incidence of poverty as well as complies with the forecast statistics. The result of the 5-year forecast horizon indicates as follows; (i) simulation exercise under the optimistic scenario, shows that 10.0 per cent positive shock on the annual real public expenditure/GDP ratio leads to increases in the real GDP per capita and incidence of poverty, respectively. (ii) simulation exercise under the pessimistic scenario, indicates that 10.0 per cent negative shock on the annual real public expenditure/GDP ratio leads to downward trend in the real GDP per capita and incidence of poverty, respectively. The simulation outcomes reconfirm our earlier models results that public expenditure increases the real GDP per capita, while the latter increases the incidence of poverty during the period of study in Nigeria. This is against our expectation that increases in public expenditure, increases the real GDP per capita, which in turn, reduces the incidence of poverty. Though, increase in public expenditure increases the real GDP per capita, the increase failed to reduce the incidence of poverty.

CHAPTER SIX
Conclusion and Policy Recommendation

6.0 Introduction

The chapter provides conclusion and policy recommendations of the study - explains the outcomes of two the two regression models: growth-public expenditure and growth-poverty, policy simulation analysis and policy recommendations. The chapter has four sections, section 6.1 is the summary. It provides insight into how the key variables of interest; public expenditure, real GDP per capita and incidence of poverty have interacted in Nigerian economy during the period, 1981 - 2015. Sections 6.2 and 6.3 are problem and limitations of the study and policy implications and recommendations. Finally, section 6.4 is areas of further research into the nature of relationship among public expenditure, economic growth and poverty reduction.

6.1 Summary

The research explains the nature of interaction among public expenditure, economic growth and poverty reduction in Nigeria during the period, 1981-2015. We adopt two regression models: growth-public expenditure and growth-poverty for explaining the nature of interactions. For the growth-public expenditure model and growth-poverty model, we applied a variant of augmented Solow model by Mankiw, Romer and Weil (1992) and a variant of Agrawal (2015), respectively. Our annual data spanned from 1981-2015 for both models.

We, however, conducted unit root test on the time series annual data, using Augmented Dickey-Fuller and Phillip-Perron tests. The results of the various unit root tests indicate that the order of integration is I(1) and I(0) for each of the data series used in the two models. Given these characteristics property of the data, we formulate an auto-regressive distributed lag (ARDL) models for the growth-public expenditure and growth-poverty, respectively. The ARDL is the co-integration technique 'bound test' proposed by Pesaran *et al.* (2001). The choice of this technique is informed by the desire; (i) to capture all the dynamic responses in both the dependent and independent variables, (ii) to reduce the effect of problem of endogeneity in the

models, (iii) variables in the models are not restricted to being integrated of the same order - a mixture of the order of integration, up to a maximum of 1, could be employed. Hence, the I(1) and I(0) and (iv) the small sample size of the study.

Our research outcome for the growth-public expenditure model indicates that public expenditure/GDP ratio increases the real GDP per capita in Nigeria during the period of study. However, this growth-enhancing strength is statistically not significant at 5.0 per cent level. The positive impact of public expenditure/GDP ratio on the real GDP per capita aligns with the theoretical predictions that in the developing countries, public expenditure has positive impact on the real GDP per capita in the long run, especially where the public expenditure/output ratio is small and within a certain threshold (Barro, 1990; Bajo-Rubio, 2000; Milbourne et al. 2003; and Chamorro-Narvaez, 2012).

The result of our control variables indicate that private capital investment/GDP ratio and human capital development have positive impacts on the real GDP per capita. The variables impact on the real GDP per capita are significant and these supports our theoretical and empirical literature that private capital investment (MRW, 1992; Khan, 1996; and M'Amanja and Morrissey, 2005) and human capital development (MRW, 1992 and Temple and Johnson, 1998) promotes growth, respectively. Also, trade openness has very significant and positive impact on growth, whereas terms of trade and population growth did not. The growth rate of population has positive impact on growth. This is against the predictions of the augmented Solow model by MRW (1992). However, some studies have confirmed that growth rate of population could have positive impact on growth in Nigeria (Tartiyus *et al*., 2015 and Ogunleye *et al.*, 2018).

Comparatively, the study shows that recurrent public expenditure/GDP ratio is growth-enhancing, whereas capital public expenditure/GDP ratio retards growth. The growth-enhancing strength of the recurrent expenditure/GDP ratio is statistically not significant at 5.0 per cent level. The research outcome aligns with the result of some

studies in developing countries. That is, recurrent expenditure is positively related to the increase of real GDP per capita, while the capital expenditure has a negative impact on it (Devarajan *et al.,* 1996; Odedokun, 2001and M'Amanja and Morrissey, 2005). In addition, the result of disaggregated public expenditure/GDP ratio by functional classification indicates different impacts on the real GDP per capita. For example, public expenditure on general administration/GDP ratio, economic services/GDP ratio and social and community services/GDP ratio impacts positively on the real GDP per capita. Their impacts on the real GDP per capita are statistically not significant at 5.0 per cent confidence level. However, transfer services/GDP ratio has negative impact on the real GDP per capita. The outcome supports the findings of Akpan (2005). He disaggregated public expenditure into administrative/GDP ratio, economic service/GDP ratio, social and community service/GDP ratio and transfers/GDP ratio to ascertain, which of them enhances growth or not. The findings indicate no significant association between most components of government expenditure by functional classification and economic growth in Nigeria.

Social sector public expenditure/GDP ratio has positive impact on the real GDP per capita, though statistically not significant at 5.0 per cent level. Its disaggregation, however, impacts differently on the real GDP per capita. For example, health/GDP ratio, education/GDP ratio, transport and communication/GDP ratio impacts positively on the real GDP per capita, while agriculture/GDP ratio and other social and community services/GDP ratio have negative impacts on it.

Dummy_1 variable in the growth-public expenditure model indicate that public expenditure/GDP ratio is growth-enhancing during the period, military rule (1981-1999) era, characterised with recurrent and capital expenditures/total public expenditures ratios of 53.6 and 46.4 per cent, respectively compared with the civilian (2000-2015) era, characterised with recurrent and capital expenditures/total public expenditures ratios of 73.8 and 26.2 per cent, respectively.

The result of our second model, growth-poverty shows that real GDP per capita increases the incidence of poverty in Nigeria, during the study period. The findings align with some research works on the growth-poverty relationship in Nigeria (Aigbokhan, 2000; Bakare and Ilemobayo, 2013 and Okoroafor and Chinweoke, 2013). The control variables result indicates that increases in income inequality, unemployment rate, inflation rate and literacy rate worsen the incidence of poverty, while overseas development assistance and population growth rate reduces it. The result of real Gross Domestic Product shows it increases the incidence of poverty, whereas its sectoral components have different impacts on it. The non-oil GDP reduces the incidence of poverty compared with the oil GDP. Further disaggregation of the real GDP into the following sectors: Agriculture/GDP ratio, Industry/GDP ratio, Wholesale Retail Trade/GDP ratio, Services and Building and Construction/GDP ratio shows different impacts on the incidence of poverty.

Industry/GDP ratio and Building and Construction/GDP ratio are found to reduce the incidence of poverty, while others increase it. Industry/GDP ratio is very significant in reducing the incidence of poverty compared with the building and Construction/GDP ratio. The Building and Construction/GDP ratio sector has the potential of being one of the major sources of employment generation and poverty reduction, offering job opportunities to millions of skilled, semi-skilled and unskilled work forces in the country. Adeagbo (2014) notes that the activities of building and construction sector are very vital for socio-economic growth and development of the country. For example, the various activities undertaking in the sector provides inter-sectoral linkages for employment generation, enhancing growth and development through public and private sector partnership.

Dummy_2 variable in the growth-poverty model indicates that the real GDP per capita reduces the incidence of poverty during the predominantly military rule (1981-1999) era, unlike during the predominantly civilian rule (2000-2015) era. The 1981-1999 corresponds with the period, during which recurrent and capital expenditures/total public expenditures ratios are 53.6 and 46.4 per cent, respectively

compared with 2000-2015, with recurrent and capital expenditures/total public expenditures ratios of 73.8 and 26.2 per cent, respectively.

The results of the models appraisal and policy simulation indicate that the former reasonably tracks the time-paths and turning-points of the actual real GDP per capita and incidence of poverty. Also, the models comply with the forecast statistics. The policy simulation exercise indicates that under the optimistic scenario, 10.0 per cent positive shock on the annual real public expenditure/GDP ratio leads to increases in both the real GDP per capita and incidence of poverty, respectively. This supports our earlier findings in both the growth-public expenditure and growth-poverty models. That is, increase in public expenditure increases the real GDP per capita, while increases in the latter increases the incidence of poverty. However, 10.0 per cent negative shock on the annual real public expenditure/GDP ratio shows a downward trend on both the real GDP per capita and incidence of poverty.

6.2 Problem and Limitations of Study

The scope of the study may appear to be relatively short compared with some other growth-public expenditure and growth-poverty studies, owing to the availability of time series annual data, especially on some developmental changes in Nigeria[90]. Also, Nigeria experiences peculiar seasonal nature of government budget implementation that tends to lump the public expenditures towards the end of each year. This could foster unrealistic values, when calculated at a less than annual frequency.

Poverty is multifaceted and mostly observed within the rural communities and local governments areas of the states in Nigeria. Therefore, research into the nature of relationship among public expenditure, economic growth and poverty reduction in Nigeria, using state-level data, as was the case in some other developing countries; India, China and Uganda (Fan *et al*, 2000; 2002 and 2004) and India and Pakistan (Ravallion and Datt, 1996; Agrawal, 2008; and Agrawal, 2015) could unravel, the

[90] This may pose a challenge, given the dearth of adequate quarterly series on key fiscal variables, such as public expenditure, as well as unemployment rate.

outcome of the interactions among the variables better. Also, Nigerian governments have embarked on several poverty alleviation/intervention programmes in the past, though there seems to be conflicting claims on their successes, given the increasing level of poverty in the country. Data to either confirm or discredit the claims on poverty reduction programmes of government are not really forthwith.

6.3 Policy Implications and Recommendations

The coefficient estimate of real public expenditure/GDP ratio is positive in the growth-public expenditure model, an indication that it is good for economic growth. Countries require increases in economic growth for their achievement of poverty reduction. Public expenditures that are not growth enhancing, poses threat to economic growth and development. Our findings that the coefficient estimate of recurrent public expenditure/GDP ratio is positive, whereas the capital public expenditure/GDP ratio is negative may not be good for the long run economic growth of the country. With predominant portion of the public expenditure devoted to recurrent spending in an economy, touted with public sector bureaucracy and inefficiency[91], building-up capital (capital formation) may be very challenging, and this could impair economic growth and development.

However, further investigation into the contributions of recurrent expenditure/GDP ratio and capital expenditure/GDP ratio to economic growth during the period (1981-1999) and (2000-2015), respectively using a dummy_1 variable indicates different outcomes. In the period 1981-1999 (predominantly military era), we experienced economic growth, where the recurrent public expenditure/public expenditure and capital public expenditure/public expenditure ratios are 53.6 and 46.4 per cent, compared with 2000-2015 (predominantly civilian administration era), where they are 73.8 and 26.2 per cent, respectively.

[91] Available statistic shows the average annual real recurrent public expenditure/total public expenditure ratio through the study period is 62.8 per cent, while the capital public expenditure is 37.2 per cent.

This shows that increase in capital public expenditure could enhance capital formation and engenders economic growth, especially in the developing countries, where the capital/output ratio could be low. In contrast, reduction in capital formation could have adverse effect on productivity, which in turn, reduces economic growth and aggravates poverty. Thus, government is implored to adopt public expenditure management switch that would shift emphasises from the presently dominant recurrent public expenditure posture to more of capital public expenditure, as this supports economic growth and poverty reduction.

Public expenditure by functional classification shows that all its components; general administration/GDP ratio, economic services/GDP ratio and social and community services/GDP ratio are growth-enhancing, except for transfers services/GDP ratio. Transfer services constitute one of the major cost burdens on governance in Nigeria, it is predominantly public debt servicing. The 5-year annual average transfer services/total public expenditure ratio is above 50.0 per cent for the periods, 1981-1985, 1986-1990 and 1991-1995. Between 2006 and 2010, it went down to about 29.0 per cent, owing to the debt relief granted to Nigeria in 2005 by their creditors. However, by 2011-2015, it has risen to about 39.0 per cent. This weighs heavily down on the public expenditure envelope, and discourages the allocation of more resources to growth-enhancing sectors; economic services and social and community services. Transfers, however, could assist in eliciting growth where it is targeted at the poor segments of the society. Government should endeavour to use its transfer services as social safety nets, in the form of redistribution of income and wage as well as poverty interventions; entrepreneurship development centers - skill acquisition that would be targeted at the poor population.

Social sector public expenditure/GDP ratio indicates that it supports the growth of real GDP per capita, whereas its disaggregation has varying impacts on it. For example, health/GDP ratio, education/GDP ratio and transport and communication/GDP ratio are growth-enhancing, while agriculture/GDP ratio and other social and community services/GDP ratio retards growth. Good health

conditions ensure effective participation of workforce in the productive activities, while poor health status reduces productivity, inhibits growth by eroding the household's income - 'healthy nation is a wealthy nation'. Similarly, education provides for the human capital development, and this empowers people to achieve their potentials. Human capital development affects economic growth through increase in productivity of workers - facilitates innovation and adoption of new technology.

In addition, transport and communication/GDP ratio is part of infrastructure development that provides for easy movement of goods and services and communication among households/businesses and organisations. It reduces cost of production, thereby encourages economic growth and reduction in poverty. Social sector public expenditure is essential for the economic growth and development of the country - provides the platform for assessing the social wellbeing of the people and developmental changes required for uplifting the populace out of poverty.

The outcome of the control variables impacts on the real GDP per capita elicits relevant policy implications. For example, the private capital investment/GDP ratio is very important for the increase in growth of real GDP per capita, unlike the public expenditure. Literature supports the role of private capital investments in generating economic growth (Khan, 1996; M'Amanja and Morrissey, 2005; and Makuyana and Odhiambo, 2018). Similarly, human capital development impacts positively on the real GDP per capita. Countries with high human capital development are expected to experience faster growth than those with low human capital development. Low human capital development could lead to low productivity and low growth. Lucas (1988) notes that the average level of human capital in any economy determines the level of total factor productivity. Therefore, government should endeavour to provide for the educational needs of her citizenry as well as firms/organisations to engage in the training and re-training of its workforce, as they enhance productivity and generates wealth.

Population growth is found to be growth effective. In a surplus-labour economy like Nigeria, with abundant human and natural resources as well as with most of her populace living in the rural area and relies heavily on the agriculture for their subsistence. An increase in the effective labour could lead to increase in the real GDP per capita, given that more hands would be involved in agriculture production and more income generated. This, however, may pose challenge to government, where the agricultural system becomes mechanised, thus requiring less human labour. Mechanisation of the agriculture system should not only involve increase in the acreage and farm yields. It should include carefully designed roadmap towards industrialization of the sector; land reform programmes, incentive-based architecture of sharing agricultural loses, processing of the primary products into finished product (value-chain addition) as this would create more job opportunities, create wealth and reduce poverty.

Trade openness is found to be very supportive of growth in the long run, whereas terms of trade suppresses it. In a global world, where international trade is highly competitive, it may be very challenging for countries involved in export of primary products to compete favourably compared with those producing finished/manufactured products. Relying solely on primary product exports may discourage economic diversification[92]. Low economic diversification could imply high economic dependency. Nigeria's quest for industrialisation may be incumbered, if the presently primary-product-dominated economy is not consciously reversed, as this would affect her international trade position vis-à-vis that of other developed nations. Hence, there is need for the development of Nigeria's internal capacity through conscious government policy that would ensure both human capital development and capital formation.

The growth-poverty model shows that the coefficient estimates of real GDP per capita growth is positive, an indication that it increases the incidence of poverty during the

[92] Economic diversification entails departure from a mono-cultured product economy (especially, primary products like the Nigerian economy)

study period. Further investigation into the impact of the real GDP per capita on poverty reduction during the period 1981-1999 and 2000-2015, using dummy_2 variable, indicates different outcomes. Real GDP per capita growth reduces the incidence of poverty during the period 1981-1999. The period of 1981-1999 era (predominantly military government) corresponds with where the average annual recurrent public expenditure/public expenditure ratio is 53.6 and capital public expenditure/public expenditure ratio is 46.4 per cent. Compared with the period 2000-2015, predominantly civilian government era, where the average annual recurrent and capital public expenditure/total public expenditure ratios are 73.8 and 26.2 per cent, respectively.

The findings that the present levels of real GDP per capita growth increases the incidence of poverty during the study period, deserves urgent government policy action that would reverse the situation. Sustained increase in the real GDP per capita growth has been adjudged as very important for poverty reduction. With the dummy_2 variable, real GDP per capita growth reduces poverty in 1981-1999, where there is more capital public expenditure. That is, where the average annual recurrent public expenditure/public expenditure and capital public expenditure/public expenditure ratios are 53.6 and 46.4 per cent, compared with 73.8 and 26.2 per cent, respectively). Thus, the need for government to readdress its public expenditure to support capital public expenditure, as this enhances growth and reduces the incidence of poverty.

Also, the coefficient estimate of real GDP has positive impact on the incidence of poverty, which means that it increases it. This is an indication that the impressive growth of the real GDP experienced by the Nigeria economy during the study period did not support reduction in the incidence of poverty. Nevertheless, the coefficient estimate of the disaggregated real GDP growth by oil and non-oil on the incidence of poverty shows different impacts. Comparatively, the non-oil GDP reduces the incidence of poverty more than the oil GDP. This is good for the economic growth of the country, considering the volatile nature of international crude oil prices on the

economy. Volatility of the oil prices could negatively affect both the fiscal and monetary policies of government. Further, this reiterates the need for the diversification of the economy away from its present reliance on crude oil.

The coefficient estimates of the disaggregated real GDP by activity sectors; agriculture/GDP ratio, wholesale trade/GDP ratio, industry/GDP ratio, services/GDP ratio and building and construction/GDP ratio have different impacts on the incidence of poverty. Industry/GDP ratio and building and construction/GDP ratio sectors reduce the incidence of poverty, while agriculture/GDP ratio, wholesale trade/GDP ratio and services/GDP ratio sectors do not. The need for industry and building and construction sectors in enhancing economic growth cannot be over-empasised. The sectors facilitate growth through the manufacturing of goods and services and infrastructure development: transportation: road, rail, air and sea, industrial development; construction of industrial parks and factories, construction of institutional buildings; and employment generation for both skilled, semi-skilled labour and artisans.

However, our research findings that the agriculture/GDP ratio, wholesale trade/GDP ratio and services/GDP ratio increase the incidence of poverty during the study period raises some policy concern, especially with respect to the agriculture sector/GDP ratio. Agriculture activities in Nigeria are still at the subsistence level - with little or near absence of mechanisation and no value-chain in its production process. Existence of value addition in the primary product processing would provide employment opportunities and income generation for the vast population of people in the rural areas, thereby reducing the number of population in poverty. To this end, government policies in the sector shall focus on modernising the sector; it could be designated as one of the centerpieces of Nigeria's industrialisation policy. By so doing, there would be value addition in the production chain of agricultural products through massive public-private sector partnership, as this would generate more employment opportunities and wealth creation.

Finally, the outcome of the simulation exercise is suggestive that government should adjust its public expenditure profile to be supportive of growth. Presently, the state of public expenditure that is skewed in favour of recurrent expenditure is such that does not generate sufficient growth, capable of reducing the incidence of poverty. Also, with the level of income inequality and fleeting economic growth in the country, reducing the incidence of poverty may go beyond the ambiance of increase in real GDP per capita growth. Introduction and conscious implementation of development policies could be required - directed at improving the standard of living of the poor, which would elicit virtuous circles of growth that promote development.

6.4 Areas for Further Research

In undergoing the research, several areas where information is lacking were highlighted, and some of these were addressed by the theoretical and empirical literature and the thesis, whereas some others remain. Within the context of Nigeria, there are set of new questions/ideas that could be presented for further research:

(a) Public Expenditure and Economic Growth in Nigeria. The study will consider the maximum level of public investment/output ratio required for the attainment of economic growth and poverty reduction in Nigeria.

(b) Growth and Poverty in Nigeria. The study will require the use of state-level data, comparing the different impacts of public expenditure on poverty reduction across the six-geopolitical zones of the country; and

(c) Giving that government has implemented several poverty alleviation programmes in the country, yet there is high level of incidence of poverty, predominantly in the rural communities of Nigeria. Why has poverty remained very high in the rural communities despite government intervention programmes, what are the employment and income elasticities effects of the various intervention programmes on poverty reduction?

