Human Development and Economic Growth: An Empirical Analysis from the Nigerian Economy (1970-2011)

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ABSTRACT

This study investigates the long run relationship between human development and economic growth in Nigeria between 1970 and 2011 through the application of Johansen Cointegration technique and Vector Error Correction Methodology. The origin of the human development index can be traced back to the work of an Indian economist Amartya Sen (1990) and a Pakistani economist Mahbub ul Haq (1995). They identified three major components for measuring human development level namely education, health and income. Our cointegration analysis suggests a long run relationship between these variables and economic growth.

The findings also show that the greatest proportion of the variations in the real GDP can be attributed to the shocks in educational component among other identified human development components in the study. Though there are mixed evidences on the impact of income inequality on economic growth, our findings suggest that increasing income inequality and high mortality rate have a significant negative effect on the real GDP in the case of Nigerian economy.

Keywords: human development, economic growth, cointegration, principal component analysis (PCA).

ÖZ

Bu çalışmada amaçlanan insani kalkınma ile ekonomik büyüme arasındaki uzun dönem ilişkisini Nijerya için 1970 – 2011 arası dönemde Johansen Eşbütünleşim testi ile Vektör Hata Düzeltme Modeli kullanarak analiz etmektir. İnsani kalkınma endeksinin kökeni Hintli ekonomist Amartya Sen ile Pakistanlı ekonomist Mahbub UL Haq ın 1990 yılındaki çalışmalarına dayanmaktadır. İnsani kalkınma endeksini belirleyen üç temel öğe sırasıyla eğitim, sağlık ve gelir olarak karşımıza çıkmaktadır. Eşbütünleşim testi insani kalkınma düzeyi ile ekonomik büyüme arasındaki bir uzun dönem ilişkisine dikkati çekmektedir.

Çalışma bulguları aynı zamanda büyüme düzeyindeki değişimlerdeki en büyük oranın eğitim öğesine dayandığına işaret etmektedir. Ekonomik büyüme üzerindeki gelir eşitsizliği etkisi karışık kanıtlar olmasına rağmen, bizim bulgular artan gelir eşitsizliği ve yüksek mortalite oranı Nijeryalı ekonominin durumunda reel GSYİH üzerinde önemli bir olumsuz etkiye sahip olduğunu göstermektedir.

Anahtar sözükler: İnsani kalkınma düzeyi, ekonomik büyüme, eş bütünleşme, temel bileşen analizi.

Dedicated to my family

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INTRODUCTION

1.1 Background of the Study

It has been observed that majority of the literature on economic growth and general productivity level have mainly focused on economic factors such as investment (domestic or foreign direct as the case may be), market structures, degree of openness with encompassing evidences that majorly center on macroeconomic variables.

Many growth models have explained the determinants of economic growth over the years. Most of these models centered on labour productivity through saving and investment that can be achieved by capital accumulation and technological growth. The classical growth theory from the work of Smith (1776) developed the measurement concept for overall economic growth as gross domestic product (GDP) which he defines as streams of goods and services that the nation creates.

The neoclassical models grew from this perspective. Harrod (1939) and Domar (1946) model, Solow model in late 1950s, which came as an offshoot of the formal, both focused on saving-investment ratio with more additional emphasis on technological growth (Solow, 1958).

In recent years, it has been observed that some of the underlying assumptions for these models are unrealistic. For instance, the neoclassical model assumed that all firms have the secrets of technical progress. They also assumed that all firms behave in the same way to attain profit maximization goal. Many of these assumptions have been revisited and enhanced. This has led to the development of various alternatives or more elaborate similar views on the explanation of what influences growth and why growth rate varies from one country to another.

In this study, we shall be looking at how human development can affect economic growth. Our variables of interest will be on the three major components that constitute the human development index based on the work of an Indian economist Amartya Sen (1990) and a Pakistani economist Mahbub ul Haq (1995).

1.2 Problem Statement

The Nigerian economy has been experiencing economic growth accumulating to an average of about 6% (CBN, 2010) in recent times but numerous researches have also shown that there are many crucial economic problems to be tackled. Official data from the Bureau of Statistics suggested that the proportion of unemployed stands at 19.70 per cent as at year 2009 (NBS 2009). This statistics exclude close to 40 million youths that were included in World Bank statistics of that year. Omotola (2008) also noted that close to 70 percent of the population lives in serious poverty conditions. Since a vast majority of the adult population is in the group of the unemployed, poverty rate is most likely to keep increasing and income inequality will keep rising.

Another crucial problem that relates to human development from health perspective is that of mortality rates (both at infancy and at childhood). On an average, there has

been a notable fall in infant and child mortality rates in most developing countries in the recent times; but it is still a major public health issue in Sub-Saharan Africa, especially in Nigeria (Adeyele & Ofoegbu, 2013). This constituted part of the major reasons why the millennium development goals (MDGs) aim at reducing infant mortality at least by two thirds by the year 2015 (Mubiana & Bernard, 2004).

Other problems include those of inefficient educational system that is characterized by poor infrastructure and irregularities of academic calendar (Babatunde & Adefabi, 2005). There is a need to investigate the possible impacts of the above-identified problems on the economic growth of the country.

1.3 Objective of the Study and Research Question

This study aims at analyzing the impacts of basic human development variables (income, health and education) on the economic growth of Nigeria. In addition, we want to see if there is a long run relationship between these variables and economic growth.

1.4 Scope of the Study

This research will provide a review of the previous studies relevant to this study and the empirical study on the relationship between basic human development variables and economic growth for Nigeria for 42 years (1970-2011). The major sources of data are Central Bank of Nigeria (CBN) statistical bulletin, the National Bureau of Statistic (NBS), World Bank Development Indicators (IBRD/IDA).

1.5 Limitation of the Study

The major limitations of this research are centered on issues of empirical analysis. We will try as much as possible to make use of the most available appropriate proxies for the variables, though there could be some better choices but due to some

missing data and unavailability of some data sets, we might be a bit constrained especially in variables and sample size selection for the study.

1.6 Organization of the Study

This study is organized into six chapters. The first chapter provides the introduction. The second chapter includes theoretical framework of the study and the literature review. The third chapter gives a review and development of the human development components for Nigeria while the fourth chapter will focus on the methodology of the study. The fifth chapter will focus on data presentation and analysis while the sixth chapter will be a summary and conclusion of the study with possible recommendations.

Chapter 2

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Theoretical Framework

2.1.1 Endogenous Growth theory

The Robert Solow growth model (1957) plays the role of a centerpiece of most modern growth theories. Despite this major role, it standard interpretation has not been fully shown to have been able to provide answers to some critical questions such as why per-capita income is so high in some countries (especially the group of developed countries) than the less developed countries. In other words, the model does not provide full explanations for the huge cross-country variation or differences in income and also the huge difference in average growth of per capita income in recent times compare to the last two centuries (Mankiw et al. 1992). The endogenous growth theories emerged in the quest to provide answers to some of these questions.

The original neoclassical growth model works on the assumptions of exogenous technological change as the driver of sustainable growth. The model assumes that labor productivity grows continually and exogenously meaning that there is a constant return to scale for any additional labor employed while the capital stock is assumed homogenous overtime. In other words, it will continually increase thereby creating expansion in output and consumption.

$$Y = AK^{\alpha}L^{1-\alpha} \quad (1)$$

Where Y= output A= technology level K= capital stock L=labor (1-α)= share of labor in production and (α) = share of capital in production.

Since the available level of technology (A) is given with a constant supply of labour, then change in output will depend on the capital stock. The rise in capital stock overtime is refer to as capital accumulation (k). The capital stock will accumulate at a rate depending on how much of income is saved (sY) and since capital also wear out with time we have to account for this rate of capital consumption.

$$K = sY - \delta K \tag{2}$$

where s=saving rate δ= depreciation rate

with the assumption of constant return to scale, it follows that output per person y=(Y/L) will depend on capital per person:

$$k = \left(\frac{K}{L}\right) \tag{3}$$

labour input (L) also grows at constant exponential rate of the population growth rate (n), then we have

$$L = nL \tag{4}$$

Measuring the change in capital per person from the combination of the above equations through the differential of equation (3), we get the general dynamic equation for the exogenous (neoclassical) growth theory as shown in equation (5) below:

$$K^* = sy - (n + \delta)k \tag{5}$$

Equation (5) implies that the rate of change in capital per person (k*) is positively related to saving rate (s) and negatively related to depreciation and population growth rate (δ) and (n) respectively. From (5), a time will come in the future when

there will be no more change in capital per person (k*=0) and at this point we have a steady state in the economy:

$$sy = (n + \delta)k \qquad (6)$$

From (6) above, output will only grow at rate of (k) which is directly proportional to population growth (n) and depreciation rate (δ). Therefore, the only way to have a long-term growth in output per person is through tecnological change that will help to offset the effects of diminishing returns. This brings in the idea of labour augumented tecnological progress where we have capital per effective labour (K/LE) instead of capital per labour (K/L). Therefore, a production function that captures technological progress from increase in labour efficiency was introduced since growth now depends on an exogenous technology. Augumenting technology through capital accumulation via better saving ratio will aid a sustainable growth (long-term growth). The endogenous growth theory attempts to endogenized this technological change that was exogenously determined in the neoclassical model.