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APPENDICES

Appendix 1: Variables Description and Measurement in the Growth-Public Expenditure Model

S/N	Variables Notation	Description/Measurement	Unit
1	**Y_GDP**	Total amount of goods and services produced within a given period of time in Nigeria, usually a year at constant 2010 prices.	N'Billion
2	Y_PERCAP	Real GDP per capita is the real GDP at constant 2010 prices divided by the population level.	N
3	PCI_GDP	Private capital investment obtained by deducting capital public expenditure from the gross fixed capital formation.	N'Billion
4	HCD	Human capital development, obtained by adding the total primary and secondary school enrolments.	Million
5	PLN_DEPRE_TECH	Effective population growt, rate of depreciatiom and technological progress.	%
6	ESP_GDP	Total public expenditure of federal government, addition of recurrent and capital expenditures	N'Billion
7	REC_GDP	Recurrent public expenditure, obtained by deducting capital public expenditure from the total public expenditure.	N'Billion
8	CAP_GDP	Capital public expenditure, obtained by deducting recurrent expenditure from total public expenditure.	N'Billion
9	GA_GDP	General administration is a component of total public expenditure by functional classification.	N'Billion
10	SCS_GDP	Social and community services is a component of total public expenditure by functional classification.	N'Billion
11	ES_GDP	Economic services is a component of total public expenditure by functional classification.	N'Billion
12	TS_GDP	Transfers service is a component of real public expenditure by functional classification.	N'Billion
13	SOC_GDP,	Social sector is a component of total public expenditure; transport and communication, agriculture, health, education and other social and community services.	N'Billion
14	TRC_GDP	Public expenditure on transport and communication, including recurrent and capital.	N'Billion
15	AGR_GDP	Public expenditure on agriculture, including recurrent and capital.	N'Billion
16	HEL_GDP	Public expenditure on health, including recurrent and capital..	N'Billion
17	EDU_GDP	Public expenditure on education, including recurrent and capital .	N'Billion
18	OSC_GDP	Public expenditure on other social and community services, including recurrent and capital.	N'Billion
19	TOT	Terms of trade obtained by dividing value of export by value of import.	Ratio
20	TOO_GDP	Trade openness obtained by dividing values of export and import by value of GDP.	%
21	Y_CAP_0	Initial real GDP per capita	N
22	DUMMY_1	Used in the growth-public expenditure model to represent the effect of public expenditure on the real GDP per capita for the two distinctive periods; (1981-1999) and (2000-2015). The period (1981-1999) assumes a value of 1, while the period (2000-2015) is zero.	

Appendix 2: *A priori* Expectation of Variables in the Growth-Public Expenditure Model

S/N	Variables Notation	Dependent Variables Relationship With Explanatory Variables	Remark
		Growth - Public Expenditure Model	
1	PCI_GDP	Increase in the private capital investment is expected to increase the GDP per capita growth rate.	$\alpha > 0$
2	HCD	Increase in the human capital development is expected to increase the GDP per capita growth rate.	$\alpha > 0$
3	PLN_DEPRE_TECH	Increase in the growth rate of population, technological change and capital depreciation is expected to decrease the GDP per capita growth rate. With technological change and capital depreciation are constant.	$\alpha < 0$
4	ESP_GDP	Increase in the total public expenditure is expected to increase the GDP per capita growth rate.	$\alpha > 0$
5	REC_GDP	Increase in the recurrent public expenditure is expected to decrease the GDP percapita growth rate.	$\alpha < 0$
6	CAP_GDP	Increase in the capital public expenditure is expected to increase the GDP per capita growth rate.	$\alpha > 0$
7	GA_GDP	Increase in the general administration public expenditureis expected to increase the GDP per capita growth rate.	$\alpha > 0$
8	SCS_GDP	Increase in the social and community services public expenditure is expected to increase the GDP per capita growth rate.	$\alpha > 0$
9	ES_GDP	Increase in the economic services public expenditure is expected to increase the GDP per capita growth rate.	$\alpha > 0$
10	TS_GDP	Increase in the transfers service public expenditure is expected to decrease the GDP per capita growth rate.	$\alpha < 0$
11	SOC_GDP	Increase in the social sector public expenditure is expected to increase the GDP per capita growth rate.	$\alpha > 0$
12	TRC_GDP	Increase in the transportation and communication public expenditure is expected to increase the GDP per capita growth rate.	$\alpha > 0$
13	AGR_GDP	Increase in the agriculture public expenditure is expected to increase the GDP per capita growth rate.	$\alpha > 0$
14	HEL_GDP	Increase in the other social and community services public expenditure is expected to increase the real GDP per capita growth rate.	$\alpha > 0$
15	EDU_GDP	Increase in the education public expenditure is expected to increase the GDP per capita growth rate.	$\alpha > 0$
16	OSC_GDP	Increase in the other social and community public expenditure is expected to increase the GDP per capita growth rate.	$\alpha > 0$
17	TOT	Increase in the terms of trade is expected to increase the GDP per capita growth rate.	$\alpha > 0$
18	TOO_GDP	Increase in the trade openness is expected to increase the GDP per capita growth rate.	$\alpha > 0$
19	Y_CAP_0	Increase in the initial real GDP per capita is expected to increase the current real GDP per capita growth rate.	$\alpha > 0$
20	DUMMY_1	Increase in the dummy variable is expected to increase the GDP per capita growth rate	$\alpha > 0$

Appendix 3: Variables Description and Measurement in the Growth-Poverty Model

S/N	Variables Notation	Description/Measurement	Unit
1	POVT_POP	Percentage of population in million that are poor	Million
2	GINI_COEFF	We used the Gini coefficient as the measurement of income inequality. It is the ratio of the area between the Lorenz curve and the diagonal (the line of perfect equality) to the area below the diagonal. As a measure of income inequality, the Gini coefficient ranges from 0 to 1.	Index
3	Y_PERCAP	Real GDP per capita is the real GDP at constant 2010 prices divided by the population level.	N
4	UMP	Unemployment rate expressed in per cent. It is calculated as the proportion of labour force that was available for work but do not work in the week preceding the survey for at least 39 hours (NBS, 2012)	%
5	INF	Persistent increase in the general price level over time. The growth rate of consumer price index between two periods.	%
6	LTR	Percentage of population that could read and write	%
7	ODA_GDP	Net official development assistance and official aid received in the US dollar and converted into the Nigeria naira, using the prevailing exchange rate.	N'Billion
8	PLN_RATE	The nation's population growth rate is generated from the publication of the National Bureau of Statistic (NBS).	%
9	Y_GDP	Total amount of goods and services produced within a given period of time in Nigeria, usually a year at constant 2010 prices.	N'Billion
10	SER_GDP	Services activity sector of the GDP, eg, transport, information and communication, utilities, accommodation and food services, finance and insurance, real estate and human health and social services.	N'Billion
11	AGRI_SECGDP	Agriculture activity sector of the GDP, eg, crop production, livestock, forestry and fishing.	N'Billion
12	IND_GDP	Industry activity sector of the GDP, eg, crude petroleum, solid minerals and manufacturing.	N'Billion
13	WRT_GDP	Wholesale and retail trade activity sector of the GDP.	N'Billion
14	BC_GDP	Building and construction activity sector of the GDP.	N'Billion
15	OIL_GDP	Crude oil and natural gas component of the GDP.	N'Billion
16	N_OIL_GDP	GDP minus Oil GDP	N'Billion
17	DUMMY_2	Used in the growth-poverty model to represent the effect of economic growth on poverty for the two distinctive periods; (1981-1999) and (2000-2015). The period (1981-1999) assumes a value of 1, while the period (2000-2015) is zero.	

Appendix 4: *A priori* Expectation of Variables in the Growth-Poverty Model

S/N	Variables Notation	Dependent Variables Relationship With Explanatory Variables	Remark
		Growth-Poverty Model	
1	GINI_COEFF	Increase in the Gini-Coefficient is expected to increase the number of population in poverty.	$\beta > 0$
2	Y_PERCAP	Increase in the GDP per capita growth rate is expected to reduce the number of population in poverty.	$\beta < 0$
3	UMP	Increase in the unemployment rate is expected to increase the number of population in poverty.	$\beta > 0$
4	INF	Increase in the level of inflation rate is expected to increase the number of population in poverty.	$\beta > 0$
5	LTR	Increase in the literacy rate is expected to reduce the number of population in poverty.	$\beta < 0$
6	ODA_GDP	Increase in the overseas development assistance is expected to reduce the number of population in poverty.	$\beta < 0$
7	PLN_RATE	Increase in the population growth is expected to increase the number of population in poverty.	$\beta > 0$
8	Y_GDP	Increase in the real gross domestic product is expected to reduce the number of population in poverty.	$\beta < 0$
9	SER_GDP	Increase in the services activity sector of the economy is expected to reduce the number of population in poverty	$\beta < 0$
10	AGRI_SECGDP	Increase in the agricultural activity sector of the economy is expected to reduce the number of population in poverty.	$\beta < 0$
11	IND_GDP	Increase in the industry activity sector of the economy is expected to reduce the number of population in poverty.	$\beta < 0$
12	WRT_GDP	Increase in the wholesale trade activity sector of the economy is expected to reduce the number of population in poverty.	$\beta < 0$
13	BC_GDP	Increase in the building and construction activity sector of the economy is expected to reduce the number of population in poverty.	$\beta < 0$
14	OIL_GDP	Increase in the oil sector of the economy is expected to reduce the number of population in poverty.	$\beta < 0$
15	N_OIL_GDP	Increase in the non-oil sector of the economy is expected to reduce the number of population in poverty.	$\beta < 0$
16	DUMMY_2	Increase in the dummy variable is expected to reduce the number of population in poverty.	$\beta < 0$

Appendix 5: Raw Data Series for the Growth-Public Expenditure Model, 1981-2015

Year	Y	y_percap	Pci_GDP	Hcd	logpln_depre_tech	Esp_GDP	Rec_GDP	Cap_GDP	Ga_GDP	Scs_GDP	Es_GDP	Ts_GDP	Soc_GDP	Trc_GDP	Agr_GDP	Hel_GDP	Edu_GDP	Osc_GDP	Tot	Too_GDP	Y_cap_0
1981	15,258.00	248,688.09	0.5329	16,500,492.00	0.0770	0.0788	0.0335	0.0453	0.0113	0.0110	0.0263	0.0302	0.0425	0.0114	0.0155	0.0015	0.0042	0.0099	0.8585	0.1648	248,688.09
1982	14,985.08	239,747.19	0.4152	17,844,432.00	0.0760	0.0769	0.0355	0.0414	0.0092	0.0084	0.0177	0.0416	0.0392	0.0085	0.0229	0.0015	0.0044	0.0019	0.7619	0.1224	248,688.09
1983	13,849.73	221,939.85	0.2940	18,733,028.00	0.0750	0.0591	0.0291	0.0300	0.0122	0.0081	0.0151	0.0237	0.0324	0.0069	0.0179	0.0013	0.0031	0.0031	0.8426	0.1007	248,688.09
1984	13,779.26	212,022.21	0.1843	17,786,152.00	0.0750	0.0583	0.0342	0.0241	0.0080	0.0035	0.0051	0.0417	0.0104	0.0018	0.0052	0.0009	0.0020	0.0006	1.2660	0.0955	248,688.09
1985	14,953.91	223,857.44	0.1529	16,020,865.00	0.0760	0.0678	0.0394	0.0284	0.0098	0.0084	0.0061	0.0435	0.0150	0.0015	0.0077	0.0010	0.0023	0.0025	1.6596	0.0977	248,688.09
1986	15,237.99	199,011.86	0.1123	16,009,219.00	0.0760	0.0801	0.0380	0.0421	0.0085	0.0055	0.0068	0.0593	0.0196	0.0028	0.0099	0.0011	0.0035	0.0023	1.4908	0.0736	199,011.86
1987	15,263.93	173,011.88	0.0923	14,474,527.00	0.0760	0.0883	0.0627	0.0255	0.0227	0.0037	0.0114	0.0505	0.0088	0.0022	0.0035	0.0004	0.0015	0.0012	1.6998	0.1933	199,011.86
1988	16,215.37	181,230.02	0.0898	15,688,262.00	0.0760	0.0866	0.0606	0.0260	0.0240	0.0120	0.0105	0.0402	0.0178	0.0029	0.0052	0.0019	0.0054	0.0023	1.4545	0.1643	199,011.86
1989	17,294.68	187,975.12	0.0749	15,444,878.00	0.0760	0.0579	0.0620	0.0359	0.0212	0.0145	0.0128	0.0494	0.0189	0.0023	0.0040	0.0017	0.0077	0.0032	1.8785	0.2119	199,011.86
1990	19,305.63	206,575.10	0.0895	16,509,242.00	0.0760	0.1206	0.0725	0.0481	0.0189	0.0110	0.0102	0.0805	0.0166	0.0023	0.0055	0.0015	0.0055	0.0018	2.4036	0.3114	199,011.86
1991	19,199.06	200,138.62	0.0903	16,900,131.00	0.0750	0.1117	0.0642	0.0475	0.0173	0.0070	0.0075	0.0800	0.0088	0.0010	0.0022	0.0013	0.0026	0.0018	1.3581	0.3540	200,138.62
1992	19,620.19	196,002.16	0.0872	18,406,557.00	0.0750	0.1020	0.0583	0.0437	0.0152	0.0038	0.0060	0.0771	0.0056	0.0013	0.0022	0.0004	0.0007	0.0011	1.4363	0.3833	200,138.62
1993	19,927.99	195,153.08	0.1062	20,062,805.00	0.0750	0.1519	0.1086	0.0433	0.0307	0.0145	0.0207	0.0860	0.0202	0.0028	0.0042	0.0034	0.0083	0.0016	1.3208	0.3053	200,138.62
1994	19,979.12	192,079.78	0.0937	21,183,560.00	0.0750	0.0913	0.0510	0.0402	0.0166	0.0086	0.0176	0.0485	0.0136	0.0010	0.0047	0.0017	0.0056	0.0006	1.2658	0.2092	200,138.62
1995	20,353.20	186,781.04	0.0552	23,078,628.00	0.0750	0.0859	0.0441	0.0418	0.0145	0.0080	0.0169	0.0465	0.0128	0.0017	0.0046	0.0017	0.0045	0.0003	1.2589	0.5892	200,138.62
1996	21,177.92	191,288.66	0.0538	25,183,701.00	0.0750	0.0893	0.0329	0.0563	0.0162	0.0065	0.0324	0.0341	0.0104	0.0029	0.0019	0.0012	0.0039	0.0005	2.3276	0.4954	191,288.66
1997	21,789.10	191,816.44	0.0509	26,740,107.00	0.0750	0.1041	0.0386	0.0656	0.0257	0.0070	0.0428	0.0286	0.0144	0.0021	0.0052	0.0016	0.0045	0.0009	1.4682	0.5077	191,288.66
1998	22,332.87	192,178.74	0.0406	28,269,693.00	0.0750	0.1061	0.0388	0.0673	0.0187	0.0098	0.0463	0.0314	0.0159	0.0018	0.0050	0.0026	0.0057	0.0007	0.8978	0.3463	191,288.66
1999	22,449.41	188,330.59	0.0104	29,766,567.00	0.0750	0.1786	0.0847	0.0938	0.0427	0.0167	0.0774	0.0418	0.0337	0.0027	0.0138	0.0045	0.0098	0.0029	1.3785	0.3865	191,288.66
2000	23,688.28	193,442.43	0.0809	31,253,895.00	0.0750	0.1016	0.0669	0.0347	0.0287	0.0163	0.0203	0.0363	0.0214	0.0009	0.0037	0.0032	0.0118	0.0019	1.9753	0.4249	191,288.66
2001	25,267.54	196,966.43	0.0309	34,380,385.00	0.0750	0.1252	0.0712	0.0539	0.0283	0.0163	0.0385	0.0421	0.0301	0.0065	0.0080	0.0055	0.0073	0.0027	1.3753	0.3966	196,966.43
2002	28,957.71	199,331.67	0.0607	37,060,862.00	0.0750	0.0898	0.0615	0.0284	0.0300	0.0163	0.0237	0.0199	0.0244	0.0041	0.0037	0.0047	0.0079	0.0039	1.1530	0.2874	196,966.43
2003	31,709.45	214,460.71	0.1040	33,383,746.00	0.0750	0.0922	0.0740	0.0182	0.0298	0.0119	0.0146	0.0359	0.0135	0.0022	0.0012	0.0030	0.0060	0.0011	1.4844	0.3885	196,966.43
2004	35,020.55	279,563.66	0.0638	35,236,343.00	0.0760	0.0823	0.0621	0.0203	0.0257	0.0095	0.0131	0.0341	0.0170	0.0010	0.0034	0.0035	0.0057	0.0034	2.3164	0.3804	196,966.43
2005	37,474.95	281,813.21	0.0470	34,319,519.00	0.0760	0.0818	0.0585	0.0233	0.0272	0.0100	0.0148	0.0298	0.0147	0.0013	0.0043	0.0035	0.0050	0.0007	2.5873	0.4512	196,966.43
2006	39,995.50	297,095.33	0.0858	28,499,667.00	0.0760	0.0676	0.0483	0.0193	0.0247	0.0095	0.0119	0.0215	0.0140	0.0006	0.0033	0.0035	0.0054	0.0012	2.3563	0.3640	297,095.33
2007	42,922.41	309,138.73	0.1157	27,641,939.00	0.0760	0.0743	0.0513	0.0230	0.0259	0.0124	0.0163	0.0198	0.0177	0.0015	0.0052	0.0041	0.0060	0.0010	2.1242	0.3704	297,095.33
2008	46,012.52	319,934.34	0.1039	27,567,118.00	0.0760	0.0828	0.0582	0.0245	0.0260	0.0124	0.0209	0.0235	0.0222	0.0058	0.0045	0.0039	0.0055	0.0024	1.8572	0.4081	297,095.33
2009	49,856.10	333,135.43	0.1337	26,443,219.00	0.0770	0.0780	0.0519	0.0260	0.0227	0.0113	0.0210	0.0230	0.0172	0.0029	0.0036	0.0032	0.0040	0.0034	1.5703	0.3181	297,095.33
2010	54,612.26	349,791.64	0.1520	29,766,434.00	0.0770	0.0768	0.0606	0.0162	0.0252	0.0129	0.0179	0.0209	0.0182	0.0023	0.0032	0.0028	0.0045	0.0055	1.4713	0.3694	297,095.33
2011	57,511.04	357,204.05	0.1319	28,802,327.00	0.0770	0.0748	0.0602	0.0146	0.0237	0.0139	0.0111	0.0261	0.0194	0.0011	0.0021	0.0046	0.0062	0.0054	1.3857	0.4165	357,204.05
2012	59,929.89	362,648.15	0.1320	28,875,939.00	0.0770	0.0642	0.0520	0.0122	0.0188	0.0124	0.0077	0.0253	0.0172	0.0012	0.0022	0.0036	0.0058	0.0044	1.5501	0.3473	357,204.05
2013	63,218.72	372,130.04	0.1336	28,949,549.00	0.0770	0.0647	0.0509	0.0138	0.0174	0.0125	0.0100	0.0249	0.0163	0.0009	0.0021	0.0030	0.0058	0.0045	1.6168	0.3084	357,204.05
2014	67,152.79	385,227.62	0.1486	28,504,301.50	0.0770	0.0515	0.0427	0.0088	0.0137	0.0100	0.0074	0.0204	0.0128	0.0007	0.0013	0.0028	0.0044	0.0037	1.2298	0.2639	357,204.05
2015	69,023.93	385,141.96	0.1424	28,266,597.20	0.0760	0.0530	0.0443	0.0087	0.0155	0.0095	0.0066	0.0214	0.0110	0.0006	0.0010	0.0030	0.0038	0.0026	0.7986	0.2116	357,204.05

Note: All the variables except Y, Y_percap, Hcd, dlogpln_depre_tech, Tot and Y_Cap_0 was expressed as shares in GDP and thereafter the logs of all the variables taken in the EViews 9.5.

Appendix 6: Raw Data Series for the Growth-Poverty Model, 1981-2015

Year	Y	Povt_pop	Gini_Coeff	y_percap	Ump	Inf	Hcd	Oda_GDP	Pln_Rate	Ser_GDP	Agri_SecGDP	Ind_GDP	Wrt_GDP	Bc_GDP	Oil_GDP	N_Oil_GDP
1981	15,258.00	21,135,114.56	0.3520	248,688.09	0.0520	0.2090	16,500,492.00	0.0170	0.0272	0.2404	0.1550	0.4328	0.1160	0.0558	0.3262	0.6738
1982	14,985.08	21,305,049.43	0.3610	239,747.19	0.0620	0.0770	17,844,432.00	0.0150	0.0260	0.2509	0.1619	0.4186	0.1233	0.0453	0.2972	0.7028
1983	13,849.73	23,044,060.33	0.3792	221,939.85	0.0340	0.2320	18,733,028.00	0.0180	0.0254	0.2726	0.1739	0.3801	0.1301	0.0432	0.2926	0.7074
1984	13,779.26	24,449,321.70	0.3869	212,022.21	0.0620	0.3960	17,786,152.00	0.0120	0.0253	0.2688	0.1672	0.4079	0.1206	0.0354	0.3309	0.6691
1985	14,953.91	38,712,957.90	0.4880	223,857.44	0.0610	0.0550	16,020,865.00	0.0110	0.0256	0.2527	0.1826	0.4266	0.1156	0.0225	0.3289	0.6711
1986	15,237.99	38,789,962.90	0.5307	199,011.86	0.0530	0.0540	16,009,219.00	0.0440	0.0260	0.2554	0.1960	0.4091	0.1174	0.0220	0.3167	0.6833
1987	15,263.93	40,879,155.39	0.5878	173,011.88	0.0700	0.1020	14,474,527.00	0.0670	0.0263	0.2600	0.1894	0.4019	0.1245	0.0240	0.3082	0.6918
1988	16,215.37	42,692,532.63	0.5437	181,230.02	0.0530	0.3830	15,688,262.00	0.0850	0.0263	0.2521	0.1958	0.3993	0.1279	0.0249	0.2978	0.7022
1989	17,294.68	40,201,604.85	0.5085	187,975.12	0.0400	0.4090	15,444,878.00	0.2500	0.0261	0.2481	0.1923	0.4106	0.1247	0.0244	0.3126	0.6874
1990	19,305.63	42,109,334.70	0.4436	206,575.10	0.0350	0.0750	16,509,242.00	0.1590	0.0258	0.2406	0.1795	0.4419	0.1151	0.0229	0.3539	0.6461
1991	19,199.06	42,901,855.80	0.4408	200,138.62	0.0310	0.1300	16,900,131.00	0.1380	0.0255	0.2480	0.1870	0.4216	0.1194	0.0240	0.3242	0.6758
1992	19,620.19	42,794,607.40	0.4670	196,002.16	0.0340	0.4450	18,406,557.00	0.1060	0.0252	0.2514	0.1873	0.4164	0.1205	0.0244	0.3252	0.6748
1993	19,927.99	47,578,684.23	0.4572	195,153.08	0.0270	0.5720	20,062,805.00	0.0800	0.0250	0.2572	0.1879	0.4076	0.1222	0.0252	0.3209	0.6791
1994	19,979.12	48,358,304.40	0.4531	192,079.78	0.0200	0.5700	21,183,560.00	0.0270	0.0249	0.2638	0.1922	0.3963	0.1219	0.0259	0.3118	0.6882
1995	20,353.20	54,869,824.22	0.4545	186,781.04	0.0180	0.7280	23,078,628.00	0.0110	0.0249	0.2664	0.1954	0.3923	0.1197	0.0261	0.3133	0.6867
1996	21,177.92	72,640,785.02	0.5290	191,288.66	0.0380	0.2930	25,183,701.00	0.0060	0.0249	0.2644	0.1952	0.3990	0.1160	0.0254	0.3226	0.6774
1997	21,789.10	73,676,235.55	0.5060	191,816.44	0.0320	0.0850	26,740,107.00	0.0060	0.0249	0.2687	0.1976	0.3929	0.1145	0.0262	0.3182	0.6818
1998	22,332.87	77,163,752.25	0.4922	192,178.74	0.0320	0.1000	28,269,693.00	0.0050	0.0249	0.2761	0.2004	0.3813	0.1150	0.0271	0.3172	0.6828
1999	22,449.41	75,772,691.36	0.4899	188,330.59	0.0820	0.0660	29,766,567.00	0.0110	0.0250	0.2874	0.2095	0.3578	0.1173	0.0280	0.2919	0.7081
2000	23,688.28	78,549,989.78	0.4639	193,442.43	0.1310	0.0690	31,253,895.00	0.0090	0.0250	0.2832	0.2044	0.3719	0.1129	0.0276	0.3074	0.6926
2001	25,267.54	78,414,646.25	0.4434	196,966.43	0.1360	0.1890	34,380,385.00	0.0070	0.0251	0.2935	0.1989	0.3701	0.1085	0.0290	0.3033	0.6967
2002	28,957.71	68,708,023.14	0.4791	199,331.67	0.1260	0.1290	37,060,862.00	0.0080	0.0252	0.2899	0.2699	0.3129	0.1008	0.0264	0.2495	0.7505
2003	31,709.45	72,848,838.22	0.4737	214,460.71	0.1480	0.1400	33,383,746.00	0.0070	0.0254	0.2690	0.2638	0.3436	0.0974	0.0262	0.2823	0.7177
2004	35,020.55	73,654,127.10	0.4700	279,563.66	0.1340	0.1500	35,236,343.00	0.0090	0.0256	0.2775	0.2538	0.3261	0.1205	0.0221	0.2641	0.7359
2005	37,474.95	77,111,410.29	0.4660	281,813.21	0.1190	0.1790	34,319,519.00	0.0640	0.0259	0.2835	0.2540	0.3115	0.1278	0.0232	0.2480	0.7520
2006	39,995.50	80,719,577.20	0.4664	297,095.33	0.1230	0.0820	28,499,667.00	0.0720	0.0261	0.2947	0.2556	0.2871	0.1381	0.0245	0.2219	0.7781
2007	42,922.41	85,800,376.06	0.4710	309,138.73	0.1270	0.0540	27,641,939.00	0.0100	0.0263	0.3066	0.2553	0.2640	0.1482	0.0258	0.1974	0.8026
2008	46,012.52	90,358,781.39	0.4694	319,934.34	0.1490	0.0680	27,567,118.00	0.0050	0.0265	0.3215	0.2531	0.2405	0.1576	0.0273	0.1727	0.8273
2009	49,856.10	99,666,607.84	0.4686	333,135.43	0.1970	0.1259	26,443,219.00	0.0060	0.0266	0.3346	0.2473	0.2277	0.1622	0.0282	0.1601	0.8399
2010	54,612.26	109,419,000.09	0.4683	349,791.64	0.2140	0.1378	29,766,434.00	0.0060	0.0267	0.3473	0.2389	0.2203	0.1647	0.0288	0.1539	0.8461
2011	57,511.04	116,457,109.34	0.4688	357,204.05	0.2390	0.1085	28,802,327.00	0.0040	0.0267	0.3434	0.2335	0.2239	0.1676	0.0316	0.1495	0.8505
2012	59,929.89	120,454,044.48	0.4692	362,648.15	0.2740	0.1223	28,875,939.00	0.0040	0.0268	0.3459	0.2391	0.2174	0.1644	0.0332	0.1364	0.8636
2013	63,218.72	123,717,098.16	0.4689	372,130.04	0.2470	0.0851	28,949,549.00	0.0040	0.0267	0.3587	0.2333	0.2059	0.1662	0.0359	0.1124	0.8876
2014	67,152.79	127,051,561.44	0.4687	385,227.62	0.2510	0.0805	28,504,301.50	0.0030	0.0266	0.3617	0.2290	0.2054	0.1657	0.0382	0.1044	0.8956
2015	69,023.93	130,450,855.68	0.4688	385,141.96	0.2680	0.0900	28,266,597.20	0.0050	0.0264	0.3676	0.2311	0.1930	0.1695	0.0388	0.0961	0.9039

Note: All the variables except Povt_pop, Y_percap, Gini_coeff, ltr_rate, Ump_rate, inf_rate, Pln_rate and Hcdwas expressed as shares in GDP and thereafter the logs of all the variables taken in the EViews 9.5.

Appendix 7: Estimation Result of the Growth-Public Expenditure Model, 1981-2015

MODEL	**MODEL 1**	**MODEL 2**	**MODEL 3**	**MODEL 4**	**MODEL 5**	**MODEL 6**
METHOD	ARDL	ARDL	ARDL	ARDL	ARDL	ARDL
DEPENDENT VARIABLE	LOGY_PERCAP	LOGY_PERCAP	LOGY_PERCAP	LOGY_PERCAP	LOGY_PERCAP	LOGY_PERCAP
CONSTANT	11.7309	8.2808	9.1557	9.0412	14.3334	14.651
	(2.82)*	(1.62)	(2.50)*	(2.65)*	(2.75)*	(2.74)*
lOGPCI_GDP	0.1306	0.1010	0.1160	0.0813	0.1083	0.1580
	(4.32)**	(2.75)*	(5.79)**	(4.74)**	(4.73)**	(3.19)*
LOGHCD	0.2003	0.1640	0.1452	0.1088	0.1748	0.1174
	(3.65)**	(1.96)	(3.92)**	(2.41)*	(4.22)**	(1.56)
LOGESP_GDP	0.0473					
	(1.17)					
LOGREC_GDP		0.0334				
		(1.54)				
LOGCAP_GDP		-0.0325				
		(-1.03)				
LOGGA_GDP			0.0364			
			(2.00)			
LOGTS_GDP				-0.0042		
				(-0.21)		
LOGES_GDP					0.017	
					(0.75)	
LOGSCS_GDP						0.0904
						(1.27)
LOGPLN_DEPRE_TECH	3.8440	2.3881	2.7532	2.7686	4.6988	3.7219
	(2.76)*	(1.28)	(2.21)*	(2.53)*	(2.83)*	(2.13)
Y_CAP_0	0.6394	0.6508	0.6926	0.7333	0.6321	0.5210
	(7.98)**	(6.09)**	(10.01)**	(11.51)**	(7.60)**	(4.22)**
LOGTOT	-0.1602	-0.1725	-0.1561	-0.1420	-0.2506	-0.1615
	(-3.28)**	(-3.10)*	(-3.82)**	(-3.46)**	(-3.85)**	(-2.51)*
LOGTOO_GDP	0.1723	0.1780	0.1551	0.1429	0.1253	0.2442
	(5.01)**	(5.30)**	(5.23)**	(5.35)**	(3.44)**	(3.07)*
Serial Correlation LM Test	0.2828	0.1074	0.3035	0.1476	0.0769	0.1602
Normality Test	0.7757	0.7410	0.0565	0.7185	0.8492	0.0972
Heteroskedasticity Test	0.9270	0.2221	0.9437	0.4174	0.8918	0.9576
Ramsey Reset Test	0.6525	0.8051	0.7425	0.1550	0.2964	0.8860

Note: The *t-statistics values* of coefficients are the figures presented in the parentheses below the coefficients and * and ** denote significance at 5.0% and 1.0% levels, respectively. The results show that various diagnostics tests for a good fit are satisfied.

Appendix 8: Estimation Result of the Growth-Public Expenditure Model, 1981-2015

MODEL	**MODEL 7**	**MODEL 8**	**MODEL 9**	**MODEL 10**	**MODEL 11**	**MODEL 12**	**MODEL 13**
METHOD	ARDL	ARDL	ARDL	ARDL	ARDL	ARDL	ARDL
DEPENDENT VARIABLE	LOGY_PERCAP	LOGY_PERCAP	LOGY_PERCAP	LOGY_PERCAP	LOGY_PERCAP	LOGY_PERCAP	LOGY_PERCAP
CONSTANT	12.1961	13.7983	12.3745	11.6377	10.8923	9.2017	12.2018
	(2.58)*	(3.05)**	(2.50)*	(2.65)*	(1.98)	(2.74)*	(2.56)*
LOGPCI_GDP	0.1108	0.1284	0.1174	0.0982	0.0985	0.0806	0.1185
	(3.65)**	(4.68)**	(4.10)**	(4.74)**	(3.11)**	(4.45)**	(3.88)**
LOGHCD	0.1485	0.1360	0.1452	0.1333	0.1500	0.1157	0.262
	(3.34)**	(2.90)	(3.31)**	(3.26)**	(3.64)**	(3.46)	(2.27)*
LOGESP_GDP							0.0416
							(0.96)
LOGSOC_GDP	0.0085						
	(0.31)						
LOGHEL_GDP		0.0233					
		(1.32)					
LOGEDU_GDP			0.0164				
			(0.83)				
LOGTRC_GDP				0.0086			
				(0.75)			
LOGAGR_GDP					-0.0070		
					(-0.29)		
LOGOSC_GDP						-0.0017	
						(-0.19)	
LOGPLN_DEPRE_TECH	3.7297	3.9981	3.7123	3.5489	3.4084	2.8923	4.5783
	(2.46)*	(2.76)	(2.44)*	(2.35)*	(1.92)	(2.49)	(2.47)*
Y_CAP_0	0.6412	0.5966	0.6336	0.6697	0.6678	2.8924	0.6638
	(6.82)**	(6.64)**	(7.03)**	(8.21)**	(6.94)**	(2.49)*	(7.80)**
LOGTOT	-0.1898	-0.1565	-0.1919	-0.2160	-0.1752	-0.1415	-0.1746
	(-3.41)**	(-3.03)*	(-3.63)**	(-3.86)**	(-3.07)**	(-3.48)**	(-3.22)**
LOGTOO_GDP	0.1867	0.1934	0.1887	0.1881	0.1697	0.1394	0.161
	(4.04)**	(5.08)**	(4.62)**	(4.65)**	(3.49)**	(4.91)**	(3.97)**
DUMMY_1							0.0500
							(1.11)
Serial Correlation LM Test	0.1887	0.0567	0.0782	0.1828	0.2457	0.1546	0.1903
Normality Test	0.9739	0.9726	0.8814	0.8673	0.9864	0.5775	0.4899
Heteroskedasticity Test	0.7365	0.7713	0.5207	0.8906	0.7418	0.3527	0.9784
Ramsey Reset Test	0.6073	0.8616	0.7743	0.2985	0.6864	0.1768	0.7130

Note: The *t-statistics values* of coefficients are the figures presented in the parentheses below the coefficients and * and ** denote significance at 5.0% and 1.0% levels, respectively. The results show that various diagnostics tests for a good fit are satisfied.

Appendix 9: Estimation Result of the Growth-Poverty Model, 1981-2015

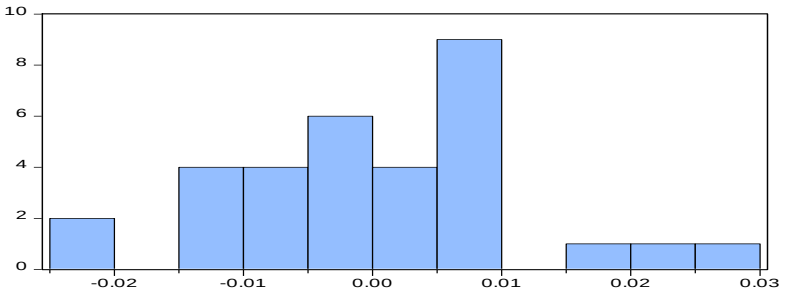
MODEL	MODEL 14	MODEL 15	MODEL 16	MODEL 17	MODEL 18	MODEL 19	MODEL 20	MODEL 21	MODEL 22
METHOD	ARDL	ARDL	ARDL	ARDL	ARDL	ARDL	ARDL	ARDL	ARDL
DEPENDENT VARIABLE	LOGPOVT_POP	LOGPOVT_POP	LOGPOVT_POP	LOGPOVT_POP	LOGPOVT_POP	LOGPOVT_POP	LOGPOVT_POP	LOGPOVT_POP	LOGPOVT_POP
CONSTANT	154.7225	15.1899	-46.4045	16.7908	41.4711	14.4415	22.2318	23.3237	14.7172
	(12.854)**	(13.66)**	(-2.65)*	(2.16)	(2.47)*	(2.36)*	(1.52)	(1.05)	(9.18)**
LOGY_PERCAP	0.8764								0.9126
	(6.81)**								(6.88)**
lOGGINI_COEFF	0.3703	0.4878	-0.2998	0.3590	3.2115	1.6836	2.5094	-4.2152	0.407
	(1.39)	(1.53)	(-0.34)	(0.61)	(4.26)**	(4.31)*	(2.08)*	(-0.91)	(1.44)
LOGY_GDP		0.7691							
		(10.25)**							
LOGOIL_GDP			-2.7458						
			(-2.20)						
LOGN_OIL_GDP			-14.7462						
			(-2.30)*						
LOGAGRI_SECGDP				1.5969					
				(3.23)**					
LOGIND_GDP					-3.6438				
					(-3.02)**				
LOGWRT_GDP						3.0612			
						(6.08)**			
LOGSER_GDP							1.6916		
							(1.69)		
LOGBC_GDP								-3.8930	
								(-1.06)	
LOGUMP	0.1866								0.1168
	(5.50)**								(1.99)
LOGINF	0.0297								0.0261
	(1.88)								(1.61)
LOGLTR	0.6853								0.5752
	(7.60)**								(4.70)**
LOGHCD		-0.2186	2.0880	0.2553	-0.4082	1.0558	0.0055	-1.7783	
		(-0.93)	(4.68)**	(0.79)	(-0.70)	(4.83)**	(0.01)	(-0.77)	
LOGODA_GDP	-0.0183	-0.0775	-0.1850	-0.1875	0.1176	0.0488	0.1870	-0.7595	-0.0211
	(-1.18)	(-2.41)*	(-3.31)**	(-4.30)**	(1.27)	(1.22)	(-0.93)	(-1.22)	(-1.26)
LOGPLN_RATE	-6.6447	-18.7957	20.5451	-1.0893	-18.4831	-6.9170	-0.9201	1.9328	-6.4434
	(-6.28)**	(-3.26)**	(2.86)*	(-0.54)	(-2.18)*	(-2.54)	(-0.24)	(1.38)	(-5.62)**
DUMMY_2									-0.1408
									(-1.41)
Serial Correlation LM Test	0.1329	0.4585	0.1118	0.0612	0.3158	0.3336	0.8083	0.7403	0.1845
Normality Test	0.1107	0.8076	0.1632	0.9065	0.6444	0.6269	0.1121	0.0844	0.1062
Heteroskedasticity Test	0.6683	0.2497	0.9935	0.6551	0.0689	0.0648	0.0155	0.1558	0.6837
Ramsey Reset Test	0.5655	0.0804	0.3336	0.3803	0.5684	0.1576	0.2889	0.2782	0.7026

Note: The t-statistics values of coefficients are the figures presented in the parentheses below the coefficients and * and ** denote significance at 5.0% and 1.0% levels, respectively. The results show that various diagnostics tests for a good fit are satisfied.

Appendix 10: ARDL Result of Growth-Public Expenditure, 1981-2015

(Residual Diagnostic)

Normality Test



Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.458277	Prob. F(2,9)	0.2828
Obs*R-squared	7.831939	Prob. Chi-Square(2)	0.0199

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.478116	Prob. F(20,11)	0.9270
Obs*R-squared	14.88131	Prob. Chi-Square(20)	0.7832
Scaled explained SS	2.199869	Prob. Chi-Square(20)	1.0000

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ01_BEST
Specification: LOGY_PERCAP LOGY_PERCAP(-1) LOGY_PERCAP(-2) LOGY_PERCAP(-3) LOGPCI_GDP LOGPCI_GDP(-1) LOGPCI_GDP(-2) LOGHCD LOGHCD(-1) LOGHCD(-2) LOGESP_GDP LOGPLN_DEPRE_TECH LOGPLN_DEPRE_TECH(-1) LOGPLN_DEPRE_TECH(-2) LOGY_CAP_0 LOGY_CAP_0(-1) LOGY_CAP_0(-2) LOGTOO_GDP LOGTOO_GDP(-1) LOGTOT LOGTOT(-1) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.464094	10	0.6525
F-statistic	0.215383	(1, 10)	0.6525

Bounds Test for Co-integration

ARDL Bounds Test
Date: 10/08/19 Time: 03:21
Sample: 1984 2015
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	9.220538	7

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.92	2.89
5%	2.17	3.21
2.5%	2.43	3.51
1%	2.73	3.9

Short-Run and Long-Run Model

ARDL Cointegrating And Long Run Form
Original dep. variable: LOGY_PERCAP
Selected Model: ARDL(3, 2, 2, 0, 2, 2, 1, 1)
Date: 10/08/19 Time: 03:22
Sample: 1981 2015
Included observations: 32

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGY_PERCAP(-1))	1.148849	0.073865	15.553337	0.0000
D(LOGY_PERCAP(-2))	-0.343350	0.059426	-5.777734	0.0001
D(LOGPCI_GDP)	0.071817	0.007251	9.904406	0.0000
D(LOGPCI_GDP(-1))	-0.015451	0.007330	-2.107836	0.0588
D(LOGHCD)	0.052639	0.055110	0.955162	0.3600
D(LOGHCD(-1))	-1.092829	0.076289	-14.324771	0.0000
D(LOGESP_GDP)	0.038819	0.016243	2.389905	0.0359
D(LOGPLN_DEPRE_T...	1.793137	0.629660	2.847785	0.0159
D(LOGPLN_DEPRE_T...	-3.116311	0.724167	-4.303301	0.0012
D(LOGY_CAP_0)	0.701992	0.048751	14.399398	0.0000
D(LOGY_CAP_0(-1))	-0.512113	0.049768	-10.290085	0.0000
D(LOGTOO_GDP)	0.038482	0.010303	3.734875	0.0033
D(LOGTOT)	0.001974	0.012901	0.152990	0.8812
CointEq(-1)	-0.770504	0.061920	-12.443483	0.0000

Cointeq = LOGY_PERCAP - (0.1306*LOGPCI_GDP + 0.2003*LOGHCD + 0.0473*LOGESP_GDP + 3.8440*LOGPLN_DEPRE_TECH + 0.6394 *LOGY_CAP_0 + 0.1724*LOGTOO_GDP -0.1603*LOGTOT + 11.7309)

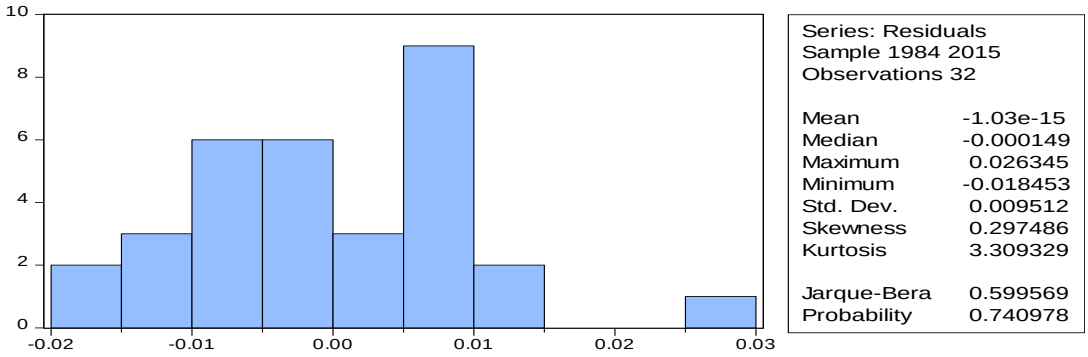
Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGPCI_GDP	0.130634	0.030213	4.323764	0.0012
LOGHCD	0.200303	0.054914	3.647568	0.0038
LOGESP_GDP	0.047328	0.040434	1.170480	0.2665
LOGPLN_DEPRE_TECH	3.844010	1.394332	2.756883	0.0187
LOGY_CAP_0	0.639378	0.080120	7.980209	0.0000
LOGTOO_GDP	0.172356	0.034396	5.010981	0.0004
LOGTOT	-0.160250	0.048844	-3.280859	0.0073
C	11.730887	4.164262	2.817039	0.0168

Appendix 11: ARDL Result of Growth-Public Expenditure by Economic Classification (Recurrent and Capital Expenditures), 1981-2015

(Residual Diagnostic)

Normality Test



Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.121248	Prob. F(2,7)	0.1074
Obs*R-squared	15.08476	Prob. Chi-Square(2)	0.0005

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.647400	Prob. F(22,9)	0.2221
Obs*R-squared	25.63435	Prob. Chi-Square(22)	0.2677
Scaled explained SS	2.341333	Prob. Chi-Square(22)	1.0000