2.1.2 Endogenization of Technology

As pointed out earlier, holding technological change as exogenously determined has not been able to account for some crucial issues like huge differences in cross-country income (Mankiw et al. 1992). Therefore, there is a need to adopt a broader view of capital to include human capital and physical capital. The major problem of the exogenous theory is that long-term growth is based on exogenous technology change. In application, it implies that technology is not correlated with other factors that could possibly affect economic growth which are assumed to be captured in the model by the error term (ε). Therefore implies that though (s, n and δ) will play a role in determining the magnitude of the steady state, it is only change in technology (A) that will eventually create sustainable growth. However, growth of (A) depends

on ‘’economic decisions’’ that varies in different countries and the capital accumulation is determined by saving rate (s) that is also a function of economic decision. This turns out that (A) will not be uncorrelated with (ε) as assumed in the exogenous model but rather it should be endogenous.

The early version of an endogenized technological growth model is the Harrod (1939) and Domar (1946) model. The major assumption of the neoclassical model is the diminishing return in capital accumulation and this actually will play a big role in limiting growth in an economy where other factors like labour and technology are given.

In the AK model, it is assumed that one of this other factors is growing directly proportionally to capital such that it offsets the effects of the diminishing return and outputs now grows directly proportionally to capital. Thus, the new production function becomes:

$$Y = AK \tag{7}$$

In equation (7) Y is directly proportional to (K) such that A is constant. This type of growth model are refers to as AK models or endogenous growth models. There are various versions of this type of model with different underlaying assumptions. The Harrod Domar model assumes that labour is directly proportional to capital. From (7) K is the cummulative capital stock and stock of knowledge and it exhibits a constant return to scale rather than decreasing return in the case of the exogenous model. This is possible because it is assumed that with increase in knowledge through research and development (R&D), impacts of decreasing return will be wipe out.

Following the initial steps with new Y=AK down to equation (5) we have a new dynamic equation as follows:

$$K^* = [sA - (n + \delta)]k \quad (8)$$

Therefore percentage growth (*k/k) will follow the expression of equation (9) below

$$(\frac{k^*}{k}) = sA - (n + \delta)k \quad (9)$$

From (9), if sA>(n + δ) it means that output per person will be falling and therefore increase in growth from higher saving will be paramount and diminishing return will not set in because faster growth in (K) will be accompanied by growth in (L) since it is initially assumed that labour grows proportionately with capital.

There are other versions of endogenous model like Franke-Romer model (1986) which assumed that technology (A) grows proportionately with capital (K). They used technological knowledge as a type of capital since it can be accumulated through (R&D) just as saving generates more physical capital.

In summary, the AK model shows that the cross-country variation in parameters like (α) and (1-α) will result into differences in economic growth and if sA>(n + δ) there won't be convergence. In the case of the exogenous model, permanent growth is affected by exogenously determined technological and population growth. When (K) is over accumulated (when s>golden rule of capital accumulation) there will be dynamic inefficiency and to boost consumption, capital accumulation has to be decreased through reduction in (s). However; if technology is AK, there will not be a dynamic inefficiency because marginal product of capital will be constant no matter how big the capital stock is.

2.1.3 Theoretical Implications of the Endogenous Theory to this Study

The endogenous model have been a major central point of attraction in many growth researches because its underlying assumptions provides basic theoretical framework for a range of qualitative and quantitative research. As noted by Sharpe (2004), human capital is usually related to issues of education, skills and health and these will have possible links to productivity and growth. Some endogenous growth models have also provided justification for growth through fiscal policies (taxes and government expenditure). For instance, innovation and creativity can be induced through better education vis-a-vis research and development (R&D) and improved health system (Sharpe, 2004).

Widening poverty gap can be a characteristic of inequality and poverty in the real sense can limit an individual's chances of accessing basic requirements for a productive life. An endogenous technological progress that will encourage sustainable growth can be stimulated by cumulative physical and human capital (capital stock and stock of knowledge). R&D is an integral component of an educational system and this would imply that economic decisions pertaining to issues like aggregate spending for better educational system, policies on other crucial issues related to health and income redistribution could have a multiplier effects on the level of sustainable growth.

2.2 Literature Review

2.2.1 Education and Growth

Endogenous growth literatures have shown that qualitative and quantitative education has substantial impact on overall level of economic growth and productivity (i.e. Barrow, 2001). On a more generalized level, it appears that there is a common belief that education has significant role or impact on individual and the nation at large. Much of those impacts can be seen in people's general way of life (communication, feeding, dressing and reasoning), overall creativity, and innovation level, which affect their level of productivity. These in turn will create multiplier effects on the overall national output and economic growth. Sweetman (2002) noted that the question should not be whether education has benefits but, rather, the extents of its real impacts. From his study of the endogenous growth theories, he concluded that both qualitative and quantitative growth of education play an important role on overall level of productivity and growth of the economy in general.

Babatunde & Adefabi (2005) maintained that a better way of encouraging economic growth is by ensuring educational development. This assertion was based on the long run relationship they established between economic growth and education in Nigeria and they proceeded to explain that a labour force that is well educated shows a better chance of creating a significant influence on economic growth in terms of productivity.

Barrow (2001) suggested that an extra year of average qualitative education is correlated with a yearly rise of about 0.44% in GDP. Harris (1999) identified education and training as part of the major drivers of productivity and economic

growth. Sharpe (1998) also identified literacy rate and educational level that characterized the structure of work force alongside other variables like size and quantity of natural resources as part of the major determinant of economic growth.

2.2.2 Health and Growth

Health is another major component of the endogenous theory of growth as demonstrated in the human capital theory. There is a common saying that "health is wealth" and this statement sounds to be in concordance with the work of Michael Grossman (1972) who modeled individual pattern of supply of labour as a function of demand for health. This demand can be seen as a derived demand because the stock of health is been demanded for the specific reasons of what it will produce. The model treated health as capital goods that can be seen in terms of consumption or investment. Consumption in the sense that health makes people feel better and investment in the sense that health helps to increase the number of healthy days for more efficiency and productivity thereby helping to generate more income and this will stimulate economic growth.

Tompa (2002) in a review of some historical economic trends reveals that there are substantial impacts of increased life expectancy especially through health and nutrition in Europe and USA over the last few centuries on their level of economic growth. All things being equal, on the average and in most cases, a healthy individual (labour) would be more productive than the unhealthy one. The World Health Organization (WHO, 1999), in a cross country survey for about 50 years, obtained a result that shows positive effect of improvement in health on growth and productivity level.

Bloom et al. (2001) through some health measures like life expectancy or mortality and health expenditure among the Organization for Economic Co-operation and Development (OECD) countries, obtained a significant and positive association between health and economic growth. Steckel (2001) also discovered that there is very strong positive correlation of about 0.82 to 0.88 between average health and the gross domestic product.

2.2.3 Income Distribution and Growth

Findings of some previous studies on the relationship between income distribution and growth are highly controversial. Jonathan et al. (2014) noted that income inequality might limit growth in ways because it invites steps for income redistribution through the fiscal policies and some of these efforts themselves may undermine growth. This implies that though income inequality is not good for economic growth, taxes and transfers may not be the right solution because there could be tradeoff between those redistribution remedy and growth.

Sharpe (2004) in his detailed study of the relationship between productivity, poverty, and income distribution; using multiple regression analysis, found out that the greater the level of inequality, the lesser the level of productivity. This implies that higher income inequality will reduce the productivity level and this aggregate productivity level has direct effect on overall economic growth.

Berg and Ostry (2011) also find out that greater equality can help sustainable growth from multi-decade and multi-country evidence. Jonathan et al. (2014) find out that, inequality is an important determinant of the speed and duration of medium-term growth. Their research suggested that though there are some unclarified evidences that very large income redistributions may have some negative impacts on growth

time but for average redistributions, there are no proofs of any negative direct effect. Therefore non-extreme income redistribution that is correlated with reduction in income inequality is related to higher and sustainable growth.

To have an accurate measurement of income distribution in an economy may be an uneasy task. Malte (2010) identified unemployment rate, poverty headcount ratio and the Gini coefficient as the most frequently cited statistics in the issues of wage distribution and general inequality. There are also many other indexes that can be computed for measuring income distribution such as; Squared Coefficient of Variation (SCV), Mean-Log Deviation (MLD) and Atkinson Index.

Some researchers have linked the issues of income inequality to unemployment level. Nolan (1986) estimated the impact of unemployment on the yearly distribution of income in the UK through a cross-sectional data from the Family Expenditure Survey and obtained a significant effect of unemployment on increasing inequality. Similarly, Cardoso (1993) noted that unemployment increases inequality based on the evidences of his research on the Brazilian economy in the 1980s.

Chapter 3

A REVIEW OF HUMAN DEVELOPMENT COMPONENTS FROM THE NIGERIAN EXPERIENCE

3.1 Overview

Amartya Sen in his book *Development as Freedom* (1999); sees development and growth as the outward movement from poverty and all kinds of deprivation of freedom. Such freedom include, economic freedom which encompasses factors like perfect mobility of labor (to attain full employment), equitable distribution of income, political freedom such as freedom of information, practice of true democracy and social freedom such as gender equality among others. According to Sen (1999), all elements of freedom that leads to development are referred to as capabilities. Example of such capabilities include equitable distribution of income, health programs, food security, education and job opportunities among others.

There are several ways by which comparison is being done among nations in term of their levels of economic development. In recent years, the Human Development Index (HDI) has been computed for many countries and it has received much popularity as it is easy to use while making development comparison between countries. The origins of the HDI are found in the annual Development Reports of the United Nations Development Programme (UNDP). The three major components of this index are income, health and education. From the HDI, Nigeria is ranked

158th out of 182 countries (UNDP, 2009). This position reflects a high degree of what under development is; and many other African societies fall into this category.

For instance, in Table 1 below we can see Nigeran's low performance on the HDI among some selected African countries.