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ06_ECO
Specification: LOGY_PERCAP LOGY_PERCAP(-1) LOGY_PERCAP(-2) LOGY_PERCAP(-3) LOGPCI_GDP LOGPCI_GDP(-1) LOGHCD LOGHCD(-1) LOGHCD(-2) LOGCAP_GDP LOGCAP_GDP(-1) LOGCAP_GDP(-2) LOGREC_GDP LOGPLN_DEPRE_TECH LOGPLN_DEPRE_TECH(-1) LOGPLN_DEPRE_TECH(-2) LOGY_CAP_0 LOGY_CAP_0(-1) LOGY_CAP_0(-2) LOGTOO_GDP LOGTOO_GDP(-1) LOGTOT LOGTOT(-1) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.255017	8	0.8051
F-statistic	0.065034	(1, 8)	0.8051

Bounds Test for Co-integration

ARDL Bounds Test
Date: 10/08/19 Time: 04:05
Sample: 1984 2015
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	7.887835	8

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.85	2.85
5%	2.11	3.15
2.5%	2.33	3.42
1%	2.62	3.77

Short-Run and Long-Run Model

ARDL Cointegrating And Long Run Form
Original dep. variable: LOGY_PERCAP
Selected Model: ARDL(3, 1, 2, 2, 0, 2, 2, 1, 1)
Date: 10/08/19 Time: 04:06
Sample: 1981 2015
Included observations: 32

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGY_PERCAP(-1))	1.101289	0.063094	17.454681	0.0000
D(LOGY_PERCAP(-2))	-0.361506	0.057902	-6.243423	0.0002
D(LOGPCI_GDP)	0.060898	0.007098	8.579272	0.0000
D(LOGHCD)	0.056553	0.048411	1.168166	0.2728
D(LOGHCD(-1))	-1.041085	0.063074	-16.505777	0.0000
D(LOGCAP_GDP)	-0.008362	0.011412	-0.732779	0.4823
D(LOGCAP_GDP(-1))	0.036626	0.010827	3.382852	0.0081
D(LOGREC_GDP)	0.031066	0.009621	3.228902	0.0103
D(LOGPLN_DEPRE_T...	1.779068	0.547720	3.248134	0.0100
D(LOGPLN_DEPRE_T...	-2.460732	0.632808	-3.888590	0.0037
D(LOGY_CAP_0)	0.716316	0.046455	15.419480	0.0000
D(LOGY_CAP_0(-1))	-0.488706	0.041926	-11.656456	0.0000
D(LOGTOO_GDP)	0.033198	0.008924	3.719958	0.0048
D(LOGTOT)	0.003150	0.009898	0.318258	0.7575
CointEq(-1)	-0.760123	0.053652	-14.167685	0.0000

Cointeq = LOGY_PERCAP - (0.1100*LOGPCI_GDP + 0.1640*LOGHCD
-0.0325*LOGCAP_GDP + 0.0334*LOGREC_GDP + 2.3881
*LOGPLN_DEPRE_TECH + 0.6508*LOGY_CAP_0 + 0.1780
*LOGTOO_GDP -0.1725*LOGTOT + 8.2808)

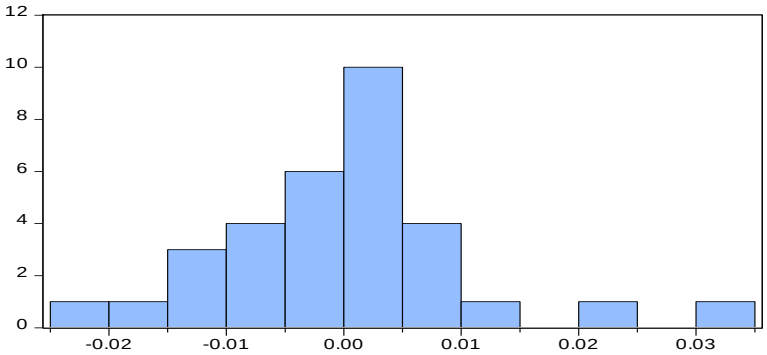
Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGPCI_GDP	0.109998	0.040051	2.746441	0.0226
LOGHCD	0.163993	0.083601	1.961612	0.0814
LOGCAP_GDP	-0.032464	0.031434	-1.032766	0.3287
LOGREC_GDP	0.033430	0.021687	1.541480	0.1576
LOGPLN_DEPRE_TECH	2.388105	1.861234	1.283076	0.2315
LOGY_CAP_0	0.650819	0.106950	6.085288	0.0002
LOGTOO_GDP	0.178049	0.033632	5.294106	0.0005
LOGTOT	-0.172501	0.055733	-3.095158	0.0128
C	8.280777	5.115612	1.618727	0.1400

Appendix 12: ARDL Result of Growth-Public Expenditure by Functional Classification (General Administration), 1981-2015

(Residual Diagnostic)

Normality Test



Series: Residuals	
Sample 1984 2015	
Observations 32	
Mean	-5.47e-15
Median	0.000935
Maximum	0.030661
Minimum	-0.020150
Std. Dev.	0.010340
Skewness	0.708832
Kurtosis	4.516862
Jarque-Bera	5.747523
Probability	0.056486

Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.365285	Prob. F(2,9)	0.3035
Obs*R-squared	7.448765	Prob. Chi-Square(2)	0.0241

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.446288	Prob. F(20,11)	0.9437
Obs*R-squared	14.33443	Prob. Chi-Square(20)	0.8131
Scaled explained SS	2.978456	Prob. Chi-Square(20)	1.0000

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ13_GA
Specification: LOGY PERCAP LOGY PERCAP(-1) LOGY PERCAP(-2) LOGY PERCAP(-3) LOGPCI GDP LOGPCI GDP(-1) LOGPCI GDP(-2) LOGHCD LOGHCD(-1) LOGHCD(-2) LOGGA GDP LOGPLN_DEPRE_TECH LOGPLN_DEPRE_TECH(-1) LOGPLN_DEPRE_TECH(-2) LOGY_CAP_0 LOGY_CAP_0(-1) LOGY_CAP_0(-2) LOGTOO GDP LOGTOO GDP(-1) LOGTOT LOGTOT(-1) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.337790	10	0.7425
F-statistic	0.114102	(1, 10)	0.7425

Bounds Test for Co-integration

ARDL Bounds Test
Date: 10/11/19 Time: 00:09
Sample: 1984 2015
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	9.231648	7

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.92	2.89
5%	2.17	3.21
2.5%	2.43	3.51
1%	2.73	3.9

Short-Run and Long-Run Model

ARDL Cointegrating And Long Run Form
Original dep. variable: LOGY_PERCAP
Selected Model: ARDL(3, 2, 2, 0, 2, 2, 1, 1)
Date: 10/11/19 Time: 00:10
Sample: 1981 2015
Included observations: 32

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGY_PERCAP(-1))	1.240805	0.073300	16.927668	0.0000
D(LOGY_PERCAP(-2))	-0.253425	0.055444	-4.570822	0.0008
D(LOGPCI_GDP)	0.068651	0.006029	11.387552	0.0000
D(LOGPCI_GDP(-1))	-0.012697	0.006667	-1.904332	0.0833
D(LOGHCD)	0.059685	0.050088	1.191592	0.2585
D(LOGHCD(-1))	-1.071974	0.068966	-15.543509	0.0000
D(LOGGA_GDP)	0.033120	0.008892	3.724695	0.0034
D(LOGPLN_DEPRE_T...	1.723431	0.579609	2.973435	0.0127
D(LOGPLN_DEPRE_T...	-2.747791	0.693952	-3.959629	0.0022
D(LOGY_CAP_0)	0.723762	0.045409	15.938728	0.0000
D(LOGY_CAP_0(-1))	-0.524989	0.046202	-11.362859	0.0000
D(LOGTOO_GDP)	0.032438	0.009543	3.399244	0.0059
D(LOGTOT)	0.001248	0.011908	0.104796	0.9184
CointEq(-1)	-0.840222	0.061701	-13.617715	0.0000

Cointeq = LOGY_PERCAP - (0.1160*LOGPCI_GDP + 0.1452*LOGHCD + 0.0364*LOGGA_GDP + 2.7533*LOGPLN_DEPRE_TECH + 0.6926 *LOGY_CAP_0 + 0.1551*LOGTOO_GDP -0.1561*LOGTOT + 9.1557)

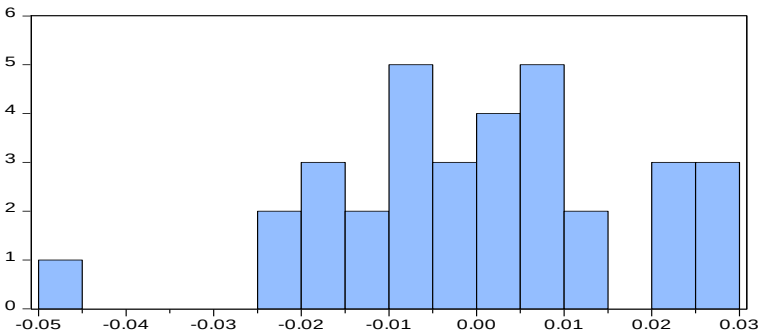
Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGPCI_GDP	0.115996	0.020047	5.786176	0.0001
LOGHCD	0.145221	0.036969	3.928163	0.0024
LOGGA_GDP	0.036360	0.018142	2.004173	0.0703
LOGPLN_DEPRE_TECH	2.753270	1.245242	2.211031	0.0491
LOGY_CAP_0	0.692628	0.069194	10.009934	0.0000
LOGTOO_GDP	0.155097	0.029623	5.235642	0.0003
LOGTOT	-0.156083	0.040834	-3.822380	0.0028
C	9.155683	3.690940	2.480583	0.0305

Appendix 13: ARDL Result of Growth-Public Expenditure by Functional Classification (Transfers Services), 1981-2015

(Residual Diagnostic)

Normality Test



Series: Residuals	
Sample 1983 2015	
Observations 33	
Mean	2.69e-15
Median	0.000391
Maximum	0.028809
Minimum	-0.047348
Std. Dev.	0.017175
Skewness	-0.329790
Kurtosis	3.213907
Jarque-Bera	0.661103
Probability	0.718527

Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.200287	Prob. F(2,14)	0.1476
Obs*R-squared	7.892088	Prob. Chi-Square(2)	0.0193

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.111812	Prob. F(16,16)	0.4174
Obs*R-squared	17.37361	Prob. Chi-Square(16)	0.3618
Scaled explained SS	4.520969	Prob. Chi-Square(16)	0.9977

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ14_TRANSFERS
Specification: LOGY_PERCAP LOGY_PERCAP(-1) LOGY_PERCAP(-2) LOGPCI_GDP LOGPCI_GDP(-1) LOGHCD LOGHCD(-1) LOGHCD(-2) LOGTS_GDP LOGPLN_DEPRE_TECH LOGY_CAP_0 LOGY_CAP_0(-1) LOGY_CAP_0(-2) LOGTOO_GDP LOGTOO_GDP(-1) LOGTOT LOGTOT(-1) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.497586	15	0.1550
F-statistic	2.242765	(1, 15)	0.1550

Bounds Test for Co-integration

ARDL Bounds Test
Date: 10/11/19 Time: 00:22
Sample: 1983 2015
Included observations: 33
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	8.951248	7

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.92	2.89
5%	2.17	3.21
2.5%	2.43	3.51
1%	2.73	3.9

Short-Run and Long-Run Model

ARDL Cointegrating And Long Run Form
Original dep. variable: LOGY_PERCAP
Selected Model: ARDL(2, 1, 2, 0, 0, 2, 1, 1)
Date: 10/11/19 Time: 00:23
Sample: 1981 2015
Included observations: 33

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGY_PERCAP(-1))	1.190960	0.102388	11.631822	0.0000
D(LOGPCI_GDP)	0.061490	0.008123	7.569528	0.0000
D(LOGHCD)	0.033950	0.078773	0.430986	0.6722
D(LOGHCD(-1))	-0.970289	0.094443	-10.273820	0.0000
D(LOGTS_GDP)	-0.000986	0.014738	-0.066905	0.9475
D(LOGPLN_DEPRE_T...	2.884374	0.766210	3.764470	0.0017
D(LOGY_CAP_0)	0.744251	0.059795	12.446727	0.0000
D(LOGY_CAP_0(-1))	-0.483490	0.069343	-6.972488	0.0000
D(LOGTOO_GDP)	0.038304	0.014336	2.671961	0.0167
D(LOGTOT)	0.000893	0.015432	0.057833	0.9546
CointEq(-1)	-0.971281	0.095719	-10.147263	0.0000

Cointeq = LOGY_PERCAP - (0.0813*LOGPCI_GDP + 0.1088*LOGHCD
-0.0042*LOGTS_GDP + 2.7686*LOGPLN_DEPRE_TECH + 0.7333
*LOGY_CAP_0 + 0.1429*LOGTOO_GDP -0.1420*LOGTOT + 9.0412)

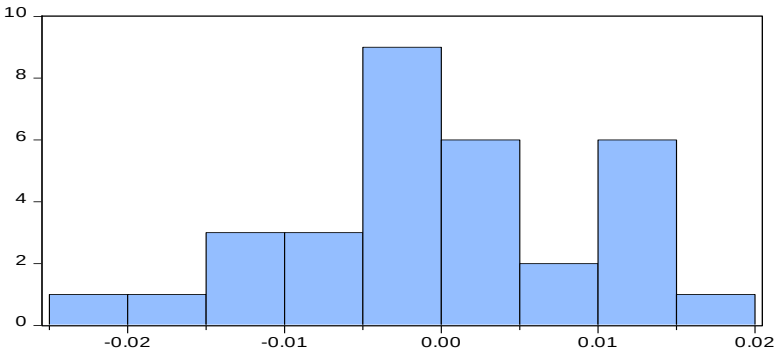
Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGPCI_GDP	0.081304	0.017170	4.735338	0.0002
LOGHCD	0.108806	0.045162	2.409242	0.0284
LOGTS_GDP	-0.004195	0.020069	-0.209004	0.8371
LOGPLN_DEPRE_TECH	2.768558	1.095058	2.528230	0.0224
LOGY_CAP_0	0.733269	0.063691	11.512895	0.0000
LOGTOO_GDP	0.142868	0.026680	5.354967	0.0001
LOGTOT	-0.142016	0.041029	-3.461361	0.0032
C	9.041184	3.409280	2.651934	0.0174

Appendix 14: ARDL Result of Growth-Public Expenditure by Functional Classification (Economic Services), 1981-2015

(Residual Diagnostic)

Normality Test



Series: Residuals	
Sample 1984 2015	
Observations 32	
Mean	9.99e-16
Median	-0.000546
Maximum	0.019870
Minimum	-0.022535
Std. Dev.	0.009800
Skewness	-0.156976
Kurtosis	2.617148
Jarque-Bera	0.326855
Probability	0.849228

Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 3 lags

F-statistic	3.805457	Prob. F(3,6)	0.0769
Obs*R-squared	20.97589	Prob. Chi-Square(3)	0.0001

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.529986	Prob. F(22,9)	0.8918
Obs*R-squared	18.05981	Prob. Chi-Square(22)	0.7024
Scaled explained SS	1.155096	Prob. Chi-Square(22)	1.0000

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ15 ES
Specification: LOGY PERCAP LOGY PERCAP(-1) LOGY PERCAP(-2) LOGY PERCAP(-3) LOGPCI GDP LOGHCD LOGHCD(-1) LOGHCD(-2) LOGES_GDP LOGES_GDP(-1) LOGES_GDP(-2) LOGPLN DEPRE TECH LOGPLN DEPRE TECH(-1) LOGPLN DEPRE TECH(-2) LOGY CAP 0 LOGY CAP 0(-1) LOGY_CAP_0(-2) LOGTOO GDP LOGTOO GDP(-1) LOGTOO GDP(-2) LOGTOT LOGTOT(-1) LOGTOT(-2) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.117141	8	0.2964
F-statistic	1.248003	(1, 8)	0.2964

Bounds Test for Co-integration

ARDL Bounds Test
Date: 10/11/19 Time: 00:41
Sample: 1984 2015
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	2.966733	7

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.92	2.89
5%	2.17	3.21
2.5%	2.43	3.51
1%	2.73	3.9

Short-Run and Long-Run Model

ARDL Cointegrating And Long Run Form
Original dep. variable: LOGY_PERCAP
Selected Model: ARDL(3, 0, 2, 2, 2, 2, 2, 2)
Date: 10/11/19 Time: 00:42
Sample: 1981 2015
Included observations: 32

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGY_PERCAP(-1))	1.439966	0.082064	17.546948	0.0000
D(LOGY_PERCAP(-2))	-0.191330	0.061951	-3.088430	0.0130
D(LOGPCI_GDP)	0.087839	0.007208	12.187015	0.0000
D(LOGHCD)	0.098273	0.052859	1.859162	0.0959
D(LOGHCD(-1))	-1.130370	0.071384	-15.835165	0.0000
D(LOGES_GDP)	0.042027	0.007345	5.721538	0.0003
D(LOGES_GDP(-1))	0.019013	0.006654	2.857561	0.0189
D(LOGPLN_DEPRE_T...	2.669608	0.585376	4.560504	0.0014
D(LOGPLN_DEPRE_T...	-5.035257	0.717380	-7.018957	0.0001
D(LOGY_CAP_0)	0.760172	0.047586	15.974678	0.0000
D(LOGY_CAP_0(-1))	-0.475864	0.046513	-10.230839	0.0000
D(LOGTOO_GDP)	0.046300	0.010200	4.539058	0.0014
D(LOGTOO_GDP(-1))	0.019476	0.009721	2.003385	0.0761
D(LOGTOT)	-0.027847	0.011657	-2.388889	0.0406
D(LOGTOT(-1))	0.022969	0.011616	1.977407	0.0794
CointEq(-1)	-0.836675	0.059447	-14.074350	0.0000

Cointeq = LOGY_PERCAP - (0.1083*LOGPCI_GDP + 0.1748*LOGHCD + 0.0170*LOGES_GDP + 4.6988*LOGPLN_DEPRE_TECH + 0.6321 *LOGY_CAP_0 + 0.1253*LOGTOO_GDP -0.2506*LOGTOT + 14.3339)

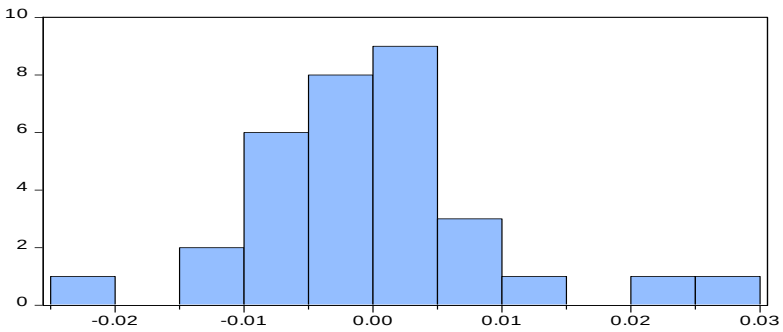
Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGPCI_GDP	0.108270	0.022905	4.726885	0.0011
LOGHCD	0.174829	0.041355	4.227534	0.0022
LOGES_GDP	0.016955	0.022601	0.750200	0.4723
LOGPLN_DEPRE_TECH	4.698752	1.662158	2.826899	0.0198
LOGY_CAP_0	0.632084	0.083160	7.600781	0.0000
LOGTOO_GDP	0.125264	0.036407	3.440651	0.0074
LOGTOT	-0.250613	0.065087	-3.850453	0.0039
C	14.333908	5.210228	2.751110	0.0224

Appendix 15: ARDL Result of Growth-Public Expenditure by Functional Classification (Social and Community Services), 1981-2015

(Residual Diagnostic)

Normality Test



Series: Residuals	
Sample 1984 2015	
Observations 32	
Mean	2.44e-15
Median	-0.000203
Maximum	0.025852
Minimum	-0.021006
Std. Dev.	0.009299
Skewness	0.603642
Kurtosis	4.427933
Jarque-Bera	4.662038
Probability	0.097197

Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.523853	Prob. F(2,6)	0.1602
Obs*R-squared	14.62083	Prob. Chi-Square(2)	0.0007

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.403825	Prob. F(23,8)	0.9576
Obs*R-squared	17.19202	Prob. Chi-Square(23)	0.7997
Scaled explained SS	1.841659	Prob. Chi-Square(23)	1.0000

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ16_SCS
Specification: LOGY_PERCAP LOGY_PERCAP(-1) LOGY_PERCAP(-2) LOGY_PERCAP(-3) LOGPCI_GDP LOGPCI_GDP(-1) LOGPCI_GDP(-2) LOGHCD LOGHCD(-1) LOGHCD(-2) LOGSCS_GDP LOGSCS_GDP(-1) LOGSCS_GDP(-2) LOGPLN_DEPRE_TECH LOGPLN_DEPRE_TECH(-1) LOGPLN_DEPRE_TECH(-2) LOGY_CAP_0 LOGY_CAP_0(-1) LOGY_CAP_0(-2) LOGTOO_GDP LOGTOO_GDP(-1) LOGTOO_GDP(-2) LOGTOT LOGTOT(-1) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.148696	7	0.8860
F-statistic	0.022111	(1, 7)	0.8860

Bounds Test for Co-integration

ARDL Bounds Test
Date: 10/11/19 Time: 00:57
Sample: 1984 2015
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	10.73573	7

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.92	2.89
5%	2.17	3.21
2.5%	2.43	3.51
1%	2.73	3.9

Short-Run and Long-Run Model

ARDL Cointegrating And Long Run Form
Original dep. variable: LOGY_PERCAP
Selected Model: ARDL(3, 2, 2, 2, 2, 2, 2, 1)
Date: 10/11/19 Time: 00:58
Sample: 1981 2015
Included observations: 32