Table 1: HDI for Selected African Countries

COUNTRY	HDI (2013 estimates)	WORLD RANK
LIBYA	0.784	55
MAURITIUS	0.771	63
EGPYT	0.682	110
SOUTH AFRICA	0.658	118
NIGERIA	0.504	152

Source: UNDP Report, 2014

In this study we shall see if these human development indicators as identified by Haq (1995) and Sen (1999) have effects on growth of the Nigerian economy as suggested in the literature and to consequently see if it is possible to establish long run relationship between those indicators and economic growth.

3.2 Education in Nigeria

The educational sector is one of the fastest expanding sectors in the Nigerian economy today despite the major challenges. Compared to the 1980s and 1990s when school enrollment rate was very low at all levels; about 13% for male and 20% for female (World Bank, 2002), in the early 2000s, there was a substantial amount of increase in the rate at primary and secondary level.

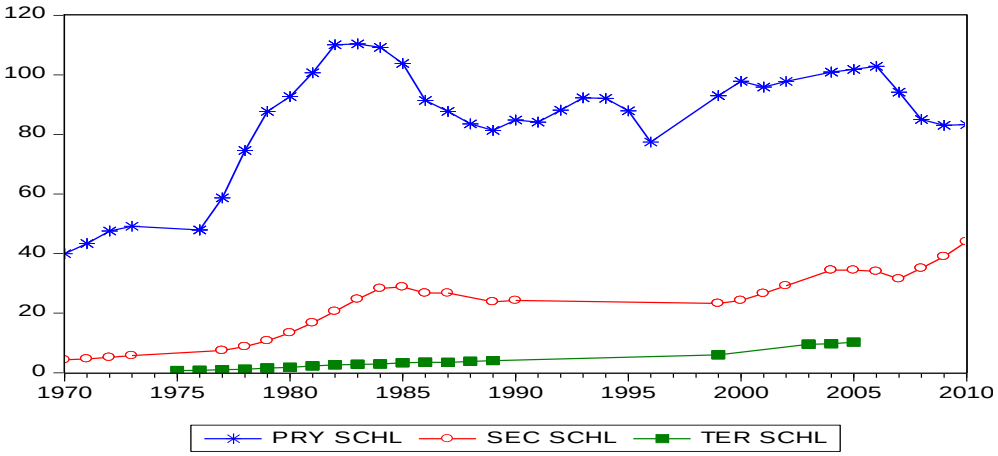

Figure 1: School enrolment rate in Nigeria
Source: Computations using World Bank (WDI, 2010) statistics

Figure 1 shows the rate at which people enroll in school, there was a very low rate of enrolment in the 1970s and as time goes on; the trend witnessed some improvement from primary school enrollment to tertiary level though there are still a vast majority of the population that is out of school.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) as the global movement under the United Nations (UN) for actualization of the goal - education for all especially through the universal primary education (UPE) has recommended that about 26% of a nation's budget should be allocated for education in order to fast track the realization of the Millennium Development Goals (MDGs) (Adeyemi, 2011).

The contrary is the case for Nigeria. Statistics from the World Bank (2004) showed that the country spends just a little less than 1% of the national budget on education in year 2002. Adeyemi (2011) also observed that there was a deficit in educational financing in Nigeria and that the funding has not been up to 17% of the national budget in any given year despite the minimum standard according to UNESCO.

Fundamental education is the kind of education which aims to help children and adults to understand the problems of their environments and their rights and duties as citizens, also to acquire knowledge and skills for the progressive improvement of their living condition and the development of their community (UNESCO, 1946).

3.3 Income Distribution: (Unemploymemt and Poverty Review from Nigeria)

In a typical economy, issue of income inequality is one of the prominent point of concern that dominate major views and ideology of household welfare managements. Income distribution virtually involves all the economic agents in an economy especially the household sector and the government. This explains part of the reasons why effective and efficient distribution of resources is one of the primal macroeconomic goals and objectives of most governments around the globe.

By even distribution of income or resources, we refer to a situation whereby the largest share of income of an economy is held by the largest possible population in an economy. To have an accurate measurement of income distribution in an economy may be an uneasy task, but in general; there are some basic ways by which this can be done.

Malte (2010) identified unemployment rate, poverty headcount ratio and the Gini coefficient as the most frequently cited statistics in the issues of wage distribution and general inequality. There are also many other indexes that can be computed for measuring income distribution such as; Squared Coefficient of Variation (SCV), Mean-Log Deviation (MLD) and Atkinson Index. The World Bank (1995) asserted that there are several issues of poverty and income inequality in many developing

countries and most of this can be linked to the structural changes in the labour market. The degree of mobility in the market also affects income distribution.

3.3.1 Unemployment Rate in Nigeria

According to the International Labour Organization (ILO), unemployment covers people who are out of work, want a job, have actively sought work in the previous four weeks and are available to start work within the next fortnight. It also covers people who are currently out of work and have accepted a job that they are waiting to start in the next fortnight (ILO, 2007). Unemployment is a situation that happens when someone who is willing and able to work cannot find a suitable job at a particular point in time.

The rise in the rate of unemployment has been one of the crucial challenges that have being confronting Nigeria in the past few years. According to statistics from the National Bureau of Statistics, the rate of unemployment in Nigeria has grown more than double between 1998 and 2011 from 10% to 23.9% with urban unemployment estimated at 29.5% in 2013 (NBS, 2013).

The national unemployment rate, estimated by the Office of Statistics (now NBS) as 4.3% of the labor force in 1985, increased to 5.3 % in 1986 and 7.0% in 1987. It dropped to 5.1% in 1988 due to measures taken under the SAP. Majority of the unemployed were city dwellers, they accounted for about 8.7% in 1985 and increased to 9.8% in 1987.

Figure 2: Unemployment rate in Nigeria.
Source: Computations using NBS statistics (NBS, 2011)

Underemployment (disguised unemployed) is another major characteristic of urban and the rural settlements. Underemployment is when people are employed only on part time or at work that is ineffective or unproductive, with a correspondingly low income that is insufficient to meet their needs (Harold, 2009). The rural unemployment figures were less accurate than those for urban figures and about two-thirds of the rural unemployed were secondary-school graduates. In general, about 35% to 50% of unemployed were secondary-school graduates with urban unemployment rate standing at 40% in the 1980s.

As noted by Subair (2013), the youth unemployment rate account for about 37% of the total unemployment rate and approximately 4 million people entered into the labour market annually. The implication of this is that as population keeps growing and more youths enter the labour market without gainful employment. Thus, the fraction of people holding largest share of the available or generated income will be reducing and hence inequality level will keep escalating in the country.

3.3.2 Poverty Rate in Nigeria

The proportion of Nigerians living in poverty has being increasing on an annual basis (NBS, 2010). The population now appears to be distributed into three categories, the

extremely poor category, moderately or averagely poor category and the non-poor category.

The proportion of the extremely poor has increased over the years from about 6.2 percent in 1980 to 29.3 percent in 1996 though it witnessed a decrease of about 7.3 percent in 2004 before reaching a higher record of 38.7% in 2010. In the moderately poor category, it was a different situation as the figure increased from 21.0 percent to 34.2 percent in 1980 and 1985 respectively. It later reduced from 36.3 percent to 32.4 percent between 1996 and 2004, and dropped more in 2010 to 30.3 percent. The category of the non-poor was very high in the country in 1980 (72.8 percent) but falls to 57.3 percent in 1992. The proportion has also witnessed some significant fall in 1996 to 34.4percent and 31 percent in 2010.

Poverty eradication has been one of the central points of policy recommendations in most part of the world today. The general aim of this is to ensure equitable distribution of income thereby stimulating higher standard of living around the globe. The World Bank Group's mission is carved in stone at the Washington headquarters and it reads, "Our Dream is a World Free of Poverty." As explained by the group on its home web page, poverty reduction mission coupled with welfare development are very crucial to combatting extreme poverty and ensuring prosperity around the world (World Bank, 2014).

According to the United Nations (2011), poverty is the inability of getting choices and opportunities. It implies the lack of basic capacity to be involved effectively in the society and this is close to violation of human rights. It encompasses lack of food, clothes, medical care, shelter, education and some other things that stands as

necessities of life. It may also include insecurity, powerlessness and chronic situation of unemployment.

Poverty is multi-dimensional and it is of different degree or categories. For the purpose of this study, we will use the National Bureau of Statistics's (NBS, 2010) approaches in classifying poverty:

- Relative Poverty approach: This refers to the set of people, who are regarded as poor by themselves or others around them in a society. They might be probably regarded as rich if they find themselves somewhere else with the same amount of provisions. The NBS categorized those households with less than one-third of total household per capita expenditure as the extreme poor or core-poor while households that are greater than one-third of total expenditure but less than two-thirds of the total spending are categorized as the moderately poor or averagely poor.
- Absolute poverty approach: this covers the minimal requirements necessary to afford items like food, clothing, healthcare and shelter. In absolute term, we mean the number of people whom everyone can call poor especially when there are inadequate basic necessities of life such as food supply, health care facilities and shelter. This approach looks at food and non- food expenditure through the per capita expenditure approach therefore it is also known as food energy intake approach to poverty. The bureau obtained the food basket for the poorest 40% from the previous poverty profile. It then computed the food expenditure that will amount to about 3000 calorie per day with respect to the national food basket for the poorest 40%.

- Dollar per day approach: refers to the World Bank's Purchasing Power Parity (PPP) index, which defines poverty as the proportion of those living on less than US$1 per day poverty line.
- Subjective Poverty approach: this is based on self-assessment and "sentiments" of an individual. Compared to the other approaches to poverty, it considers the individual's opinion; if they see themselves to be poor or not.

Some papers have linked the measurement of poverty and inequality in a country to acute unemployment rate on the ground that the poor's most abundant resource lays in their labour. Gainful employment is important for individuals to earn income to be able to escape from absolute poverty. This assertion is based on the above explanation by the NBS concerning the minimal requirements necessary to afford minimal standards of food, clothing, healthcare and shelter (NBS, 2010).

The report of the Harmonized Nigeria Living Standard Survey (HNLSS, 2010); that was carried out by the NBS on the poverty profile of Nigeria with support from the World Bank, concluded that the rise in poverty rate may increase in subsequent years if there are no potential anti-poverty and employment generation intervention programmes that will help to mitigate the problem.

3.4 Review of the Nigerian Health Sector

The Nigerian health sector is one of the low performing sectors of the economy despite of the recent evidences that has shown that the sector could perform better and grow up to a world class standard if all hands are on the desks to combat the various overwhelming challenges of the sector. The major challenges facing this sector include gross inadequate finance, shortage of qualified health care

practitioners and inadequate infrastructural facilities (health care facilities) among others.

Table 2: Mortality Rate in Selected African Countries

COUNTRY	DATE OF INFORMATION	(DEATHS/1,000 LIVE BIRTHS)	RANK
Nigeria	2014	74.09	1
Sierra Leone	2014	73.29	2
Congo, Democratic Republic of the	2014	73.15	3
Mozambique	2014	72.42	4
Equatorial Guinea	2014	71.12	5
Liberia	2014	69.19	6
South Sudan	2014	68.16	7
Zambia	2014	66.82	8
Gambia, The	2014	65.74	9
Comoros	2014	65.31	10

Source: World Factbook (CIA, 2014)

The basic health indicators in the country are pointing at the fact that health performance in the entire country is very low. The infant mortality rate (IMR) was 112.5 per 1,000 live births and life expectancy was as low as 48.2 years for females and 46.8 years for males in 2000 (World Bank, 2011). The rates witnessed little improvement in 2010 with infant mortality rate per 1000 birth standing at 80.8 and life expectancy was 51.4 years (World Bank, 2011).

The percentage of the population that have no access to improved sanitation facilities decreased from 34% in 2000 to 31% in 2010. Though there was an improvement in the percentage of the country's population with access to improved water from 53% in 2000 to 58% in 2010, yet more than 40% of the population is still struggling with lack of access to improved water. Health expenditure as total percentage of the national budgets has been less than 6% since 2009, and the trend follows 5.95%, 5.70%, 5.4%, 4.0%, and 4.10% from 2009 to 2013 respectively (NBS, 2013).

Uneke et.al.' (2007) noted that Nigeria is one of the major health-staff exporting countries in the continent of Africa. They gave an instance that over 430 nurses were recorded to have legally emigrated to work in the UK between year 2001 and 2002, and this figure represent more than 20% of the total number of nurses that are legally emigrating from Africa due to factors like inadequate infrastructure and poor compensation packages.

3.4.1 The Ebola Scenario

In the recent outbreak of the Ebola epidemic in West African region, about 4000 death cases have been reported; as at the time of carrying out this study. More than half of the people in these death cases are of working population (WHO, 2014). The world health organization also warned that the Ebola epidemic threatens the "very survival" of societies and could lead to failed states (WHO, 2014). Health care issues should be taken seriously because it could create a general impact on the country's overall productivity level.

The first Ebola case in Nigeria during this outbreak was confirmed around July 2014. Health officials were reported to have immediately taking necessary precautionary measures against it. The public health sector with immediate effect took up the

challenge with the assistance of the government especially in providing needed facilities and finance. For instance, the equipping and staffing of the virology laboratory for prompt and reliable diagnosis of any cases of Ebola virus disease, and this helped the containment measures to kick-start within the shortest period.

Quick immigration measures were also taken by the government; such as the screening of all immigrants by air and by sea into the country especially in the most populated states like Lagos and Rivers States. On an average, the number of travelers screened daily increased to more than 16000. At the end, the country recorded 19 cases, out of which seven died and twelve survived.

WHO Director-General while declaring the Nigeria free of Ebola noted that if a country like Nigeria, hampered by serious security problems, can make significant progress towards interrupting polio transmission, eradicate guinea-worm disease and contain Ebola, all at the same time, any country in the world experiencing an imported case can hold onward transmission to just a handful of cases. (Margaret Chan, 2014).

A former Minister of Mines, Power and Steel, who is also a virologist, Prof. Tam David-West, said that it was not time for Nigeria to rejoice after being declared Ebola free by WHO (Punch, 2014). Warning that without proper care, the virus could return to Nigeria. He emphasized the importance of public expenditure on the sector and he further noted that more reformations have to be carried out in the Nigerian health sector.

Chapter 4

METHODOLOGY

4.1 Overwiew

In this work, we shall be making use of Johansen test of cointegration to see if there is a long run equilibrating condition between our variables and economic growth. The Vector Error Correction Mechanism (VECM) approach will also be used to measure the long run effects of our variables on the growth of the economy provided that the cointegration results is positive (suggest that the long run relationship exists). The necessary conditions that made this approach suitable for this study shall be highlighted as we continue in this chapter.

4.2 Unit-Root Test

As noted by Gujarati (2004), empirical work based on time series data assumes that the underlying time series is stationary. This implies that before a time series data can be used for econometric forecasting, it has to be stationary. A random or stochastic process is a collection of random variables ordered in time. A stochastic process is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the distance or gap or lag between the two time periods and not the actual time at which the covariance is computed (Gujarati, 2004). In other words, this means that a time series data is said to be purely stochastic (white noise) if it has zero mean, constant variance and is serially uncorrelated. If a time series is nonstationary, we can study its behavior only for the time period under consideration therefore it is not possible

to generalize it to other time periods. Therefore testing to see if a time series data is stationary becomes paramount. To do this, we follow the following equations:

$$Y_t = \rho Y_{t-1} + \mu_t \quad (10)$$

Where Y_t is the discreet value of variable Y at time t and Y_{t-1} is the value of the variable in time (t-1). The value of ρ ranges from -1 to 1 i.e ($-1 \leq \rho \leq 1$). If ρ=1 then the variance of Y_t will not be constant such that it will be changing with time and when this happens, Y_t is nonstationary. This condition is what is refers to as unit root problem.

If there is a unit root, ρ=1 therefore when we regress equation (10) we can carry out a test to see if ρ is statistically equal to 1. From (10) subtracting Y_{t-1} from both sides we will have:

$$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + \mu_t \quad (11)$$

Since first difference of Y_t i.e (ΔY_t) = (Y_t - Y_{t-1}) where μ_t is a white noise error term (i.e u_t has zero mean and constant variance and no serial correlation), it means that the first differences of a random walk time series are stationary (Gujarati, 2004). Let δ = ρ-1 therefore substituting ΔY_t and δ into (11)

$$\Delta Y_t = \delta(Y_{t-1}) + \mu_t \quad (12)$$

Instead of estimating (11) we can estimate (12) and test for statistical significance of δ. The hypothesis is set up as shown bellow:

H_0 δ = 0 (here, when ρ=1 i.e there is unit root, δ=0)

H_1 $\delta \neq 0$ (here, when $-1 \leq \rho < 1$ i.e no unit root, δ≠0)

We should however note that since ρ ranges from -1 to 1, then it follows that δ must always be negative for any appropriate model. But if δ is positive, then the unit root

model is inappropriate because in such case ρ>1. This approach is known as the Dickey-Fuller (DF) test for unit root. For decision making about the hypothesis, we shall compare the computed t-statistics with the DF or Mackinnon critical values under the chosen level of significance which is conventionally usually taken as 5%. If the t-statistic is absolutely greater than the critical value, we shall reject the null hypothesis showing that there is no unit root and the variable Y_t in that condition is stationary otherwise; we fail to reject the null hypothesis and conclude that there is unit root problem with our variable.

In this study, we shall be making use of the Augmented Dickey Fuller (ADF, 1981) test for unit root. We shall be applying the approach because the underlying assumptions for the DF approach is that there is absence of serial correlation between the (μ_t) but this approach will help to take care of this problem by introducing a lag difference of the dependent variable as part of the new explanatory variable(s).

$$\Delta Y_t = \delta(Y_{t-1}) + \beta \Delta Y_{t-1} + \epsilon_t \quad (13)$$

Equation (13) represents the ADF function for unit root test when the variable Y_t shows a random walk without drift and trend.

$$\Delta Y_t = \beta_0 + \delta(Y_{t-1}) + \beta_1 \Delta Y_{t-1} + \epsilon_t \quad (14)$$

Equation (14) represents the ADF function for unit root test when the variable Y_t shows a random walk with drift and no trend.

$$\Delta Y_t = \beta_0 + \beta_1 t + \delta(Y_{t-1}) + \beta_2 \Delta Y_{t-1} + \epsilon_t \quad (15)$$

Equation (15) represents the ADF function for unit root test when the variable Y_t shows a random walk movement with both drift and trend process.

The unit root test will be conducted to know the time series properties of each of the variable that will be used in the model. If a non stationary time series data becomes stationary by differencing, it will be referred to as differenced stationary process (DSP) and the number of times it is differenced measures its order of integration. For instance, if a time series variable Y_t has to be differenced once for it to be stationary, then we say that Y_t is integrated order of 1 which can be represented as; $Y_t \sim I(1)$. The Philips & Perron (PP, 1988) test will also be carried out as an alternative test to the ADF to ensure that all possible serial correlation is taken care off.