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGY_PERCAP(-1))	0.961079	0.060805	15.805869	0.0000
D(LOGY_PERCAP(-2))	-0.390588	0.068928	-5.666620	0.0005
D(LOGPCI_GDP)	0.059814	0.005430	11.016111	0.0000
D(LOGPCI_GDP(-1))	-0.021153	0.007029	-3.009229	0.0168
D(LOGHCD)	-0.067789	0.056723	-1.195078	0.2663
D(LOGHCD(-1))	-1.107096	0.072899	-15.186707	0.0000
D(LOGSCS_GDP)	0.026359	0.009085	2.901407	0.0198
D(LOGSCS_GDP(-1))	-0.025993	0.007360	-3.531459	0.0077
D(LOGPLN_DEPRE_T...	1.051248	0.588202	1.787223	0.1117
D(LOGPLN_DEPRE_T...	-2.616080	0.771265	-3.391933	0.0095
D(LOGY_CAP_0)	0.580917	0.053571	10.843840	0.0000
D(LOGY_CAP_0(-1))	-0.521104	0.046964	-11.095769	0.0000
D(LOGTOO_GDP)	0.019647	0.010328	1.902193	0.0937
D(LOGTOO_GDP(-1))	-0.029059	0.009611	-3.023665	0.0165
D(LOGTOT)	0.022170	0.011980	1.850638	0.1014
CointEq(-1)	-0.651586	0.046873	-13.901190	0.0000

Cointeq = LOGY_PERCAP - (0.1580*LOGPCI_GDP + 0.1174*LOGHCD + 0.0904*LOGSCS_GDP + 3.7219*LOGPLN_DEPRE_TECH + 0.5300 *LOGY_CAP_0 + 0.2442*LOGTOO_GDP -0.1615*LOGTOT + 14.6510)

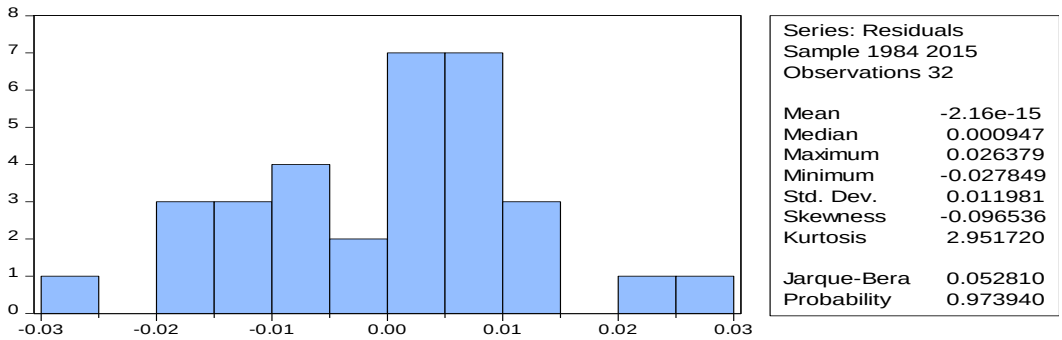
Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGPCI_GDP	0.158040	0.049572	3.188082	0.0128
LOGHCD	0.117443	0.075296	1.559747	0.1574
LOGSCS_GDP	0.090418	0.071372	1.266856	0.2408
LOGPLN_DEPRE_TECH	3.721875	1.747025	2.130407	0.0658
LOGY_CAP_0	0.529966	0.125554	4.221005	0.0029
LOGTOO_GDP	0.244214	0.079318	3.078947	0.0151
LOGTOT	-0.161518	0.064439	-2.506535	0.0366
C	14.651034	5.341894	2.742666	0.0253

Appendix 16: ARDL Result of Growth-Public Expenditure on Social Sector, 1981-2015

(Residual Diagnostic)

Normality Test



Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.963326	Prob. F(1,11)	0.1887
Obs*R-squared	4.846474	Prob. Chi-Square(1)	0.0277

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.732524	Prob. F(19,12)	0.7365
Obs*R-squared	17.18402	Prob. Chi-Square(19)	0.5774
Scaled explained SS	2.358168	Prob. Chi-Square(19)	1.0000

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ08_FUNCT
Specification: LOGY_PERCAP LOGY_PERCAP(-1) LOGY_PERCAP(-2) LOGY_PERCAP(-3) LOGPCI GDP LOGPCI GDP(-1) LOGHCD LOGHCD(-1) LOGHCD(-2) LOGSOC_GDP LOGPLN_DEPRE_TECH LOGPLN_DEPRE_TECH(-1) LOGPLN_DEPRE_TECH(-2) LOGY_CAP_0 LOGY_CAP_0(-1) LOGY_CAP_0(-2) LOGTOO_GDP LOGTOO_GDP(-1) LOGTOT LOGTOT(-1) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.529056	11	0.6073
F-statistic	0.279900	(1, 11)	0.6073

Bounds Test for Co-integration

ARDL Bounds Test
Date: 10/08/19 Time: 12:20
Sample: 1984 2015
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	11.65843	7

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.92	2.89
5%	2.17	3.21
2.5%	2.43	3.51
1%	2.73	3.9

Short-Run and Long-Run Model

ARDL Cointegrating And Long Run Form
Original dep. variable: LOGY_PERCAP
Selected Model: ARDL(3, 1, 2, 0, 2, 2, 1, 1)
Date: 10/08/19 Time: 12:21
Sample: 1981 2015
Included observations: 32

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGY_PERCAP(-1))	1.153191	0.073470	15.696015	0.0000
D(LOGY_PERCAP(-2))	-0.304050	0.066016	-4.605688	0.0006
D(LOGPCI_GDP)	0.068604	0.006540	10.489456	0.0000
D(LOGHCD)	0.033123	0.061024	0.542787	0.5972
D(LOGHCD(-1))	-1.047849	0.071194	-14.718155	0.0000
D(LOGSOC_GDP)	0.008758	0.008696	1.007100	0.3338
D(LOGPLN_DEPRE_T...	2.126958	0.656604	3.239331	0.0071
D(LOGPLN_DEPRE_T...	-2.978977	0.805503	-3.698284	0.0030
D(LOGY_CAP_0)	0.669722	0.053204	12.587702	0.0000
D(LOGY_CAP_0(-1))	-0.505477	0.051282	-9.856897	0.0000
D(LOGTOO_GDP)	0.039533	0.010535	3.752653	0.0028
D(LOGTOT)	0.003625	0.011865	0.305514	0.7652
CointEq(-1)	-0.724347	0.056112	-12.909021	0.0000

Cointeq = LOGY_PERCAP - (0.1108*LOGPCI_GDP + 0.1485*LOGHCD + 0.0085*LOGSOC_GDP + 3.7297*LOGPLN_DEPRE_TECH + 0.6412 *LOGY_CAP_0 + 0.1867*LOGTOO_GDP -0.1898*LOGTOT + 12.1961)

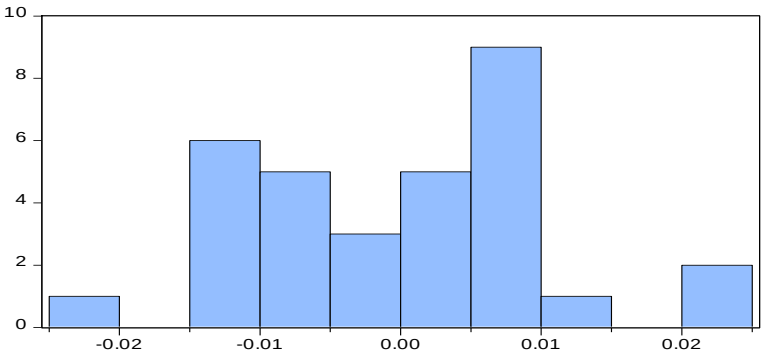
Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGPCI_GDP	0.110819	0.030371	3.648844	0.0033
LOGHCD	0.148485	0.044504	3.336431	0.0059
LOGSOC_GDP	0.008471	0.027376	0.309448	0.7623
LOGPLN_DEPRE_TECH	3.729688	1.518997	2.455363	0.0303
LOGY_CAP_0	0.641247	0.093967	6.824147	0.0000
LOGTOO_GDP	0.186729	0.046224	4.039650	0.0016
LOGTOT	-0.189798	0.055648	-3.410702	0.0052
C	12.196060	4.727848	2.579622	0.0241

Appendix 17: ARDL Result of Growth-Public Expenditure on Health Sector, 1981-2015

(Residual Diagnostic)

Normality Test



Series: Residuals	
Sample 1984 2015	
Observations 32	
Mean	8.66e-15
Median	0.001692
Maximum	0.024134
Minimum	-0.024292
Std. Dev.	0.010684
Skewness	0.082031
Kurtosis	2.878463
Jarque-Bera	0.055583
Probability	0.972591

Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	4.775933	Prob. F(1,9)	0.0567
Obs*R-squared	11.09397	Prob. Chi-Square(1)	0.0009

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.692289	Prob. F(21,10)	0.7713
Obs*R-squared	18.95904	Prob. Chi-Square(21)	0.5878
Scaled explained SS	1.738957	Prob. Chi-Square(21)	1.0000

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ11_HEALTH
Specification: LOGY PERCAP LOGY PERCAP(-1) LOGY PERCAP(-2) LOGY PERCAP(-3) LOGPCI GDP LOGPCI GDP(-1) LOGPCI GDP(-2) LOGHCD LOGHCD(-1) LOGHCD(-2) LOGHEL_GDP LOGPLN_DEPRE_TECH LOGPLN_DEPRE_TECH(-1) LOGPLN_DEPRE_TECH(-2) LOGY_CAP_0 LOGY_CAP_0(-1) LOGY_CAP_0(-2) LOGTOO GDP LOGTOO GDP(-1) LOGTOO GDP(-2) LOGTOT LOGTOT(-1) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.179362	9	0.8616
F-statistic	0.032171	(1, 9)	0.8616

Bounds Test for Co-integration

ARDL Bounds Test
Date: 10/10/19 Time: 23:33
Sample: 1984 2015
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	8.678662	7

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.92	2.89
5%	2.17	3.21
2.5%	2.43	3.51
1%	2.73	3.9

Short-Run and Long-Run Model

ARDL Cointegrating And Long Run Form
Original dep. variable: LOGY_PERCAP
Selected Model: ARDL(3, 2, 2, 0, 2, 2, 2, 1)
Date: 10/10/19 Time: 23:35
Sample: 1981 2015
Included observations: 32

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGY_PERCAP(-1))	1.106917	0.071220	15.542222	0.0000
D(LOGY_PERCAP(-2))	-0.278197	0.065962	-4.217517	0.0018
D(LOGPCI_GDP)	0.068758	0.006319	10.880788	0.0000
D(LOGPCI_GDP(-1))	-0.012864	0.007184	-1.790684	0.1036
D(LOGHCD)	0.013982	0.058458	0.239190	0.8158
D(LOGHCD(-1))	-1.083752	0.078520	-13.802192	0.0000
D(LOGHEL_GDP)	0.018153	0.006028	3.011510	0.0131
D(LOGPLN_DEPRE_T...	1.820970	0.624405	2.916329	0.0154
D(LOGPLN_DEPRE_T...	-3.370293	0.747174	-4.510719	0.0011
D(LOGY_CAP_0)	0.619427	0.055316	11.198062	0.0000
D(LOGY_CAP_0(-1))	-0.534155	0.051769	-10.318089	0.0000
D(LOGTOO_GDP)	0.039078	0.010521	3.714143	0.0040
D(LOGTOO_GDP(-1))	-0.015444	0.010149	-1.521656	0.1591
D(LOGTOT)	0.012452	0.012971	0.959985	0.3597
CointEq(-1)	-0.762707	0.060655	-12.574553	0.0000

Cointeq = LOGY_PERCAP - (0.1283*LOGPCI_GDP + 0.1360*LOGHCD + 0.0233*LOGHEL_GDP + 3.9981*LOGPLN_DEPRE_TECH + 0.5966 *LOGY_CAP_0 + 0.1934*LOGTOO_GDP -0.1565*LOGTOT + 13.7984)

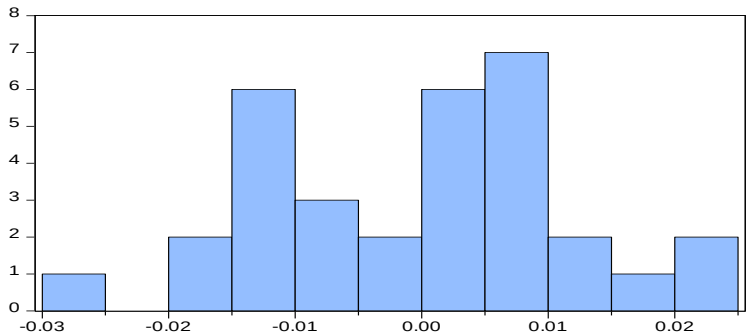
Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGPCI_GDP	0.128350	0.027415	4.681775	0.0009
LOGHCD	0.136008	0.046833	2.904103	0.0157
LOGHEL_GDP	0.023331	0.017740	1.315150	0.2178
LOGPLN_DEPRE_TECH	3.998100	1.448710	2.759766	0.0201
LOGY_CAP_0	0.596562	0.089878	6.637499	0.0001
LOGTOO_GDP	0.193423	0.038093	5.077691	0.0005
LOGTOT	-0.156474	0.051674	-3.028105	0.0127
C	13.798362	4.526879	3.048096	0.0123

Appendix 18: ARDL Result of Growth-Public Expenditure on Education Sector, 1981-2015

(Residual Diagnostic)

Normality Test



Series: Residuals
Sample 1984 2015
Observations 32

Mean	-1.04e-14
Median	0.002269
Maximum	0.023148
Minimum	-0.028157
Std. Dev.	0.011656
Skewness	-0.187345
Kurtosis	2.778583
Jarque-Bera	0.252558
Probability	0.881369

Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.770087	Prob. F(1,11)	0.0782
Obs*R-squared	8.168048	Prob. Chi-Square(1)	0.0043

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.993484	Prob. F(19,12)	0.5207
Obs*R-squared	19.56324	Prob. Chi-Square(19)	0.4213
Scaled explained SS	2.446513	Prob. Chi-Square(19)	1.0000

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ09 EDU
Specification: LOGY PERCAP LOGY PERCAP(-1) LOGY PERCAP(-2) LOGY_PERCAP(-3) LOGPCI_GDP LOGPCI_GDP(-1) LOGHCD LOGHCD(-1) LOGHCD(-2) LOGEDU_GDP LOGPLN_DEPRE_TECH LOGPLN_DEPRE_TECH(-1) LOGPLN_DEPRE_TECH(-2) LOGY_CAP_0 LOGY_CAP_0(-1) LOGY_CAP_0(-2) LOGTOO_GDP LOGTOO_GDP(-1) LOGTOT LOGTOT(-1) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.293936	11	0.7743
F-statistic	0.086398	(1, 11)	0.7743

Bounds Test for Co-integration

ARDL Bounds Test
Date: 10/08/19 Time: 13:47
Sample: 1984 2015
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	11.59902	7

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.92	2.89
5%	2.17	3.21
2.5%	2.43	3.51
1%	2.73	3.9

Short-Run and Long-Run Model

ARDL Cointegrating And Long Run Form
Original dep. variable: LOGY_PERCAP
Selected Model: ARDL(3, 1, 2, 0, 2, 2, 1, 1)
Date: 10/08/19 Time: 13:37
Sample: 1981 2015
Included observations: 32

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGY_PERCAP(-1))	1.133597	0.072511	15.633383	0.0000
D(LOGY_PERCAP(-2))	-0.272806	0.066906	-4.077471	0.0015
D(LOGPCI_GDP)	0.066989	0.006007	11.151108	0.0000
D(LOGHCD)	0.039327	0.056025	0.701945	0.4961
D(LOGHCD(-1))	-1.046215	0.069002	-15.162170	0.0000
D(LOGEDU_GDP)	0.012587	0.006095	2.065159	0.0612
D(LOGPLN_DEPRE_T...	2.307872	0.622415	3.707932	0.0030
D(LOGPLN_DEPRE_T...	-3.288022	0.820705	-4.006336	0.0017
D(LOGY_CAP_0)	0.637976	0.050985	12.513034	0.0000
D(LOGY_CAP_0(-1))	-0.505191	0.050086	-10.086523	0.0000
D(LOGTOO_GDP)	0.039274	0.010504	3.739103	0.0028
D(LOGTOT)	0.002012	0.011583	0.173720	0.8650
CointEq(-1)	-0.698366	0.052499	-13.302525	0.0000

Cointeq = LOGY_PERCAP - (0.1174*LOGPCI_GDP + 0.1452*LOGHCD + 0.0164*LOGEDU_GDP + 3.7123*LOGPLN_DEPRE_TECH + 0.6336 *LOGY_CAP_0 + 0.1887*LOGTOO_GDP -0.1919*LOGTOT + 12.3746)

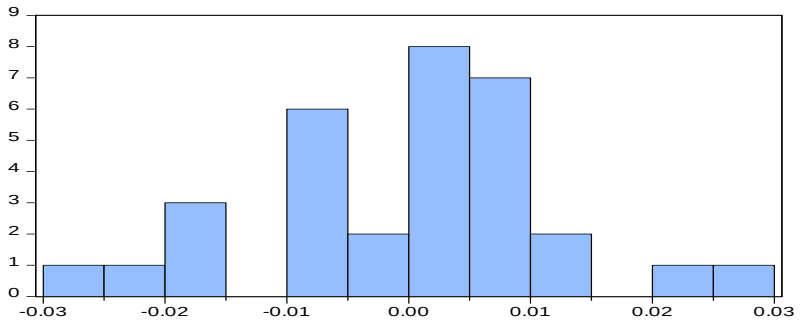
Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGPCI_GDP	0.117423	0.028650	4.098501	0.0015
LOGHCD	0.145240	0.043815	3.314844	0.0062
LOGEDU_GDP	0.016386	0.019665	0.833275	0.4210
LOGPLN_DEPRE_TECH	3.712320	1.524318	2.435397	0.0314
LOGY_CAP_0	0.633576	0.090176	7.025966	0.0000
LOGTOO_GDP	0.188691	0.040884	4.615233	0.0006
LOGTOT	-0.191935	0.052935	-3.625828	0.0035
C	12.374580	4.654903	2.658397	0.0209

Appendix 19: ARDL Result of Growth-Public Expenditure on Transport and Communication Sector, 1981-2015

(Residual Diagnostic)

Normality Test



Series: Residuals	
Sample 1984 2015	
Observations 32	
Mean	-5.11e-15
Median	0.002307
Maximum	0.025746
Minimum	-0.026621
Std. Dev.	0.012261
Skewness	-0.227268
Kurtosis	3.083641
Jarque-Bera	0.284797
Probability	0.867275

Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.998891	Prob. F(1,12)	0.1828
Obs*R-squared	4.569256	Prob. Chi-Square(1)	0.0326

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.536204	Prob. F(18,13)	0.8906
Obs*R-squared	13.63491	Prob. Chi-Square(18)	0.7526
Scaled explained SS	2.344401	Prob. Chi-Square(18)	1.0000

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: UNTITLED
Specification: LOGY_PERCAP LOGY_PERCAP(-1) LOGY_PERCAP(-2) LOGY_PERCAP(-3) LOGPCI_GDP LOGHCD LOGHCD(-1) LOGHCD(-2) LOGTRC_GDP LOGPLN_DEPRE_TECH LOGPLN_DEPRE_TECH(-1) LOGPLN_DEPRE_TECH(-2) LOGY_CAP_0 LOGY_CAP_0(-1) LOGY_CAP_0(-2) LOGTOO_GDP LOGTOO_GDP(-1) LOGTOT LOGTOT(-1) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.086849	12	0.2985
F-statistic	1.181241	(1, 12)	0.2985

Bounds Test for Co-integration

ARDL Bounds Test
Date: 10/08/19 Time: 13:30
Sample: 1984 2015
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	2.811254	7

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.92	2.89
5%	2.17	3.21
2.5%	2.43	3.51
1%	2.73	3.9

Short-Run and Long-Run Model

ARDL Cointegrating And Long Run Form
Original dep. variable: LOGY_PERCAP
Selected Model: ARDL(3, 0, 2, 0, 2, 2, 1, 1)
Date: 10/08/19 Time: 13:31
Sample: 1981 2015
Included observations: 32

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGY_PERCAP(-1))	1.205771	0.077423	15.573893	0.0000
D(LOGY_PERCAP(-2))	-0.336720	0.061722	-5.455433	0.0001
D(LOGPCI_GDP)	0.064937	0.006904	9.406105	0.0000
D(LOGHCD)	0.040370	0.059269	0.681121	0.5077
D(LOGHCD(-1))	-1.098270	0.073803	-14.881157	0.0000
D(LOGTRC_GDP)	0.003182	0.004937	0.644471	0.5305
D(LOGPLN_DEPRE_T...	2.181648	0.645227	3.381210	0.0049
D(LOGPLN_DEPRE_T...	-2.816967	0.756841	-3.722004	0.0026
D(LOGY_CAP_0)	0.722061	0.050040	14.429546	0.0000
D(LOGY_CAP_0(-1))	-0.510911	0.054193	-9.427567	0.0000
D(LOGTOO_GDP)	0.039545	0.010357	3.818002	0.0021
D(LOGTOT)	-0.004289	0.012108	-0.354214	0.7289
CointEq(-1)	-0.714342	0.056480	-12.647662	0.0000

Cointeq = LOGY_PERCAP - (0.0982*LOGPCI_GDP + 0.1333*LOGHCD + 0.0086*LOGTRC_GDP + 3.5490*LOGPLN_DEPRE_TECH + 0.6697 *LOGY_CAP_0 + 0.1882*LOGTOO_GDP -0.2160*LOGTOT + 11.6377)

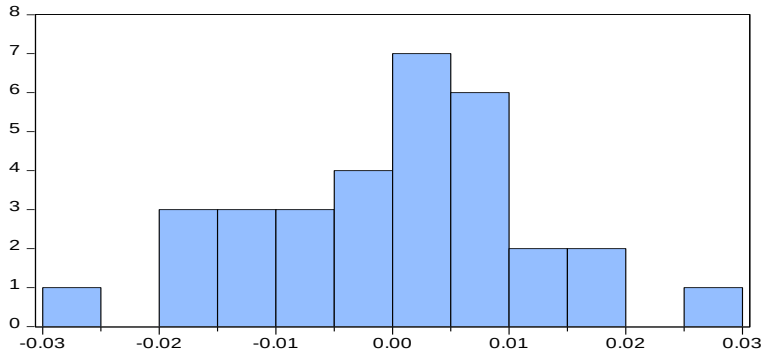
Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGPCI_GDP	0.098177	0.020677	4.748067	0.0004
LOGHCD	0.133337	0.040914	3.258958	0.0062
LOGTRC_GDP	0.008600	0.011424	0.752868	0.4649
LOGPLN_DEPRE_TECH	3.548988	1.509917	2.350453	0.0352
LOGY_CAP_0	0.669713	0.081623	8.205010	0.0000
LOGTOO_GDP	0.188186	0.040463	4.650797	0.0005
LOGTOT	-0.216036	0.056014	-3.856839	0.0020
C	11.637675	4.584809	2.538312	0.0247

Appendix 20: ARDL Result of Growth-Public Expenditure on Agriculture Sector, 1981-2015

(Residual Diagnostic)

Normality Test



Series: Residuals	
Sample 1984 2015	
Observations 32	
Mean	-1.19e-14
Median	0.003249
Maximum	0.028218
Minimum	-0.027017
Std. Dev.	0.011990
Skewness	-0.053166
Kurtosis	2.904355
Jarque-Bera	0.027273
Probability	0.986456

Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.503811	Prob. F(1,11)	0.2457
Obs*R-squared	3.848583	Prob. Chi-Square(1)	0.0498

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.726344	Prob. F(19,12)	0.7418
Obs*R-squared	17.11659	Prob. Chi-Square(19)	0.5820
Scaled explained SS	2.291912	Prob. Chi-Square(19)	1.0000

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ10_AGR
Specification: LOGY_PERCAP LOGY_PERCAP(-1) LOGY_PERCAP(-2) LOGY_PERCAP(-3) LOGPCI_GDP LOGPCI_GDP(-1) LOGHCD LOGHCD(-1) LOGHCD(-2) LOGAGR_GDP LOGPLN_DEPRE_TECH LOGPLN_DEPRE_TECH(-1) LOGPLN_DEPRE_TECH(-2) LOGY_CAP_0 LOGY_CAP_0(-1) LOGY_CAP_0(-2) LOGTOO_GDP LOGTOO_GDP(-1) LOGTOT LOGTOT(-1) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.414630	11	0.6864
F-statistic	0.171918	(1, 11)	0.6864

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	6.86E-05	1	6.86E-05
Restricted SSR	0.004456	12	0.000371
Unrestricted SSR	0.004388	11	0.000399

Bounds Test for Co-integration

ARDL Bounds Test
Date: 10/10/19 Time: 23:22
Sample: 1984 2015
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	11.96566	7

Short-Run and Long-Run Model

ARDL Cointegrating And Long Run Form
Original dep. variable: LOGY_PERCAP
Selected Model: ARDL(3, 1, 2, 0, 2, 2, 1, 1)
Date: 10/10/19 Time: 23:22
Sample: 1981 2015
Included observations: 32

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGY_PERCAP(-1))	1.142583	0.072320	15.798881	0.0000
D(LOGY_PERCAP(-2))	-0.301885	0.063694	-4.739649	0.0005
D(LOGPCI_GDP)	0.063701	0.007309	8.715195	0.0000
D(LOGHCD)	0.060447	0.063193	0.956546	0.3577
D(LOGHCD(-1))	-1.018917	0.072012	-14.149298	0.0000
D(LOGAGR_GDP)	-0.001207	0.007050	-0.171157	0.8670
D(LOGPLN_DEPRE_T...	2.283114	0.688829	3.314486	0.0062
D(LOGPLN_DEPRE_T...	-2.566812	0.739967	-3.468821	0.0046
D(LOGY_CAP_0)	0.696691	0.051068	13.642474	0.0000
D(LOGY_CAP_0(-1))	-0.488964	0.049987	-9.781797	0.0000
D(LOGTOO_GDP)	0.034773	0.010291	3.378972	0.0055
D(LOGTOT)	0.006185	0.011834	0.522621	0.6108
CointEq(-1)	-0.736096	0.057393	-12.825496	0.0000

Cointeq = LOGY_PERCAP - (0.0985*LOGPCI_GDP + 0.1500*LOGHCD
-0.0070*LOGAGR_GDP + 3.4084*LOGPLN_DEPRE_TECH + 0.6668
*LOGY_CAP_0 + 0.1697*LOGTOO_GDP -0.1752*LOGTOT + 10.8923)

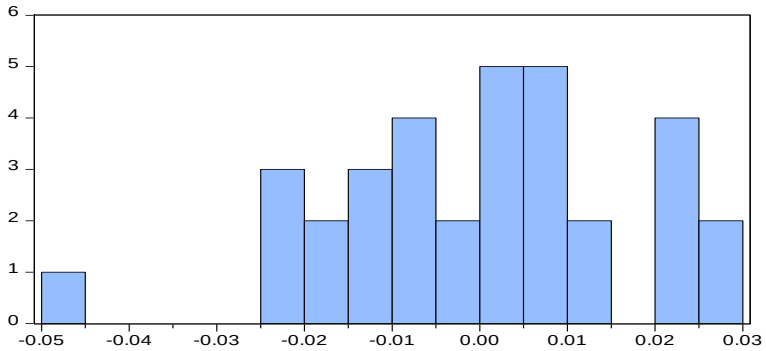
Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGPCI_GDP	0.098485	0.031717	3.105135	0.0091
LOGHCD	0.149952	0.043281	3.464576	0.0047
LOGAGR_GDP	-0.007008	0.024542	-0.285547	0.7801
LOGPLN_DEPRE_TECH	3.408398	1.781504	1.913214	0.0799
LOGY_CAP_0	0.666754	0.096097	6.938334	0.0000
LOGTOO_GDP	0.169729	0.048625	3.490570	0.0045
LOGTOT	-0.175180	0.057023	-3.072094	0.0097
C	10.892348	5.515063	1.975018	0.0717

Appendix 21: ARDL Result of Growth-Public Expenditure on Other Social and Community Services Sector, 1981-2015

(Residual Diagnostic)

Normality Test



Series: Residuals	
Sample 1983 2015	
Observations 33	
Mean	1.72e-15
Median	0.000460
Maximum	0.028430
Minimum	-0.048375
Std. Dev.	0.017180
Skewness	-0.418569
Kurtosis	3.312928
Jarque-Bera	1.098245
Probability	0.577456

Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.139534	Prob. F(2,14)	0.1546
Obs*R-squared	7.725190	Prob. Chi-Square(2)	0.0210

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.211856	Prob. F(16,16)	0.3527
Obs*R-squared	18.08040	Prob. Chi-Square(16)	0.3192
Scaled explained SS	4.915324	Prob. Chi-Square(16)	0.9962

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: UNTITLED
Specification: LOGY_PERCAP LOGY_PERCAP(-1) LOGY_PERCAP(-2) LOGPCI_GDP LOGPCI_GDP(-1) LOGHCD LOGHCD(-1) LOGHCD(-2) LOGOSC GDP LOGPLN DEPRE TECH LOGY CAP 0 LOGY CAP 0(-1) LOGY CAP 0(-2) LOGTOO GDP LOGTOO GDP(-1) LOGTOT LOGTOT(-1) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.417307	15	0.1768
F-statistic	2.008758	(1, 15)	0.1768

F-test summary:

Bounds Test for Co-integration

ARDL Bounds Test
Date: 10/10/19 Time: 23:43
Sample: 1983 2015
Included observations: 33
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	9.860084	7

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.92	2.89
5%	2.17	3.21
2.5%	2.43	3.51
1%	2.73	3.9

Short-Run and Long-Run Model

ARDL Cointegrating And Long Run Form
Original dep. variable: LOGY_PERCAP
Selected Model: ARDL(2, 1, 2, 0, 0, 2, 1, 1)
Date: 10/10/19 Time: 23:45
Sample: 1981 2015
Included observations: 33

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGY_PERCAP(-1))	1.206293	0.098815	12.207537	0.0000
D(LOGPCI_GDP)	0.061265	0.008090	7.573368	0.0000
D(LOGHCD)	0.048193	0.072222	0.667288	0.5141
D(LOGHCD(-1))	-0.996868	0.098334	-10.137548	0.0000
D(LOGOSC_GDP)	-0.005532	0.005992	-0.923223	0.3696
D(LOGPLN_DEPRE_T...	3.051626	0.773196	3.946769	0.0012
D(LOGY_CAP_0)	0.769134	0.064577	11.910386	0.0000
D(LOGY_CAP_0(-1))	-0.498884	0.070797	-7.046729	0.0000
D(LOGTOO_GDP)	0.035367	0.013675	2.586244	0.0199
D(LOGTOT)	-0.000809	0.015392	-0.052572	0.9587
CointEq(-1)	-0.997518	0.093944	-10.618256	0.0000

Cointeq = LOGY_PERCAP - (0.0806*LOGPCI_GDP + 0.1157*LOGHCD
-0.0017*LOGOSC_GDP + 2.8924*LOGPLN_DEPRE_TECH + 0.7364
*LOGY_CAP_0 + 0.1394*LOGTOO_GDP -0.1415*LOGTOT + 9.2017)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGPCI_GDP	0.080576	0.018109	4.449494	0.0004
LOGHCD	0.115677	0.033446	3.458596	0.0032
LOGOSC_GDP	-0.001739	0.009355	-0.185941	0.8548
LOGPLN_DEPRE_TECH	2.892370	1.163249	2.486458	0.0243
LOGY_CAP_0	0.736396	0.064374	11.439322	0.0000
LOGTOO_GDP	0.139412	0.028408	4.907490	0.0002
LOGTOT	-0.141529	0.040726	-3.475160	0.0031
C	9.201745	3.507401	2.623523	0.0184

Appendix 22: ARDL Result of Growth-Public Expenditure with Dummy_1, 1981-2015

Dependent Variable: LOGESP_GDP
Method: Least Squares
Date: 10/11/19 Time: 01:56
Sample: 1981 2015
Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.462743	0.045910	-53.64333	0.0000

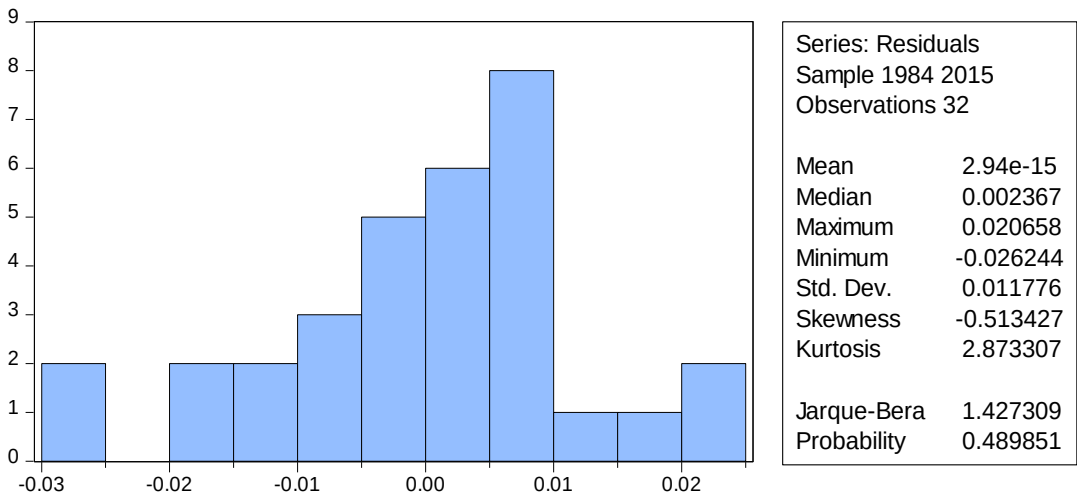
R-squared	0.000000	Mean dependent var	-2.462743
Adjusted R-squared	0.000000	S.D. dependent var	0.271605
S.E. of regression	0.271605	Akaike info criterion	0.259218
Sum squared resid	2.508151	Schwarz criterion	0.303656
Log likelihood	-3.536310	Hannan-Quinn criter.	0.274558
Durbin-Watson stat	0.615144		

Chow Breakpoint Test: 2000
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1981 2015

F-statistic	4.629168	Prob. F(1,33)	0.0388
Log likelihood ratio	4.594518	Prob. Chi-Square(1)	0.0321
Wald Statistic	4.629168	Prob. Chi-Square(1)	0.0314

(Residual Diagnostic)

Normality Test



Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.967391	Prob. F(2,10)	0.1903
Obs*R-squared	9.035882	Prob. Chi-Square(2)	0.0109

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.356163	Prob. F(19,12)	0.9784
Obs*R-squared	11.53865	Prob. Chi-Square(19)	0.9044
Scaled explained SS	1.519835	Prob. Chi-Square(19)	1.0000

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ07_ESP_DUMMY_1
Specification: LOGY PERCAP LOGY PERCAP(-1) LOGY PERCAP(-2) LOGY_PERCAP(-3) LOGPCI_GDP LOGHCD LOGHCD(-1) LOGHCD(-2) LOGESP_GDP LOGPLN_DEPRE_TECH LOGPLN_DEPRE_TECH(-1) LOGPLN DEPRE TECH(-2) LOGY CAP 0 LOGY CAP 0(-1) LOGY_CAP_0(-2) LOGTOO_GDP LOGTOO_GDP(-1) LOGTOT LOGTOT(-1) DUMMY_1 C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.377511	11	0.7130
F-statistic	0.142514	(1, 11)	0.7130

Bounds Test for Co-integration

ARDL Bounds Test
Date: 10/11/19 Time: 01:41
Sample: 1984 2015
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	2.935045	7

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.92	2.89
5%	2.17	3.21
2.5%	2.43	3.51
1%	2.73	3.9

Short-Run and Long-Run Model

ARDL Cointegrating And Long Run Form
Original dep. variable: LOGY_PERCAP
Selected Model: ARDL(3, 0, 2, 0, 2, 2, 1, 1)
Date: 10/11/19 Time: 01:43
Sample: 1981 2015
Included observations: 32

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGY_PERCAP(-1))	1.183011	0.064764	18.266544	0.0000
D(LOGY_PERCAP(-2))	-0.377694	0.054307	-6.954859	0.0000
D(LOGPCI_GDP)	0.089938	0.008010	11.227871	0.0000
D(LOGHCD)	0.152782	0.049394	3.093132	0.0093
D(LOGHCD(-1))	-1.084607	0.064369	-16.849899	0.0000
D(LOGESP_GDP)	0.026426	0.014781	1.787908	0.0990
D(LOGPLN_DEPRE_T...	2.303356	0.563631	4.086638	0.0015
D(LOGPLN_DEPRE_T...	-3.738131	0.652915	-5.725295	0.0001
D(LOGY_CAP_0)	0.711255	0.042941	16.563434	0.0000
D(LOGY_CAP_0(-1))	-0.519939	0.045197	-11.503861	0.0000
D(LOGTOO_GDP)	0.034500	0.008981	3.841377	0.0023
D(LOGTOT)	0.015066	0.010776	1.398118	0.1874
D(DUMMY_1)	0.082838	0.020783	3.985826	0.0018
CointEq(-1)	-0.692957	0.047947	-14.452641	0.0000

Cointeq = LOGY_PERCAP - (0.1185*LOGPCI_GDP + 0.2620*LOGHCD + 0.0416*LOGESP_GDP + 4.5783*LOGPLN_DEPRE_TECH + 0.6638 *LOGY_CAP_0 + 0.1610*LOGTOO_GDP -0.1746*LOGTOT + 0.0500 *DUMMY_1 + 12.2018)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGPCI_GDP	0.118462	0.030524	3.881015	0.0022
LOGHCD	0.262000	0.115382	2.270711	0.0424
LOGESP_GDP	0.041618	0.043403	0.958864	0.3565
LOGPLN_DEPRE_TECH	4.578276	1.854569	2.468646	0.0296
LOGY_CAP_0	0.663776	0.085047	7.804859	0.0000
LOGTOO_GDP	0.161005	0.040529	3.972546	0.0019
LOGTOT	-0.174610	0.054236	-3.219472	0.0074
DUMMY_1	0.049994	0.044881	1.113916	0.2871
C	12.201825	4.771778	2.557081	0.0251

Appendix 23: ARDL Result of Growth-Public Expenditure by Economic Classification (Rec and Cap) With Dummy_1, 1981-2015

Dependent Variable: LOGESP_GDP
Method: Least Squares
Date: 10/11/19 Time: 01:56
Sample: 1981 2015
Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.462743	0.045910	-53.64333	0.0000

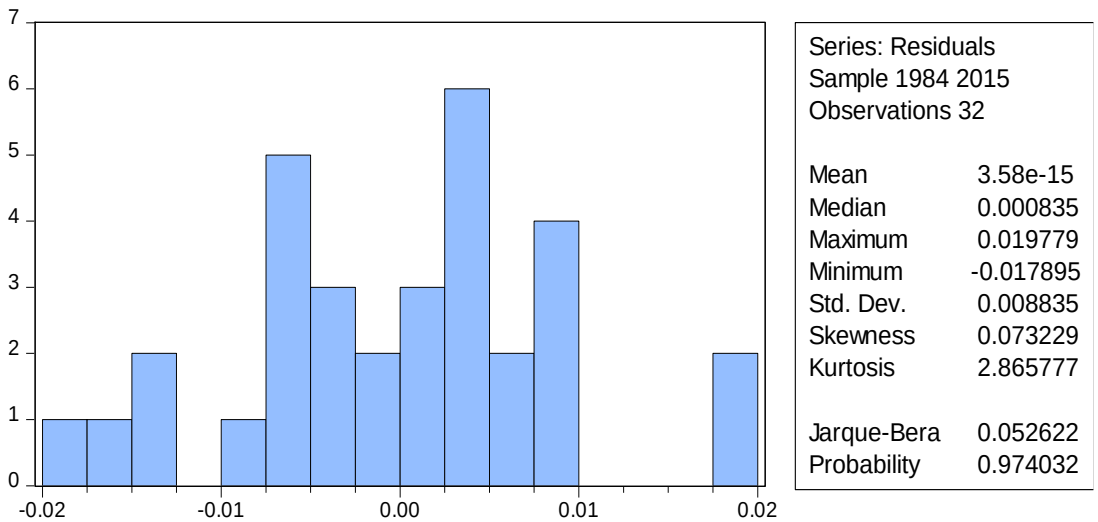
R-squared	0.000000	Mean dependent var	-2.462743
Adjusted R-squared	0.000000	S.D. dependent var	0.271605
S.E. of regression	0.271605	Akaike info criterion	0.259218
Sum squared resid	2.508151	Schwarz criterion	0.303656
Log likelihood	-3.536310	Hannan-Quinn criter.	0.274558
Durbin-Watson stat	0.615144		

Chow Breakpoint Test: 2000
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1981 2015

F-statistic	4.629168	Prob. F(1,33)	0.0388
Log likelihood ratio	4.594518	Prob. Chi-Square(1)	0.0321
Wald Statistic	4.629168	Prob. Chi-Square(1)	0.0314

(Residual Diagnostic)

Normality Test



Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.724955	Prob. F(2,7)	0.2460
Obs*R-squared	10.56441	Prob. Chi-Square(2)	0.0051

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.885952	Prob. F(22,9)	0.6154
Obs*R-squared	21.89152	Prob. Chi-Square(22)	0.4664
Scaled explained SS	1.615440	Prob. Chi-Square(22)	1.0000

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ17_D_D
Specification: LOGY_PERCAP LOGY_PERCAP(-1) LOGY_PERCAP(-2) LOGY_PERCAP(-3) LOGPCI_GDP LOGHCD LOGHCD(-1) LOGHCD(-2) LOGCAP GDP LOGREC GDP LOGPLN DEPRE TECH LOGPLN DEPRE TECH(-1) LOGPLN DEPRE TECH(-2) LOGY CAP 0 LOGY CAP 0(-1) LOGY CAP 0(-2) LOGTOO GDP LOGTOO_GDP(-1) LOGTOO_GDP(-2) LOGTOT LOGTOT(-1) LOGTOT(-2) DUMMY_1 C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.296736	8	0.7742
F-statistic	0.088052	(1, 8)	0.7742

Bounds Test for Co-integration

ARDL Bounds Test
Date: 10/11/19 Time: 01:49
Sample: 1984 2015
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	2.209491	8

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.85	2.85
5%	2.11	3.15
2.5%	2.33	3.42
1%	2.62	3.77

Short-Run and Long-Run Model

ARDL Cointegrating And Long Run Form
Original dep. variable: LOGY_PERCAP
Selected Model: ARDL(3, 0, 2, 0, 0, 2, 2, 2, 2)
Date: 10/11/19 Time: 01:50
Sample: 1981 2015
Included observations: 32

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGY_PERCAP(-1))	1.206889	0.064335	18.759489	0.0000
D(LOGY_PERCAP(-2))	-0.312702	0.057330	-5.454412	0.0004
D(LOGPCI_GDP)	0.071554	0.008318	8.602081	0.0000
D(LOGHCD)	0.243279	0.047941	5.074516	0.0007
D(LOGHCD(-1))	-0.980493	0.058328	-16.809885	0.0000
D(LOGCAP_GDP)	-0.033894	0.012351	-2.744235	0.0227
D(LOGREC_GDP)	0.044761	0.009769	4.581951	0.0013
D(LOGPLN_DEPRE_T...	2.210186	0.541489	4.081681	0.0028
D(LOGPLN_DEPRE_T...	-3.165913	0.617729	-5.125085	0.0006
D(LOGY_CAP_0)	0.737847	0.043069	17.131552	0.0000
D(LOGY_CAP_0(-1))	-0.512793	0.044719	-11.467109	0.0000
D(LOGTOO_GDP)	0.023809	0.008864	2.686113	0.0250
D(LOGTOO_GDP(-1))	0.015828	0.009713	1.629470	0.1377
D(LOGTOT)	0.029825	0.010410	2.864898	0.0186
D(LOGTOT(-1))	-0.021577	0.010797	-1.998319	0.0768
D(DUMMY_1)	0.100019	0.021071	4.746832	0.0010
CointEq(-1)	-0.764895	0.050600	-15.116345	0.0000