4.3 Cointegration (Johansen Test of Cointegration)

Cointegration is a term that refers to the existence of a long run relationship between variables. It is a situation whereby variables tend to move together in the long run. As noted by Engle and Granger (1986) regressing non stationary time series on another will produce a stationary stochastic error. For instance, given variable (Y_t) and (X_t) that are integrated order of 1 i.e I(1) meaning that the variables are non-stationary at level but rather at first difference. If we regress the formal on the latter and obtain a residual that is integrated order of zero I.e I(0) from a unit root test, then it implies that the residual is stationary and this implies that the two variables are cointegrated.

In time series analysis, there are various approaches for testing for existence of long run relationship or cointegration between variables. The choice of which methods to use depends on the basic underlying assumptions or conditions for application of each approach. Here we shall be applying the Johansen test of cointegration.

This approach to cointegration was developed by Søren Johansen (1988). This approach is used in testing cointegration of times series that are integrated of order one; commonly denoted as I(1). The choice of this approach was prompted by the unique assumptions and requirements that back up the empirical application of this approach.

The Johansen method follows the vector autoregressive (VAR) of order p that is given in the equation below:

$$Y_t = \mu + A_i Y_{t-1} + \cdots + A_p Y_{t-p} + \varepsilon_t \tag{16}$$

Where Y_t is an nx1 vector of variables that are integrated order of one and ε_t is an nx1 vector of innovations. The equation 7 can be re-written as follows:

$$\Delta Y_t = \mu + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \, \Delta Y_{t-i} + \varepsilon_t \tag{17}$$

$$\Pi = \sum_{i=1}^{p} \mathrm{A}_i - \mathrm{I} \quad \text{and} \quad \Gamma_i = -\sum_{j=i+1}^{p} \mathrm{A}_j \tag{18}$$

Assuming that the matrix Π has a reduced rank such that n>r or r<n, then we will have a nxr matrices with each α and β parameters having rank $\Pi = \alpha\beta^{\iota}$ and $\beta^{\iota} Y_t$ is stationary. In this case, Γ represents the number of available cointegration relationship while α is the adjustment parameters in the VECM such that all columns of the β are cointegrating vector.

There are two likelihood ratios to test for the significance of the canonical correlations of ΔY_t with Y_{t-1} as given by Johansen. These are the trace statistics and the maximum eigen value test. These are given bellow:

$$J_{trace} = -T \sum_{i=r+1}^{n} Ln(1 - \lambda_i) \quad (19)$$

$$J_{max} = -T\, Ln(1 - \lambda_{r+1}) \quad (20)$$

Where: T= sample size and λ_i= i:th largest canonical correlation.

When applying the trace statistics, we are testing the null hypothesis that there is r cointegrating vector against the alternative hypothesis of n cointegrating vectors. On the other hand, when using the maximum eigen value, we are testing the null hypothesis of r cointegrating vectors against alternative hypothesis of r+1 cointegrating vectors. The result of the test will be provided in the chapter five.

Although Johansen's methodology is typically used in a setting where all variables in the system are I(1), having stationary variables in the system is theoretically not an issue. Johansen (1995) states that there is little need to pre-test the variables in the system to establish their order of integration this is because it is assumed that any variable that is not I(1), is a stationary I(0) process. This follows that cointegrating vector will have a spanned space by the only stationary variable in the model.

However, Erik et al. (2007) noted that since stationary variables in a system will introduce restricted cointegrating vectors, proper care should be taken in empirical work especially as regarding which variables is to be included in the cointegrating relationship.

Firstly, we set up a vector autoregressive (VAR) model that would help us in determining the maximum amount of lags that will be optimal for the most appropriate model for this study in the following manner:

$$X_t = \gamma_{1t} X_{t-1} + \cdots \gamma_{kt} X_{t-k} + \mu_t \tag{21}$$

$$X_t = \begin{bmatrix} Y_t \\ P_t \\ Q_t \\ R_t \end{bmatrix}$$

From the equation (12) above, X_t is an n x 1 matrix that denotes our variables starting from real gross domestic product (Y_t), educational component (P_t), inequality component (Q_t), and the health component (R_t). If we consider a bivariate structural VAR (with Y_t and P_t), following the expression in equation (21) above, we can model a simple reduced standard form of VAR model as follows:

$$Y_t + b_{12} P_t = b_{10} + \beta_{11} Y_{t-1} + \beta_{12} P_{t-1} + \varepsilon_{yt} \tag{22}$$

$$b_{21} Y_t + P_t = b_{20} + \beta_{21} Y_{t-1} + \beta_{22} P_{t-1} + \varepsilon_{pt} \tag{23}$$

Equation (22) and (23) are initially in form of a structural VAR expression and we can simply form the resultant matrices by reducing them in such a way that Y_t and P_t are functions of their lagged values so as to obtain a standard VAR. In this conditions, the two variables are endogenous and the error terms (structural shocks) ε_{yt} and ε_{pt} are white noise (Sims, 1980).

$$\begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix} \begin{bmatrix} Y_t \\ P_t \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix} + \begin{bmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{bmatrix} \begin{bmatrix} Y_{t-1} \\ P_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{pt} \end{bmatrix}$$

$$A \quad X_t \quad = \quad \gamma_0 \quad + \quad \gamma_1 X_{t-1} \quad + \quad \varepsilon_t \tag{24}$$

Multiplying (24) by inverse if A (i.e A^{-1}) we have the equation as follows

$$X_t = A^{-1}\gamma_0 + A^{-1}\gamma_1 X_{t-1} + A^{-1}\ \varepsilon_t$$

Let $\emptyset_0, \emptyset_1 \, and \, \mu_t$ represent $A^{-1}\gamma_0, A^{-1}\gamma_1, A^{-1}\ \varepsilon_t$ respectively then we have the equation (25) as follows:

$$X_t = \emptyset_0 + \emptyset_1 X_{t-1} + \mu_t \tag{25}$$

Equation (25) above is a typical expression of a bivariate VAR model as the simplest form just as expressed in equation (21) above. From this expression assuming we have a VAR (k) with all our variables included, we shall have the VAR expression as shown below:

$$X_t = \emptyset_0 + \emptyset_1 X_{t-1} + \emptyset_2 X_{t-2} + \cdots + \emptyset_k X_{t-k} + \mu_t \tag{26}$$

Where $\emptyset_i$ are matrices such that:

$$\emptyset_1 = \begin{bmatrix} \emptyset_{11} & \emptyset_{12} & \emptyset_{13} & \emptyset_{14} \\ \emptyset_{21} & \emptyset_{22} & \emptyset_{23} & \emptyset_{24} \\ \emptyset_{31} & \emptyset_{32} & \emptyset_{33} & \emptyset_{34} \\ \emptyset_{41} & \emptyset_{42} & \emptyset_{43} & \emptyset_{44} \end{bmatrix}$$

In general, a typical equation from this system will look like equation below

$$Y_t = \alpha_0 + \emptyset_{11}^{(1)} P_{t-1} + \emptyset_{12}^{(1)} Q_{t-1} + \emptyset_{13}^{(1)} R_{t-1} + \cdots + \emptyset_{11}^{(k)} P_{t-k} + \emptyset_{12}^{(k)} Q_{t-k} + \emptyset_{13}^{(k)} R_{t-k} + \mu_t \tag{27}$$

From (27) above, $\emptyset_{it}$ is the n x n vector of all the parameters that come from variables where (i) ranges from 1 to the value of k. The error term (innovations) from the system of equations are white noise in the sense that they are normally distributed with zero mean and have heteroscedastic variance, i.e. $u_t \sim N(0, \Omega t)$. In each of all the systems, all the equation will have the same numbers of corresponding regressors.

4.4 Longrun Linear Regression Model

According to Engel and Granger (1987), the regression of non-stationary time series data that exhibit long-run relationship will generate a stationary residual (errors). The

implication of this is that if the growth rate and our identified variables exhibit a long run relationship, we can carry out a regression of these variables on growth rate at their original level point to obtain a residual term that will be stationary. By this, we can use this residual to measure the speed of adjustment of these variables in the long run. The long run linear regression model is given as follow:

$$LnRGDP_t = \alpha_0 + \alpha_1 t + \varphi_1 \mathrm{LnEduc}_t + \varphi_2 InEqua_t + \varphi_3 LnMort_t + \epsilon_t \quad (28)$$

From the estimation of equation (28) above, we should obtain a serially uncorrelated ϵ_t. This will be our error correction term (ECT) that we will use in reconciling the short run disequilibrium with the long run equilibrium condition.

4.5 Vector Error Correction Model (VECM)

This model is the usual conventional error correction model. The error correction model is given in the equation as follows:

$$\Delta Y_t = \gamma_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta Y_{t-i} + \sum_{j=0}^{n} \alpha_{2j} \Delta P_{t-j} + \sum_{k=0}^{n} \alpha_{3k} \Delta Q_{t-k} + \sum_{l=0}^{n} \alpha_{4l} \Delta R_{t-l} + \theta ECT_{t-1} + V_t \quad (29)$$

From equation (29) above, the ECT is gotten from the residual of equation (28) and the estimated coefficients of the differenced variables capture their short run effects. The new error term of the model is now V_t. Other variables in the model follows there previous definition as given before. We are expecting the ECM coefficient (θ) to be negative and significant.

4.6 Principal Component Analysis

Principal component analysis (PCA) is a statistical method of converting a set of sample observations that are very closely related or connected (i.e. correlated

variables) into a single component that is made up of linearly uncorrelated values called principal components.