Cointeq = LOGY_PERCAP - (0.0910*LOGPCI_GDP + 0.3184*LOGHCD
-0.0392*LOGCAP_GDP + 0.0581*LOGREC_GDP + 2.0521
*LOGPLN_DEPRE_TECH + 0.7841*LOGY_CAP_0 + 0.1100
*LOGTOO_GDP -0.0576*LOGTOT + 0.1107*DUMMY_1 + 2.9449)

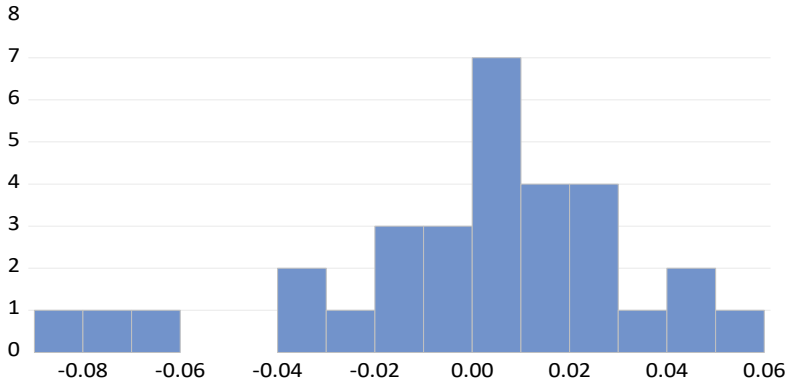
Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGPCI_GDP	0.091008	0.028581	3.184223	0.0111
LOGHCD	0.318401	0.119550	2.663320	0.0259
LOGCAP_GDP	-0.039163	0.027737	-1.411952	0.1916
LOGREC_GDP	0.058150	0.025849	2.249582	0.0510
LOGPLN_DEPRE_TECH	2.052102	1.705918	1.202931	0.2597
LOGY_CAP_0	0.784090	0.072927	10.751652	0.0000
LOGTOO_GDP	0.109977	0.037837	2.906598	0.0174
LOGTOT	-0.057598	0.062218	-0.925750	0.3787
DUMMY_1	0.110733	0.046829	2.364660	0.0423
C	2.944886	4.869808	0.604723	0.5603

Appendix 24: ARDL Result of Growth-Poverty, 1981-2015

(Residual Diagnostic)

Normality Test



Series: Residuals	
Sample 1985 2015	
Observations 31	
Mean	0.000000
Median	0.005654
Maximum	0.056823
Minimum	-0.087209
Std. Dev.	0.033416
Skewness	-0.865476
Kurtosis	3.641895
Jarque-Bera	4.402292
Probability	0.110676

Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	2.315352	Prob. F(2,15)	0.1329
Obs*R-squared	7.312617	Prob. Chi-Square(2)	0.0258

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.783014	Prob. F(13,17)	0.6683
Obs*R-squared	11.61016	Prob. Chi-Square(13)	0.5598
Scaled explained SS	4.612094	Prob. Chi-Square(13)	0.9828

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ01_BEST_PHD
Omitted Variables: Squares of fitted values
Specification: LOGPOVT POP LOGPOVT POP(-1) LOGPOVT POP(-2) LOGPOVT POP(-3) LOGPOVT POP(-4) LOGY PERCAP LOGGINI COEFF LOGUMP LOGINF LOGLTR LOGLTR(-1) LOGODA_GDP LOGPLN RATE LOGPLN RATE(-1) C

	Value	df	Probability
t-statistic	0.586910	16	0.5655
F-statistic	0.344463	(1, 16)	0.5655
Likelihood ratio	0.660315	1	0.4164

Bounds Test for Co-integration

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	15.94810	10%	1.92	2.89
k	7	5%	2.17	3.21
		2.5%	2.43	3.51
		1%	2.73	3.9
Actual Sample Size	31		Finite Sample: n=35	

Short-Run and Long-Run Model

ARDL Error Correction Regression
Dependent Variable: D(LOGPOVT_POP)
Selected Model: ARDL(4, 0, 0, 0, 0, 1, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 04/06/20 Time: 13:49
Sample: 1981 2015
Included observations: 31

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGPOVT_POP(-1))	0.490218	0.071664	6.840511	0.0000
D(LOGPOVT_POP(-2))	0.865902	0.076897	11.26051	0.0000
D(LOGPOVT_POP(-3))	0.590757	0.080083	7.376849	0.0000
D(LOGLTR)	0.355697	0.068193	5.216058	0.0001
D(LOGPLN_RATE)	-14.05218	1.539275	-9.129088	0.0000
CointEq(-1)*	-0.969285	0.066716	-14.52852	0.0000

R-squared	0.887869	Mean dependent var	0.054013
Adjusted R-squared	0.865442	S.D. dependent var	0.099790
S.E. of regression	0.036605	Akaike info criterion	-3.605271
Sum squared resid	0.033498	Schwarz criterion	-3.327725
Log likelihood	61.88170	Hannan-Quinn criter.	-3.514798
Durbin-Watson stat	2.397336		

Levels Equation
Case 2: Restricted Constant and No Trend

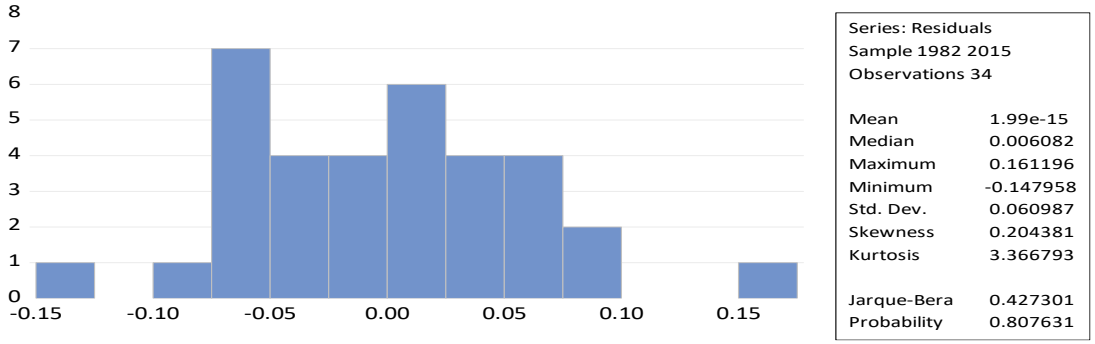
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGY_PERCAP	0.876443	0.128758	6.806899	0.0000
LOGGINI_COEFF	0.370286	0.266612	1.388857	0.1828
LOGUMP	0.186596	0.033916	5.501755	0.0000
LOGINF	0.029717	0.015793	1.881640	0.0771
LOGLTR	0.685337	0.090183	7.599414	0.0000
LOGODA_GDP	-0.018258	0.015414	-1.184551	0.2525
LOGPLN_RATE	-6.644716	1.057481	-6.283534	0.0000
C	15.72254	1.223925	12.84599	0.0000

EC = LOGPOVT_POP - (0.8764*LOGY_PERCAP + 0.3703 *LOGGINI_COEFF + 0.1866*LOGUMP + 0.0297*LOGINF + 0.6853 *LOGLTR -0.0183*LOGODA_GDP -6.6447*LOGPLN_RATE + 15.7225)

Appendix 25: ARDL Result of Growth-Poverty with Gross Domestic Product, 1981-2015

(Residual Diagnostic)

Normality Test



Serial Correlation

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.804558	Prob. F(2,25)	0.4585
Obs*R-squared	2.056059	Prob. Chi-Square(2)	0.3577

Heteroskedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	1.402839	Prob. F(6,27)	0.2497
Obs*R-squared	8.080270	Prob. Chi-Square(6)	0.2323
Scaled explained SS	6.030119	Prob. Chi-Square(6)	0.4198

Stability Test

Ramsey RESET Test
Equation: EQ010 Y GDP BEST
Omitted Variables: Squares of fitted values
Specification: LOGPOVT POP LOGPOVT POP(-1) LOGGINI COEFF LOGY_GDP LOGHCD LOGODA_GDP LOGPLN_RATE C

	Value	df	Probability
t-statistic	1.819428	26	0.0804
F-statistic	3.310318	(1, 26)	0.0804
Likelihood ratio	4.074664	1	0.0435

Bounds Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	8.678635	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Actual Sample Size	34		Finite Sample: n=35	

Short-run and Long-run

ARDL Error Correction Regression
Dependent Variable: D(LOGPOVT_POP)
Selected Model: ARDL(1, 0, 0, 0, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 12/18/19 Time: 15:50
Sample: 1981 2015
Included observations: 34

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CointEq(-1)*	-0.478200	0.055496	-8.616876	0.0000

R-squared	0.592871	Mean dependent var	0.053531
Adjusted R-squared	0.592871	S.D. dependent var	0.095580
S.E. of regression	0.060987	Akaike info criterion	-2.727351
Sum squared resid	0.122739	Schwarz criterion	-2.682458
Log likelihood	47.36497	Hannan-Quinn criter.	-2.712041
Durbin-Watson stat	2.086285		

Levels Equation
Case 2: Restricted Constant and No Trend

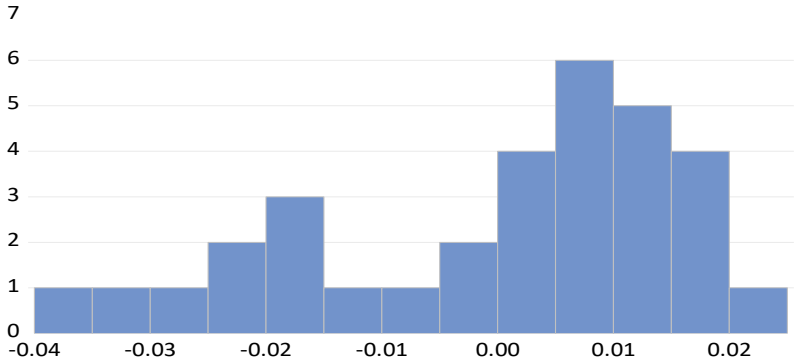
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGINI_COEFF	1.821912	0.275703	6.608240	0.0000
LOGY_GDP	0.997827	0.137951	7.233216	0.0000
LOGHCD	-0.218600	0.234507	-0.932169	0.3595
LOGODA_GDP	-0.077542	0.032182	-2.409506	0.0231
LOGPLN_RATE	-6.553808	2.011138	-3.258756	0.0030
C	18.79570	4.385292	4.286079	0.0002

EC = LOGPOVT_POP - (1.8219*LOGGINI_COEFF + 0.9978*LOGY_GDP -0.2186*LOGHCD -0.0775*LOGODA_GDP -6.5538*LOGPLN_RATE + 18.7957)

Appendix 26: ARDL Result of Growth-Poverty with Oil and Non-Oil GDP, 1981-2015

(Residual Diagnostic)

Normality Test



Series: Residuals	
Sample 1984 2015	
Observations 32	
Mean	2.11e-15
Median	0.005624
Maximum	0.024393
Minimum	-0.038812
Std. Dev.	0.016628
Skewness	-0.795559
Kurtosis	2.567148
Jarque-Bera	3.625353
Probability	0.163217

Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	3.506254	Prob. F(2,5)	0.1118
Obs*R-squared	18.68055	Prob. Chi-Square(2)	0.0001

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.262899	Prob. F(24,7)	0.9935
Obs*R-squared	15.17000	Prob. Chi-Square(24)	0.9157
Scaled explained SS	0.568803	Prob. Chi-Square(24)	1.0000

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ09_OIL_NONOIL
Omitted Variables: Squares of fitted values
Specification: LOGPOVT_POP LOGPOVT_POP(-1) LOGPOVT_POP(-2) LOGGINI_COEFF LOGGINI_COEFF(-1) LOGGINI_COEFF(-2) LOGOIL_GDP LOGOIL_GDP(-1) LOGOIL_GDP(-2) LOGN_OIL_GDP LOGN_OIL_GDP(-1) LOGN_OIL_GDP(-2) LOGN_OIL_GDP(-3) LOGHCD LOGHCD(-1) LOGHCD(-2) LOGHCD(-3) LOGODA_GDP LOGODA_GDP(-1) LOGODA_GDP(-2) LOGODA_GDP(-3) LOGPLN_RATE LOGPLN_RATE(-1) LOGPLN_RATE(-2) LOGPLN_RATE(-3) C

	Value	df	Probability
t-statistic	1.051431	6	0.3336
F-statistic	1.105507	(1, 6)	0.3336
Likelihood ratio	5.411540	1	0.0200

Bounds Test for Co-integration

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	12.33772	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99
Actual Sample Size	32		Finite Sample: n=35	

Short-Run and Long-Run Model

ARDL Error Correction Regression
Dependent Variable: D(LOGPOVT_POP)
Selected Model: ARDL(2, 2, 2, 3, 3, 3, 3)
Case 2: Restricted Constant and No Trend
Date: 11/23/19 Time: 02:50
Sample: 1981 2015
Included observations: 32

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGPOVT_POP(-1))	-0.747933	0.088597	-8.441984	0.0001
D(LOGGINI_COEFF)	1.555996	0.133869	11.62326	0.0000
D(LOGGINI_COEFF(-1))	0.485080	0.124133	3.907753	0.0058
D(LOGOIL_GDP)	-0.833955	0.220179	-3.787631	0.0068
D(LOGOIL_GDP(-1))	-2.928235	0.260345	-11.24750	0.0000
D(LOGN_OIL_GDP)	-4.601192	0.654033	-7.035105	0.0002
D(LOGN_OIL_GDP(-1))	-12.27863	0.925314	-13.26968	0.0000
D(LOGN_OIL_GDP(-2))	-0.819919	0.231684	-3.538953	0.0095
D(LOGHCD)	-0.237435	0.099920	-2.376256	0.0492
D(LOGHCD(-1))	0.475472	0.088258	5.387321	0.0010
D(LOGHCD(-2))	0.266737	0.085074	3.135357	0.0165
D(LOGODA_GDP)	0.111925	0.012534	8.929850	0.0000
D(LOGODA_GDP(-1))	-0.024513	0.009134	-2.683716	0.0314
D(LOGODA_GDP(-2))	0.035588	0.008871	4.011910	0.0051
D(LOGPLN_RATE)	43.11256	4.203902	10.25537	0.0000
D(LOGPLN_RATE(-1))	-41.10318	5.813717	-7.070036	0.0002
D(LOGPLN_RATE(-2))	20.14089	3.220305	6.254342	0.0004
CointEq(-1)*	0.615576	0.043813	14.05003	0.0000

R-squared	0.971312	Mean dependent var	0.054175
Adjusted R-squared	0.936476	S.D. dependent var	0.098172
S.E. of regression	0.024743	Akaike info criterion	-4.262211
Sum squared resid	0.008571	Schwarz criterion	-3.437734
Log likelihood	86.19537	Hannan-Quinn criter.	-3.988920
Durbin-Watson stat	2.995946		

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 2: Restricted Constant and No Trend

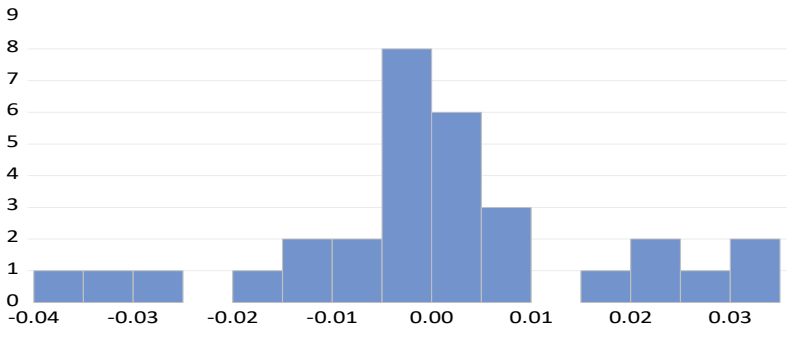
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGINI_COEFF	-0.299843	0.881189	-0.340270	0.7436
LOGOIL_GDP	-2.745811	1.245094	-2.205304	0.0632
LOGN_OIL_GDP	-14.74620	6.420755	-2.296646	0.0553
LOGHCD	2.088026	0.446254	4.679005	0.0023
LOGODA_GDP	-0.182480	0.055197	-3.305962	0.0130
LOGPLN_RATE	20.54513	7.183258	2.860141	0.0243
C	-46.40454	17.49205	-2.652893	0.0328

EC = LOGPOVT_POP - (-0.2998*LOGGINI_COEFF -2.7458*LOGOIL_GDP
-14.7462*LOGN_OIL_GDP + 2.0880*LOGHCD -0.1825
*LOGODA_GDP + 20.5451*LOGPLN_RATE - 46.4045)

Appendix 27: ARDL Result of Growth-Poverty with Agriculture Sector of GDP Product, 1981-2015

(Residual Diagnostic)

Normality Test



Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 3 lags

F-statistic	3.951713	Prob. F(3,7)	0.0612
Obs*R-squared	19.49120	Prob. Chi-Square(3)	0.0002

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.829892	Prob. F(20,10)	0.6551
Obs*R-squared	19.34492	Prob. Chi-Square(20)	0.4995
Scaled explained SS	2.189235	Prob. Chi-Square(20)	1.0000

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ013_AGRI_SECGDP
Omitted Variables: Squares of fitted values
Specification: LOGPOVT_POP LOGPOVT_POP(-1) LOGPOVT_POP(-2) LOGPOVT_POP(-3) LOGPOVT_POP(-4) LOGGINI_COEFF LOGGINI_COEFF(-1) LOGGINI_COEFF(-2) LOGAGRI_SECGDP LOGAGRI SECGDP(-1) LOGAGRI SECGDP(-2) LOGAGRI SECGDP(-3) LOGHCD LOGHCD(-1) LOGODA GDP LOGODA_GDP(-1) LOGODA_GDP(-2) LOGPLN_RATE LOGPLN_RATE(-1) LOGPLN_RATE(-2) LOGPLN_RATE(-3) C

	Value	df	Probability
t-statistic	0.922565	9	0.3803
F-statistic	0.851127	(1, 9)	0.3803
Likelihood ratio	2.801200	1	0.0942

Bounds Test for Co-integration

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	17.42902	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Actual Sample Size	31		Finite Sample: n=35	

Short-Run and Long-Run Model

ARDL Error Correction Regression
Dependent Variable: D(LOGPOVT_POP)
Selected Model: ARDL(4, 2, 3, 1, 2, 3)
Case 2: Restricted Constant and No Trend
Date: 11/24/19 Time: 20:50
Sample: 1981 2015
Included observations: 31

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGPOVT_POP(-1))	-0.242503	0.062453	-3.882962	0.0030
D(LOGPOVT_POP(-2))	-0.141300	0.053594	-2.636499	0.0249
D(LOGPOVT_POP(-3))	0.271247	0.045291	5.989011	0.0001
D(LOGGINI_COEFF)	0.604879	0.109267	5.535768	0.0002
D(LOGGINI_COEFF(-1))	0.354149	0.107749	3.286809	0.0082
D(LOGAGRI_SECGDP)	-0.626648	0.082372	-7.607508	0.0000
D(LOGAGRI_SECGD...)	-1.451430	0.124912	-11.61959	0.0000
D(LOGAGRI__SECGD...)	-0.986182	0.108155	-9.118257	0.0000
D(LOGHCD)	-0.022622	0.085565	-0.264383	0.7969
D(LOGODA_GDP)	-0.097718	0.008695	-11.23806	0.0000
D(LOGODA_GDP(-1))	0.039043	0.008250	4.732313	0.0008
D(LOGPLN_RATE)	-24.49258	3.758166	-6.517163	0.0001
D(LOGPLN_RATE(-1))	24.80268	5.357653	4.629392	0.0009
D(LOGPLN_RATE(-2))	-14.07581	2.566773	-5.483852	0.0003
CointEq(-1)*	-0.641563	0.045919	-13.97158	0.0000

R-squared	0.972294	Mean dependent var	0.054013
Adjusted R-squared	0.948051	S.D. dependent var	0.099790
S.E. of regression	0.022744	Akaike info criterion	-4.422646
Sum squared resid	0.008277	Schwarz criterion	-3.728781
Log likelihood	83.55101	Hannan-Quinn criter.	-4.196463
Durbin-Watson stat	2.995994		

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 2: Restricted Constant and No Trend

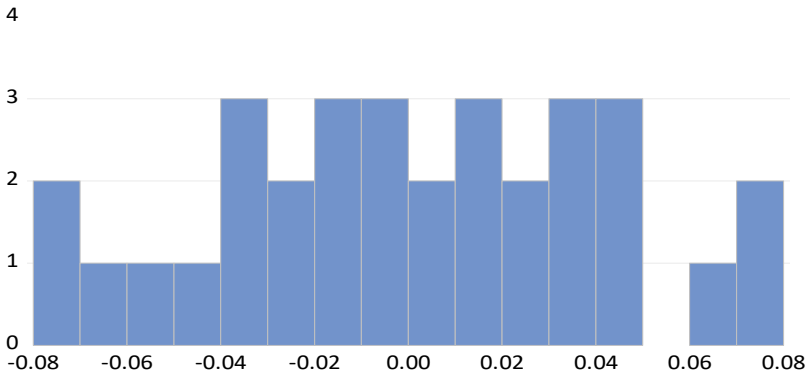
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGINI_COEFF	0.359022	0.583827	0.614945	0.5523
LOGAGRI__SECGDP	1.596870	0.493922	3.233041	0.0090
LOGHCD	0.255346	0.322129	0.792682	0.4464
LOGODA_GDP	-0.187484	0.043665	-4.293658	0.0016
LOGPLN_RATE	-1.089345	2.020482	-0.539151	0.6016
C	16.79080	7.765520	2.162225	0.0559