We created a component (INEQUA), using the PCA for poverty rate and unemployment rate as a combined measure of income inequality. There are evidences of strong positive correlation between unemployment rate and poverty rate in Nigeria based on our correlation analysis between these variables. The result of our analysis shows that poverty rate is positively correlated with unemployment rate in Nigeria. This finding is in line with the report of the household survey carried out by NBS in collaboration with the World Bank that unemployment still stands as the major driver of poverty and inequality in the country (NBS report, 2010).

We also create a component for education (LnEDUC) using three basic educational indicators that are positively correlated namely the school enrolment rate, number of teachers and the gross expenditure on education. The third component (LnMORT) is for the health sector and this comprises of the infant mortality (the death of a child less than one year of age) and childhood mortality rate (the death of a child before the child's fifth birthday). We should however NOTE that:

- The use of VECM through the application of vector autoregressive process for the empirical analysis is prompted by the nature of the interdependency or endogeneity among the variables of interest in the entire system of our study. Aiyedogbon & Ohwofasa (2012) noted that low returns to labour as well as high unemployment indicates poverty and poverty makes it difficult to make investments in education and health that would increase a person’s productivity, which on an aggregate will affect the RGDP.

- Getting the perfect variable for estimating the impact of education, health and income on RGDP is a huge task especially in developing countries like Nigeria. Hence, we decided to make use of some of the available variables as seen in some of our reviewed related studies. For instance Aiyedogbon & Ohwofasa (2012) noted that unemployment and poverty are so intertwine that one can easily confuse one for the other. We combined these two variables under income inequality instead of making use of only poverty rate. Moreover, it is possible for one to be employed and still poor in cases like underemployment.
- We created a component as a proxy for each of our variables with the use of PCA to ensure wider coverage of measurement for each variable. As noted in chapter one of this study in the introduction, a major limitation of the study is unavailability of data or inadequate observations. This constrained us from expanding our data set and incorporating some other variables into the study.
- Variables like proportion of population with improved water sources, better sanitation facilities and health expenditure would have been included as part of the health component and variables like average year of schooling would have been included in the educational component too. We could not do this because of the short sample size and irregularity of the data points for these variables.
- For future purposes; this study would be expanded and improved upon by exploring other available estimating techniques with wider data sets.

Chapter 5

DATA ANALYSIS, MODEL ESTIMATION AND INTERPRETATION OF RESULTS

As explained earlier in Section 4.2 in the methodology chapter, to know the time series properties of our variables, a unit root test was carried out on each of the variables using the Augmented Dickey Fuller (ADF, 1981) and Philips & Perron (PP, 1988) test. The result is shown on Table 3 below:

Table 3: ADF and PP unit root test

Statistic (Level)	**lnrgdp**	**Lag**	**lneduc**	**lag**	**lnequa**	**lag**	**InMort**	**lag**
τ_T (ADF)	-0.914374	(4)	-2.617969	(1)	-2.895042	(0)	-3.176140	(2)
τ_μ (ADF)	1.757021	(4)	-2.642390	(4)	-0.022522	(0)	2.930828	(8)
τ (ADF)	1.951793	(4)	-1.492138	(0)	-0.097792	(0)	-0.679227	(1)
τ_T (PP)	-0.852097	(5)	-3.229195	(5)	-2.889511	(2)	0.181026	(5)
τ_μ (PP)	0.801778	(5)	-1.040201	(39)	0.104034	(3)	1.873137	(5)
τ (PP)	3.570014	(5)	-1.331436	(9)	-0.129002	(1)	-3.344629	(5)
Statistic (1^{st} Diff)	**Δlnrgdp**	**lag**	**Δlneduc**	**lag**	**Δlnequa**	**lag**	**ΔlnMort**	**lag**
τ_T (ADF)	-4.621962 ***	(8)	-7.786962 ***	(0)	-6.643021 ***	(0)	-3.393168 **	(7)
τ_μ (ADF)	-2.567858	(3)	-7.916063 ***	(0)	-6.386206 ***	(0)	-0.408240	(0)
τ (ADF)	-1.635292 *	(3)	-7.831563 ***	(0)	-6.179436 ***	(0)	0.230648	(0)
τ_T (PP)	-6.292223 ***	(4)	-13.27588 ***	(22)	-10.27477 ***	(24)	-1.534716	(4)
τ_μ (PP)	-5.982525 ***	(5)	-12.01685 ***	(19)	-10.24581 ***	(23)	-0.688456	(23)
τ (PP)	-4.687227 ***	(5)	-9.003394 ***	(10)	-6.377703 ***	(5)	-0.007760	(4)

lnrgdp represents real gross domestic product; lnedu denotes the educational component (real gross expenditure on education, school enrolment rate and number of teachers), lnmort is the health indicator (computed from infant mortality and mortality of age 5 and below) while Inequa denotes the inequality component that is computed from the principal component analysis of poverty and unemployment rate. All of the series are at their natural logarithms except the inequality component. τ_μ represents the most general model with a drift and trend; τ_T is the model with a drift and without trend; τ is the most restricted model without a drift and trend. Numbers in brackets are lag lengths used in ADF test (as determined by SIC set to maximum 9) to

remove serial correlation in the residuals. When using PP test, numbers in brackets represent Newey-West Bandwith (as determined by Bartlett-Kernel). Both in ADF and PP tests, unit root tests were performed from the most general to the least specific model by eliminating trend and intercept across the models (See Enders, 1995: 254-255). ***, ** and * denote rejection of the null hypothesis at the 1%, 5% and 10% levels respectively. Tests for unit roots have been carried out in E-VIEWS 7.0.

The results suggest that all of the variables are stationary at the first difference i.e I(1). Also from equation (27) under Section 4.4 in the Methodolgy chapter, we estimated the VAR model to get our optimal lag length through the available lag selection criteria. The estimation suggested optimal lag at lag 2 based on the Schwarz (SC) information criterion. The test for cointegration is presented in Table 4 below:

Table 4: Johansen cointegration test for overall model

Lag=1					
Null hypothesis	**Eigen-Value**	**Max-Eigen Statistic**	**Trace Statistic**	**5 %/1 % Critical Value (Trace)**	**5%/1 % Critical Value (Max-eigen)**
r = 0	0.6882	33.23050 *	72.30618 **	62.99/70.05	31.46/36.65
r = 1	0.5671	24.28496	41.50119	42.44/48.45	25.54/30.34
r = 2	0.2747	9.317060	17.21623	25.32/30.45	18.96/23.65
Lag=2					
Null hypothesis	**Eigen-Value**	**Max-Eigen Statistic**	**Trace Statistic**	**5 %/1 % Critical Value (Trace)**	**5%/1 % Critical Value (Max-eigen)**
r = 0	0.8654	56.28715 **	121.6924 **	62.99/70.05	31.46/36.65
r = 1	0.7500	38.91630*	68.16220**	42.44/48.45	25.54/30.34
r = 2	0.4397	16.22261	29.24591	25.32/30.45	18.96/23.65

The above cointegration test suggests that there is at least one long run equation to explain the relationship among our variables since we can reject the null hypothesis of no cointegration relationship using either of the trace statistics or the maximum-eigen statistics. The sign * and ** denotes the rejection of the null hypothesis of no cointegration at 5% and 1% level of significance respectively. Haven established a cointegration relationship among our data, the system of equations that are regressed using the 1st difference of these variables (i.e the short run relationship) should have

a long run relationship which would be obtained by an error correction model such that the VAR form of the model would be the VECM as shown in equation (20) in the methodology. We did not restrict the linear trend in the cointegration equation, as it remains very significant in the overall estimations. Table 5 below shows the unrestricted form of the long run relationship between lnrgdp and the independent variables:

Table 5: Unrestricted long run equation

Normalized co-integrating coefficients:			
Lag=1			
LNRGDP	**LNEDUC**	**INEQUA**	**LNMORT**
1.000000	0.719948 (0.13034) [5.52349] ***	- 0.253671 (0.08208) [-3.09065] ***	1.075719 (0.59016) [1.82277] *
Lag=2			
LNRGDP	**LNEDUC**	**INEQUA**	**LNMORT**
1.000000	0.221670 (0.05806) [3.81794] ***	-0.053721 (0.02997) [-1.79268] *	-0.753763 (0.21140) [-3.56566] ***

From Table 5 above, the sign *, ** and *** denotes the rejection of the null hypothesis of that estimated parameter are statistically insignificant at 10%, 5% and 1% level of significance respectively. The figures in the parenthesis denote the standard deviation of the estimated parameter while those in the bracket denote the t-statistics. The estimated coefficients can be interpreted as the long run elasticity of the variables in the system. The Schwarz criterion (SC) from the estimated model with lag 2 is lesser than lag 1, therefore our interpretation will mainly dwell on lag 2.

(1) Education and Economic growth: When we set lag=2, the educational component has a significant positive impact on economic growth. The coefficient suggested that the growth in the RGDP has a high responsiveness to growth in our educational components such that a 1% rise in educational expenditure, school enrolment level and number of teachers will lead to about 0.22% rise in growth in the long run.

This result is in line with the conclusion of Babatunde & Adefabi (2005) that a better way of encouraging economic growth in Nigeria is by ensuring educational development in the country. He reached this conclusion based on the long run relationship he established between economic growth and education in Nigeria just as we have also established in this work. In addition, when we set the lag length to 1, the result generated is quite similar to those generated using two lag. Here the lnrgdp becomes much responsive to educational component.

(2) Inequality and Economic growth: the estimated long run coefficient of the income inequality component suggested that inequality has a significant negative impact on economic growth at all lag settings. When we set lag at 2, economic growth respond in a significantly negative manner to a rise in income inequality components such that a 1% rise in poverty and unemployment rate will lead to about 0.05% drop in RGDP in the long run. This result is line with the findings of Sharpe (2004) in a detailed study of the relationship between productivity, poverty, and income distribution using Multiple Regression Analysis, that the greater the level of inequality, the lesser the level of productivity and the overall level of productivity is a basic indicator of economic growth.

(3) Health and Economic Growth: the responsiveness of RGDP to the health indicator (mortality rate) happens to be negative and significant in the model. The estimated long run relationship suggested that the Real GDP would drop by about 0.75% for every 1% rise in mortality rate in the long run. The magnitude of this coefficient actually reflects that the elasticity of economic growth to changes in mortality level is high. This result supports the findings of Bakare et al. (2011) that there is a significant positive relationship between health care expenditure and growth of the Nigerian economy using ordinary least square multiple regression analysis. This is because adequate health expenditure can help to combat rising mortality rate.

As mentioned earlier, we estimate the VECM to show the speed of adjustment from short run to long run equilibrium. This is done by estimating the short run model with the inclusion of an adjustment mechanism (ECT) that would help us to see how our variables will converge in the long run. The Schwartz Criterion coefficients for the VEC model with 2 lags is lower in actual term therefore we shall be analyzing the parameter estimate from the VEC model with special attention to lag 2 since the ECT term is significant.

Table 6: Error Correction Model (Short run equation with ECT for long run equilibrium)

	ECT	**Intercept**	**ΔlnRgdp (-1)**	**ΔlnEduc (-1)**	**ΔInequa (-1)**	**ΔlnMort (-1)**	**Δlrgdp (-2)**	**ΔlnEduc (-2)**	**ΔInequ (-2)**	**ΔlnMort (-2)**
VECM (lag=1)	-0.0241 (0.0368) [-0.660]	0.02576 (0.0119) [2.149]**	0.21477 (0.15027) [1.4292]	0.0193 (0.0170) [1.5634]	0.03128 (0.0239) [1.4190]	0.9360 (0.4986) [-1.359]				
VECM (lag=2)	-0.2800 (0.0702) [-3.988]***	0.10892 (0.0259) [4.86794]***	0.0197 (0.1897) [0.1043]	0.0603 (0.0154) [3.3117]**	0.0222 (0.0165) [-1.3392]	0.45884 (1.5974) [0.2872]	0.3902 (0.1643) [2.3739]**	0.0210 (0.0159) [-1.319]	0.0044 (0.0180) [-0.245]	- 2.5668 (1.4279) [-1.7975]*

From Table 6 above the ECT for our model at lag=2 is estimated to be -0.2800. The negative sign shows that the disequilibrium condition will gradually disappear in the long run. With the ECT estimated as -0.312, from VEC model 2; it implies that the disequilibrium among our variables will be reduced by about 28% annually. This implies that there will be a convergence from the short run to the long run equilibrium in every approximate 3.5 consecutive year.

Inequality in the short run appears to be positively affecting growth in the short run. However, this effect is statistically insignificant to real GDP growth in the model. This shows that the rising unemployment and poverty rate that has increase income inequality might have not been showing any significant impact on growth of the economy in the short run. For instance, the country has been witnessing rising growth rate up to about 6% on an average for some periods now, but the negative impact will come out in the long run.

On the other hand, education and mortality follow the theoretical expectation as they have positive and negative statistically significant effects on real GDP respectively. This is a clear indication that adequate investment in basic human development variables of an economy especially education, may yield a significant positive effect on the growth of the economy even in the short run and more often in the long run.

GRANGER CAUSALITY TEST

The granger causality test was also carried out to see the direction of causality between our variables in the estimated model. Given two variables X and Y, X can be said to granger-cause Y if Y can be better predicted using the past values of X and Y than that of Y alone. Katircioglu (2009) explained that there could be spurious

regression result if the time series data are not stationary. Based on this simple illustration, we can formulate a null hypothesis ($H_{0)}$ against an alternative hypothesis (H_1) that:

(H_0) ; X does not granger cause Y

(H_1) ; X granger cause Y $(X \rightarrow Y)$

We should recall that our variables are endogenous and as such we can have the equation linking Y to X too. If there is no long run relationship between series (if there is no cointegration), the Vector Autoregressive (VAR) model will be suitable in testing for the direction of causality (Toda-Phillips, 1993) but this is not the case of our variables.

The cointegration test suggests the existence of a long run relationship between our variables and we can make use of their VECM. This approach to causality is referred to as the block exogeneity wald test by Toda and Phillips (1993). There are various ways in which the result can occur; it is possible to have a form of one way causality (unidirectional causality) running from X to Y or unidirectional causality from Y to X , it is also possible that there is no causality between the two variables or a two way causality between them due to the endogenous relationship.

The granger causality between lnrgdp and other variables that make up the system of equations (VAR) can be simply expressed as follow:

$$Granger\ Causality\ for\ LnRgdp$$

$$LnRgdp\ =\ f\ (LnEduc, Inequa, LnMort)$$

$$(LnEduc, Inequa, LnMort)\ \rightarrow LnRgdp$$

The same thing will be applicable to other equation in the system. The causality result is provided for the VECM at two separate lags. Katircioglu (2009) explained

that the VECM for causality tests; having statistically significant F and t ratios for ECT (-1) would be enough condition to have causation from X to Y and from Y to X as the case may be. The results are presented in the table below:

Table 6: Granger Causality for lnrgdp = f(*lneduc, lnhlt, inequa*)

Null hypothesis	lag 1		lag 2		Remark
	F-stat	t-stat (ECT)	F-stat	t-stat (ECT)	
LNEDUC does not Granger Cause LNRGDP	3.8E-05	2.444259	0.04952	11.05737 ***	LnRgdp→LnEduc
LNRGDP does not Granger Cause LNEDUC	2.09431	0.004166	3.23908 **	0.633781	
INEQUA does not Granger Cause LNRGDP	1.66560	2.013634	1.58894	1.818443	LnRgdp→Inequa
LNRGDP does not Granger Cause INEQUA	3.33099 *	0.402391	2.70507 *	2.456497	
LNMORT does not Granger Cause LNRGDP	0.58817	1.940892	0.30491	12.06144 ***	LnRgdp→LnMort
LNRGDP does not Granger Cause LNMORT	7.97758 ***	1.151980	7.38933 ***	0.003575	
INEQUA does not Granger Cause LNEDUC	2.09604	9.883688 ***	5.23638 ***	5.451603 *	Inequa→LnEduc
LNEDUC does not Granger Cause INEQUA	1.81957	0.012202	2.33201	0.407999	
LNMORT does not Granger Cause LNEDUC	3.14433 **	14.59744 ***	2.40889	0.474959	LnMort→LnEduc
LNEDUC does not Granger Cause LNMORT	10.0743 ***	0.029998	1.38324	0.295707	
LNMORT does not Granger Cause INEQUA	1.09359	0.786384	1.00087	4.242108	LnInequa→LnMort
INEQUA does not Granger Cause LNMORT	11.1775 ***	1.379293	6.54568 ***	1.703537	

The f-stat statistics column shows the long run causality test and *,** and *** denotes the rejection of the null hypothesis at 10%, 5% and 1% respectively. The short run causality test from the VEC Granger Causality (Block Exogeneity Tests) report the Chi-sq values with the corresponding probability values.

The causality test that is presented in Table 7 above shows that there is short run causality from education to economic growth based on block exogeneity test.

However, the real gdp is granger causing the educational components in the long run. In addition, there is no evidence for existence of short run causality between inequality and growth but there is evidence that real gdp is granger-causing inequality in the long run though not based on conventional level of significance (5%).

Results for the causality between mortality and growth shows that mortality will granger cause growth in the short run and the reverse will be the case of this relationship in the long run. One interesting finding here is that there is causality running from inequality to education in both the short run and long run. This supports the common view that education is a function of income level among other factors.

The result further suggests that mortality is granger-causing education in Nigeria. This is also possible because mortality rate (as the proxy of health level) can have a direct effect on the school enrolment rate that is a part of the educational component.

Lastly, the causality results show that income inequality is granger-causing mortality and this is not quite far from our expectation in the sense that high inequality disenfranchises a vast majority of the population from accessing basic health care services, which may be increasing mortality rate.

We also make a report of the sources of innovative shocks in real GDP based on our estimated model.

Table 7: Variance decomposition for LRGDP

Period	S.E.	LNRGDP	LNEDUC	INEQUA	LNMORT
1	0.028283	100.0000	0.000000	0.000000	0.000000
2	0.043071	91.62755	3.378302	4.958336	0.035816
3	0.055789	78.24856	14.04004	6.773609	0.937793
4	0.070377	74.05821	19.35603	5.731313	0.854444
5	0.081368	73.41376	20.26489	5.681788	0.639566
6	0.088870	70.61189	23.07749	5.751842	0.558783
7	0.097089	66.92873	27.18906	5.360072	0.522135
8	0.104986	64.36289	30.14709	5.043408	0.446612
9	0.111308	61.83866	32.86596	4.877981	0.417403
10	0.117316	58.80613	36.13531	4.663040	0.395516

Table 8 above presents the result for the variance decomposition. The Cholesky variance decomposition for real GDP shows that as time goes by the error variance in real GDP that can be attributed to the innovative shocks in the three variables would have increased to about 58.8% after a period of about 10 years. The result suggested that very little proportion of the error variance in real gdp could be explained by shocks from both mortality rate and inequality (about 12.5% altogether) all through the periods. This implies that about 87.5% of the total 41.2% reduction in error variance of real GDP comes from shocks in educational component.