EC = LOGPOVT_POP - (0.3590*LOGGINI_COEFF + 1.5969
*LOGAGRI__SECGDP + 0.2553*LOGHCD -0.1875*LOGODA_GDP
-1.0893*LOGPLN_RATE + 16.7908)

Appendix 28: ARDL Result of Growth-Poverty with Industry Sector of GDP Product, 1981-2015

(Residual Diagnostic)

Normality Test



Series: Residuals	
Sample 1984 2015	
Observations 32	
Mean	5.77e-15
Median	0.002784
Maximum	0.071377
Minimum	-0.079426
Std. Dev.	0.041166
Skewness	-0.151659
Kurtosis	2.246919
Jarque-Bera	0.878844
Probability	0.644409

Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.252881	Prob. F(2,14)	0.3158
Obs*R-squared	4.857962	Prob. Chi-Square(2)	0.0881

Heteroskedasticity Test

Scaled explained SS	3.338218	Prob. Chi-Square(12)	0.9905
Obs*R-squared	14.14969	Prob. Chi-Square(12)	0.2939
F-statistic	1.252853	Prob. F(12,19)	0.3089

Null hypothesis: Homoskedasticity
Heteroskedasticity Test: Breusch-Pagan-Godfrey

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ014_IND_GDP
Omitted Variables: Squares of fitted values
Specification: LOGPOVT POP LOGPOVT POP(-1) LOGGINI COEFF LOGGINI COEFF(-1) LOGGINI COEFF(-2) LOGGINI COEFF(-3) LOGIND GDP LOGIND GDP(-1) LOGIND GDP(-2) LOGHCD LOGODA GDP LOGODA GDP(-1) LOGODA GDP(-2) LOGODA_GDP(-3) LOGPLN_RATE LOGPLN RATE(-1) C

	Value	df	Probability
t-statistic	0.583239	15	0.5684
F-statistic	0.340168	(1, 15)	0.5684
Likelihood ratio	0.717586	1	0.3969

Bounds Test for Co-integration

F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	6.885599	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Actual Sample Size	32		Finite Sample: n=35	

Short-Run and Long-Run Model

ARDL Error Correction Regression
Dependent Variable: D(LOGPOVT_POP)
Selected Model: ARDL(1, 3, 2, 0, 3, 1)
Case 2: Restricted Constant and No Trend
Date: 11/24/19 Time: 20:56
Sample: 1981 2015
Included observations: 32

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGGINI_COEFF)	0.817943	0.158340	5.165748	0.0001
D(LOGGINI_COEFF(-1))	-0.713592	0.172584	-4.134744	0.0008
D(LOGGINI_COEFF(-2))	-0.409132	0.158585	-2.579899	0.0201
D(LOGIND_GDP)	0.486922	0.170087	2.862785	0.0113
D(LOGIND_GDP(-1))	0.910847	0.220003	4.140149	0.0008
D(LOGODA_GDP)	-0.015255	0.014822	-1.029217	0.3187
D(LOGODA_GDP(-1))	-0.021591	0.014441	-1.495194	0.1543
D(LOGODA_GDP(-2))	-0.022826	0.014804	-1.541817	0.1427
D(LOGPLN_RATE)	7.014406	1.826622	3.840097	0.0014
CointEq(-1)*	-0.352395	0.043287	-8.140878	0.0000

R-squared	0.824162	Mean dependent var	0.054175
Adjusted R-squared	0.752228	S.D. dependent var	0.098172
S.E. of regression	0.048867	Akaike info criterion	-2.949138
Sum squared resid	0.052535	Schwarz criterion	-2.491096
Log likelihood	57.18621	Hannan-Quinn criter.	-2.797310
Durbin-Watson stat	2.413420		

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 2: Restricted Constant and No Trend

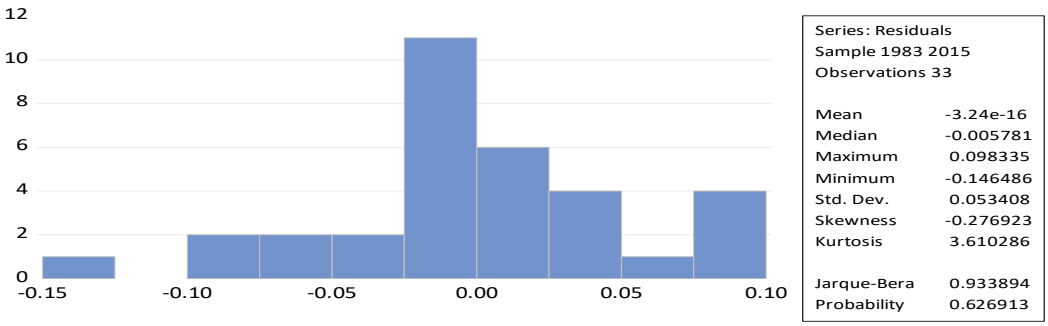
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGINI_COEFF	3.211481	0.754148	4.258425	0.0006
LOGIND_GDP	-3.643765	1.206001	-3.021361	0.0081
LOGHCD	-0.408220	0.582063	-0.701333	0.4932
LOGODA_GDP	0.117586	0.092606	1.269739	0.2223
LOGPLN_RATE	-18.48309	8.467170	-2.182912	0.0443
C	41.47109	16.77420	2.472314	0.0250

EC = LOGPOVT_POP - (3.2115*LOGGINI_COEFF -3.6438*LOGIND_GDP
-0.4082*LOGHCD + 0.1176*LOGODA_GDP -18.4831*LOGPLN_RATE
+ 41.4711)

Appendix 29: ARDL Result of Growth-Poverty with Wholesale Retail Trade Sector of GDP Product, 1981-2015

(Residual Diagnostic)

Normality Test



Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.160214	Prob. F(2,20)	0.3336
Obs*R-squared	3.430674	Prob. Chi-Square(2)	0.1799

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	2.149030	Prob. F(10,22)	0.0648
Obs*R-squared	16.30662	Prob. Chi-Square(10)	0.0912
Scaled explained SS	9.458878	Prob. Chi-Square(10)	0.4892

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ015WRT_GDP
Omitted Variables: Squares of fitted values
Specification: LOGPOVT POP LOGPOVT POP(-1) LOGPOVT POP(-2) LOGGINI_COEFF LOGWRT_GDP LOGWRT_GDP(-1) LOGWRT_GDP(-2) LOGHCD LOGODA_GDP LOGPLN_RATE LOGPLN_RATE(-1) C

	Value	df	Probability
t-statistic	1.465565	21	0.1576
F-statistic	2.147881	(1, 21)	0.1576
Likelihood ratio	3.213567	1	0.0730

Bounds Test for Co-integration

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	9.542640	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

Short-Run and Long-Run Model

ARDL Error Correction Regression
Dependent Variable: D(LOGPOVT_POP)
Selected Model: ARDL(2, 0, 2, 0, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 11/24/19 Time: 21:06
Sample: 1981 2015
Included observations: 33

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGPOVT_POP(-1))	-0.375179	0.115011	-3.262120	0.0036
D(LOGWRT_GDP)	0.747048	0.215027	3.474204	0.0022
D(LOGWRT_GDP(-1))	-1.121008	0.222920	-5.028751	0.0000
D(LOGPLN_RATE)	3.114332	1.265639	2.460679	0.0222
CointEq(-1)*	-0.481289	0.052198	-9.220425	0.0000

R-squared	0.695071	Mean dependent var	0.054911
Adjusted R-squared	0.651510	S.D. dependent var	0.096718
S.E. of regression	0.057096	Akaike info criterion	-2.749453
Sum squared resid	0.091277	Schwarz criterion	-2.522709
Log likelihood	50.36597	Hannan-Quinn criter.	-2.673160
Durbin-Watson stat	2.386949		

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 2: Restricted Constant and No Trend

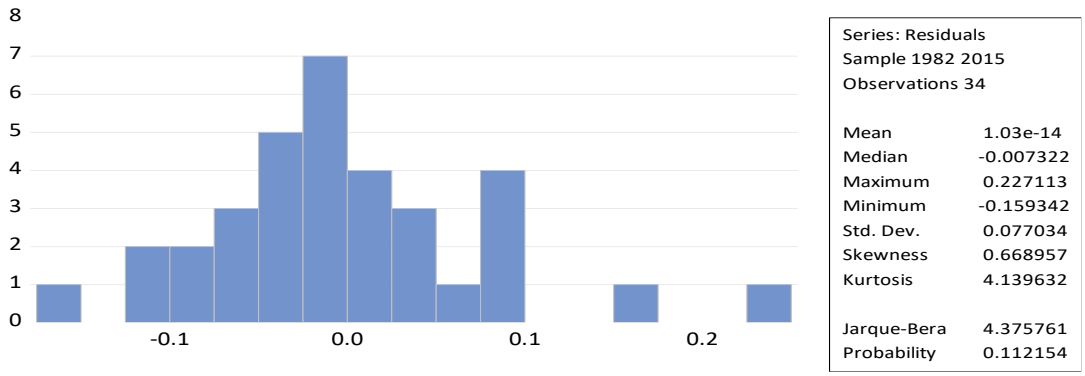
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGINI_COEFF	1.683601	0.390402	4.312480	0.0003
LOGWRT_GDP	3.061219	0.503107	6.084628	0.0000
LOGHCD	1.055872	0.218434	4.833836	0.0001
LOGODA_GDP	0.048782	0.039864	1.223704	0.2340
LOGPLN_RATE	-6.917034	2.726440	-2.537021	0.0188
C	14.44151	6.106522	2.364932	0.0273

EC = LOGPOVT_POP - (1.6836*LOGGINI_COEFF + 3.0612
*LOGWRT_GDP + 1.0559*LOGHCD + 0.0488*LOGODA_GDP
-6.9170*LOGPLN_RATE + 14.4415)

Appendix 30: ARDL Result of Growth-Poverty with Services Sector of GDP Product, 1981-2015

(Residual Diagnostic)

Normality Test



Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.214745	Prob. F(2,24)	0.8083
Obs*R-squared	0.597747	Prob. Chi-Square(2)	0.7417

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	3.133528	Prob. F(7,26)	0.0155
Obs*R-squared	15.55824	Prob. Chi-Square(7)	0.0295
Scaled explained SS	14.28230	Prob. Chi-Square(7)	0.0464

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ016_SER_GDP
Omitted Variables: Squares of fitted values
Specification: LOGPOVT_POP LOGPOVT_POP(-1) LOGGINI_COEFF LOGSER_GDP LOGHCD LOGHCD(-1) LOGODA_GDP LOGPLN_RATE C

	Value	df	Probability
t-statistic	1.083488	25	0.2889
F-statistic	1.173945	(1, 25)	0.2889
Likelihood ratio	1.560214	1	0.2116

Bounds Test for Co-integration

F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	3.582166	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Actual Sample Size	34		Finite Sample: n=35	

Short-Run and Long-Run Model

ARDL Error Correction Regression
Dependent Variable: D(LOGPOVT_POP)
Selected Model: ARDL(1, 0, 0, 1, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 12/19/19 Time: 14:58
Sample: 1981 2015
Included observations: 34

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGHCD)	-0.342182	0.194141	-1.762544	0.0897
CointEq(-1)*	-0.136409	0.023786	-5.734945	0.0000

R-squared	0.350432	Mean dependent var	0.053531
Adjusted R-squared	0.330133	S.D. dependent var	0.095580
S.E. of regression	0.078228	Akaike info criterion	-2.201351
Sum squared resid	0.195829	Schwarz criterion	-2.111565
Log likelihood	39.42297	Hannan-Quinn criter.	-2.170732
Durbin-Watson stat	2.183890		

Levels Equation
Case 2: Restricted Constant and No Trend

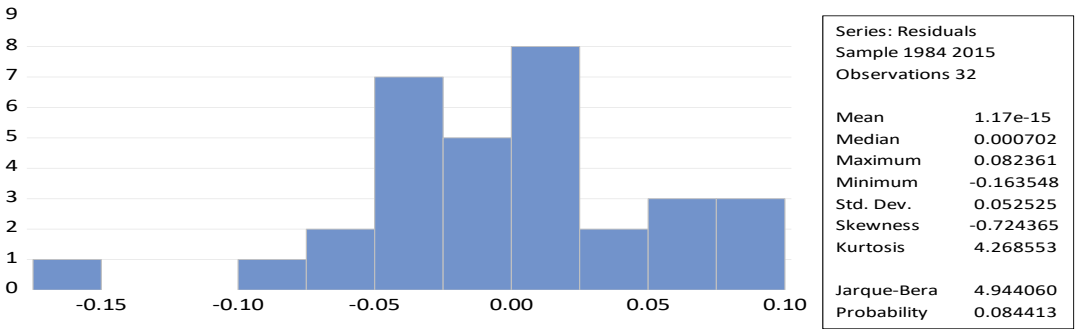
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGINI_COEFF	2.509413	1.207829	2.077623	0.0474
LOGSER_GDP	1.691585	1.002280	1.687737	0.1030
LOGHCD	0.005517	0.814491	0.006773	0.9946
LOGODA_GDP	-0.187004	0.200906	-0.930805	0.3602
LOGPLN_RATE	-0.920149	3.898114	-0.236050	0.8152
C	22.23180	14.65118	1.517407	0.1408

EC = LOGPOVT_POP - (2.5094*LOGGINI_COEFF + 1.6916
*LOGSER_GDP + 0.0055*LOGHCD -0.1870*LOGODA_GDP -0.9201
*LOGPLN_RATE + 22.2318)

Appendix 31: ARDL Result of Growth-Poverty with Building and Construction Sector of GDP Product, 1981-2015

(Residual Diagnostic)

Normality Test



Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.306075	Prob. F(2,17)	0.7403
Obs*R-squared	1.112234	Prob. Chi-Square(2)	0.5734

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	1.662362	Prob. F(12,19)	0.1558
Obs*R-squared	16.38958	Prob. Chi-Square(12)	0.1740
Scaled explained SS	9.442797	Prob. Chi-Square(12)	0.6647

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ017 BC GDP
Omitted Variables: Squares of fitted values
Specification: LOGPOVT POP LOGPOVT POP(-1) LOGGINI COEFF LOGGINI_COEFF(-1) LOGBC_GDP LOGBC_GDP(-1) LOGBC_GDP(-2) LOGBC GDP(-3) LOGHCD LOGODA GDP LOGODA_GDP(-1) LOGODA_GDP(-2) PLN_RATE C

	Value	df	Probability
t-statistic	1.118281	18	0.2782
F-statistic	1.250552	(1, 18)	0.2782
Likelihood ratio	2.149375	1	0.1426

Bounds Test for Co-integration

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	4.122106	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Actual Sample Size	32		Finite Sample: n=35	

Short-Run and Long-Run Model

ARDL Error Correction Regression
Dependent Variable: D(LOGPOVT_POP)
Selected Model: ARDL(1, 1, 3, 0, 2, 0)
Case 2: Restricted Constant and No Trend
Date: 11/19/19 Time: 22:50
Sample: 1981 2015
Included observations: 32

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGGINI_COEFF)	0.469179	0.223131	2.102708	0.0491
D(LOGBC_GDP)	-0.204044	0.120902	-1.687679	0.1078
D(LOGBC_GDP(-1))	0.293057	0.148858	1.968704	0.0638
D(LOGBC_GDP(-2))	0.674341	0.155854	4.326753	0.0004
D(LOGODA_GDP)	-0.067938	0.017710	-3.836125	0.0011
D(LOGODA_GDP(-1))	0.082610	0.022607	3.654233	0.0017
CointEq(-1)*	-0.151863	0.024646	-6.161718	0.0000

R-squared	0.713737	Mean dependent var	0.054175
Adjusted R-squared	0.645033	S.D. dependent var	0.098172
S.E. of regression	0.058490	Akaike info criterion	-2.649290
Sum squared resid	0.085526	Schwarz criterion	-2.328660
Log likelihood	49.38863	Hannan-Quinn criter.	-2.543010
Durbin-Watson stat	2.212286		

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 2: Restricted Constant and No Trend

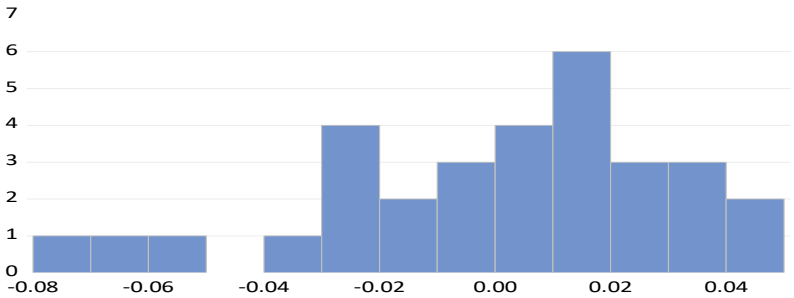
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGINI_COEFF	-4.215169	4.652363	-0.906028	0.3763
LOGBC_GDP	-3.892968	3.680865	-1.057623	0.3035
LOGHCD	-1.778266	2.313736	-0.768569	0.4516
LOGODA_GDP	-0.759534	0.624870	-1.215508	0.2391
PLN_RATE	1.932849	1.396895	1.383675	0.1825
C	23.32367	22.17915	1.051603	0.3062

EC = LOGPOVT_POP - (-4.2152*LOGGINI_COEFF -3.8930*LOGBC_GDP -1.7783*LOGHCD -0.7595*LOGODA_GDP + 1.9328*PLN_RATE + 23.3237)

Appendix 32: ARDL Result of Growth-Poverty with Dummy_2 Variable, 1981-2015

(Residual Diagnostic)

Normality Test



Series: Residuals	
Sample 1985 2015	
Observations 31	
Mean	-4.00e-16
Median	0.003960
Maximum	0.045009
Minimum	-0.076909
Std. Dev.	0.030730
Skewness	-0.804532
Kurtosis	3.166273
Jarque-Bera	3.379948
Probability	0.184524

Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	2.678195	Prob. F(2,13)	0.1062
Obs*R-squared	9.045793	Prob. Chi-Square(2)	0.0109

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.777772	Prob. F(15,15)	0.6837
Obs*R-squared	13.56244	Prob. Chi-Square(15)	0.5589
Scaled explained SS	3.439379	Prob. Chi-Square(15)	0.9991

Stability Diagnostic (Ramsey Reset Test)

Ramsey RESET Test
Equation: EQ02_DUMMY_2
Omitted Variables: Squares of fitted values
Specification: LOGPOVT_POP LOGPOVT_POP(-1) LOGPOVT_POP(-2) LOGPOVT_POP(-3) LOGPOVT_POP(-4) LOGGINI_COEFF LOGY_PERCAP LOGUMP LOGUMP(-1) LOGINF LOGLTR LOGLTR(-1) LOGODA_GDP LOGPLN_RATE LOGPLN_RATE(-1) DUMMY_2 C

	Value	df	Probability
t-statistic	0.389701	14	0.7026
F-statistic	0.151867	(1, 14)	0.7026
Likelihood ratio	0.334465	1	0.5630

Bounds Test for Co-integration

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	14.50117	10%	1.85	2.85
k	8	5%	2.11	3.15
		2.5%	2.33	3.42
		1%	2.62	3.77
Actual Sample Size	31		Finite Sample: n=35	

Short-Run and Long-Run Model

ARDL Error Correction Regression
Dependent Variable: D(LOGPOVT_POP)
Selected Model: ARDL(4, 0, 0, 1, 0, 1, 0, 1, 0)
Case 2: Restricted Constant and No Trend
Date: 06/05/20 Time: 20:18
Sample: 1981 2015
Included observations: 31

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGPOVT_POP(-1))	0.538218	0.068844	7.817980	0.0000
D(LOGPOVT_POP(-2))	0.887617	0.074197	11.96292	0.0000
D(LOGPOVT_POP(-3))	0.641831	0.084966	7.553962	0.0000
D(LOGUMP)	0.178095	0.025959	6.860654	0.0000
D(LOGLTR)	0.328428	0.065976	4.977969	0.0002
D(LOGPLN_RATE)	-15.21710	1.495241	-10.17702	0.0000
CointEq(-1)*	-0.957973	0.062891	-15.23216	0.0000

R-squared	0.905168	Mean dependent var	0.054013
Adjusted R-squared	0.881460	S.D. dependent var	0.099790
S.E. of regression	0.034357	Akaike info criterion	-3.708317
Sum squared resid	0.028330	Schwarz criterion	-3.384513
Log likelihood	64.47891	Hannan-Quinn criter.	-3.602765
Durbin-Watson stat	2.549052		

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGINI_COEFF	0.407039	0.282845	1.439088	0.1707
LOGY_PERCAP	0.912566	0.132608	6.881692	0.0000
LOGUMP	0.116785	0.058809	1.985845	0.0656
LOGINF	0.026107	0.016168	1.614722	0.1272
LOGLTR	0.575214	0.122335	4.701945	0.0003
LOGODA_GDP	-0.021073	0.016741	-1.258827	0.2273
LOGPLN_RATE	-6.443428	1.145648	-5.624264	0.0000
DUMMY_2	-0.140856	0.099911	-1.409820	0.1790
C	14.71723	1.603155	9.180166	0.0000

EC = LOGPOVT_POP - (0.4070*LOGGINI_COEFF + 0.9126
*LOGY_PERCAP + 0.1168*LOGUMP + 0.0261*LOGINF + 0.5752
*LOGLTR -0.0211*LOGODA_GDP -6.4434*LOGPLN_RATE -0.1409
*DUMMY_2 + 14.7172)