The interpretation of the parameter estimates of the VECM usually provides us the necessary short run interactions within the system. Since we are mainly interested in the long run activities in real economic analysis, the estimated short run coefficients are not really the main point of interest. However, these estimated short run coefficients are used to produce the needed series of parameters that will explain how each variable will response to a unit standard deviation in other variables within the system. This process is referred to as the impulse response function. The result of this analysis is presented in figure 3 below:

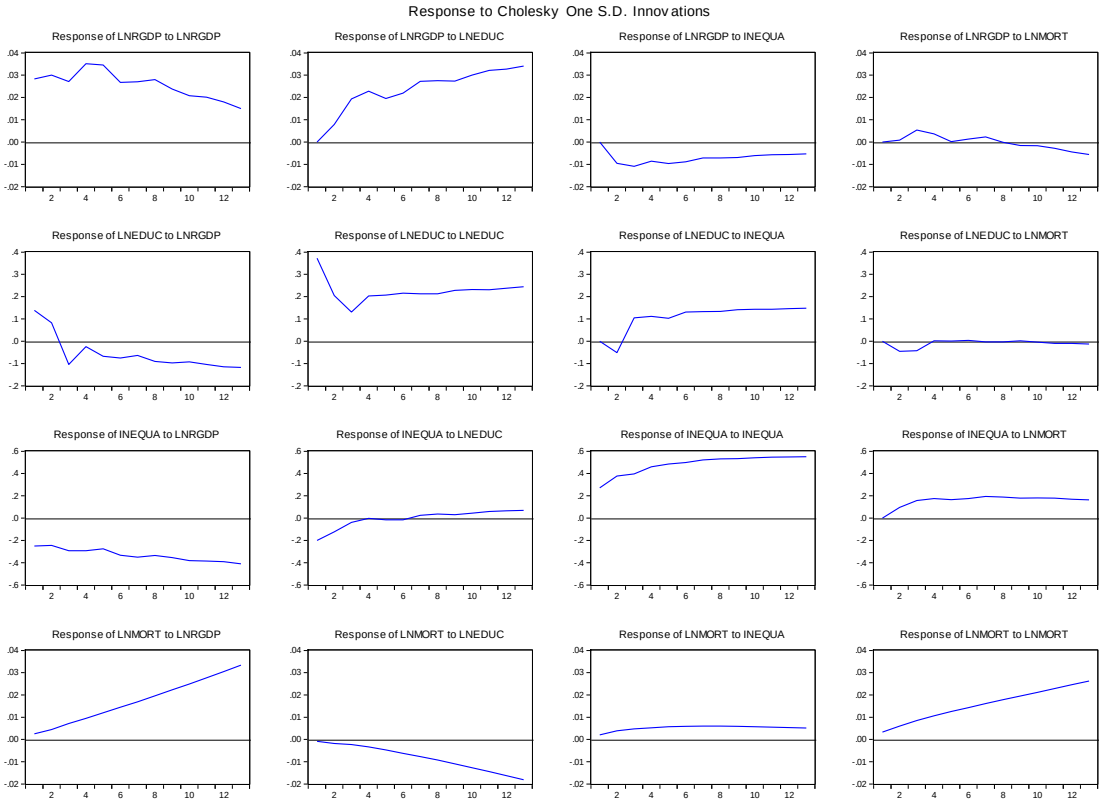

Figure 3: Impulse Response

The response of real gdp to a unit shock (one standard deviation) in education, income inequality and mortality as presented in the 3 above, shows that economic activities respond steadily initially and permanently in a positive manner to shocks in education in the long run. In the case of inequality, real gdp respond gradually in a negative manner and the response later transmits to a permanent negative effect in the long run. Contrary our expectation, the result shows that real gdp initially respond slowly in a positive manner to a standard deviation (shock) in mortality. However, after a short period, the respond later transmits to a permanent negative effect in the long run.

Chapter 6

SUMMARY CONCLUSION AND RECOMMENDATION

6.1 Summary

This study looks at the impact of human development on economic growth in the Nigerian economy. The origin of the human development index can be traced back to the work of an Indian economist Amartya Sen and a Pakistani economist Mahbub ul Haq in 1990. They identified three major components for measuring human development level and by so doing; they created an index based on these components. The index comprises of income indicator, health indicators and educational indicators. The index is usually computed for different countries and has been reviewed for quite a number of times since its inception. Most of the sub Saharan African country have not been rated high on the index especially those in the West African region with specific reference to Nigeria.

In the course of the research, we did a review of some variables that are related to human development with respect to the Nigerian economy. We have examined the three major component of the HDI basically by identifying some related proxies in all categories. The gross expenditure on education by the government and rate of enrolment in school were used to study the educational component while we reviewed the health component from some of its output indicators mainly the infant mortality rate and childhood mortality rate. On the aspect of income inequality, we

examined the poverty and unemployment level as a component in the Nigerian economy.

We tried to look at economic growth from the perspective of endogenous growth theories and we have provided a brief review of the findings of the previous related studies. Time series models were applied in the empirical analysis of this study to see if a long run relationship exists between basic human development variables and economic growth in Nigeria. Data were sourced from the World Development Indicator (WDI), National Bureau of Statistics (NBS) and the Central Bank of Nigeria (CBN).

6.2 Conclusion

The reviews of some existing studies have shown how basic human development variables that constitute human development index affect economic growth especially the education and health variables. However, there is little attention to income inequality partly due to the variation in the findings of various studies that have examined growth and inequality and the fact that there is no consensus on the standard for measuring income inequality. The empirical analysis that was carried out in this study reveals that in the case of Nigerian economy, there is an evidence of long run relationship between economic growth and the identified human development proxies; education expenditures, school enrollment, infant and childhood mortality, unemployment and poverty rate.

Our finding suggested that education plays a very significant and positive effect on growth of the Nigerian economy and better investment in education in terms of

higher expenditure with more proportion of the population enrolled in school will help to stimulate growth in the long run.

The findings in this study also suggest that mortality rate has a significant negative effect on economic growth of the country. The high mortality rate is a sign that no much has been done concerning the health sector of the economy. For instance, the observed trend in public health expenditure in the country based on data from the National Bureau of Statistics reveals that health expenditure as total percentage of the national budgets has been less than 6% since 2009 from about 5.95% to 5.70%, 5.4%, 4.0%, and 4.10% from 2009 to 2013 respectively (NBS, 2013). This low health expenditure may not create any significant positive impact on economic growth of the nation in the long run.

The estimated model also suggested that rising income inequality will create a significant negative impact on the growth of the economy in the long run. We should remember that the proxy components for the inequality measure are poverty rate and unemployment rate. Higher rate of unemployment could be a signal of lower performances in the real sector of the economy or failure of existing businesses. This is probably due to the huge infrastructural deficit in the country and it will end up creating a negative effect on the economy especially in the long run.

6.3 Recommendations

As noted by Sen (1999), all elements of freedom that enhances human capabilities leads to development. Examples of such capabilities are equitable distribution of income, health programs, food security, education and job creation among others. Education plays a major role in fostering economic growth and development through

improvement in labour productivity level. It can also enhance aggregate increase in in the overall level of economic productivity through research and development (R&D) process. Education has been identified as part of the driving force of economic growth in many of the fastest growing economies in the world such as The People's Republic of China (Hongyi LI & Liang HUANG, 2009).

The review of the educational sector in Nigeria has shown that a lot has to be done in the aspect of provision of educational facilities as statistics have shown that there is increasing demand in this sector on yearly basis. There is a need for an increase in public spending in this sector and proper arrangement should be made to ensure that funds are efficiently utilized for adequate provision of modern educational facilities and proper staffing of school. Government and major private stakeholder can also collaborate to encourage R&D by providing necessary supports such as building of research institute, granting of educational subsidies, teachers training workshops and encouragement of intellectual property right.

Our analysis of the health sector of the country using the mortality rate suggests that the sector needs a special attention. As at year 2010, close to 40% of Nigerian population do not have access to improved water supply and an approximate 71% of the population have no access to improved sanitation facilities; also mortality rate for infant and those of age under-5 stands at about 81 and 131 per 1,000 live births respectively (World Bank, 2010). These are clear evidences that both government and private individuals have a great task to play in this sector.

On the part of the government, efforts should be made to reduce the gross inadequate finance in this sector and health care workers should be motivated with adequate

remunerations to discourage the huge emigration of qualified workers in search of greener pastures. Private health care services should also be encouraged since there is a huge deficit in this sector and proper monitoring by designated government parastatals should be ensure in order to adequately save guide the health of the population.

Lastly, on a more generalized level, there are standing empirical studies that have shown that growth and productivity are high when there is high performance in the real sector since it will induce job creation and output tends to be high thereby creating a multiplier impact on overall growth.

The worrisome unemployment situation of the country is a pointer to the low performance of the country in term of manufacturing sector. Higher poverty rate is most likely going to be the situation where people cannot earn income or when they earn too little income that can barely make them to be more productive. In either of the two cases, there is high tendency that a person has no employment at all to earn income or he is underemployed. The gross implication of the rise in these two variables (poverty and unemployment) is that the greater cumulative percent of income will eventually end up in the smaller cumulative percent of the population and this is a situation of inequality.

Government should provide an investment-enabling environment in the country especially in the aspect of power supply and other basic infrastructural facilities. By so doing domestic production can be stimulated and more foreign direct investment (FDI) will be encouraged to come into the country. Loans and grants can be provided for entrepreneurs in the country to bring out the creativity in them and these will

equally encourage the growth of small and medium scale enterprises (SMEs). Lastly, adequate efforts should be made to ensure proper protection of infant industries in the country so as to encourage economic self-reliance.

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