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A Multivariate VAR Modelling of Fertility Rate and the Economic Growth in Nigeria

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Abstract: *The debate on the linkage between fertility rate, its socio-economic variables and economic growth emerged over a long period of time. Economists revolve around three schools of thoughts: The first school of thought views fertility rate as a factor that adversely affects economic growth, the second school of thought states that fertility rate stimulates economic growth while the third school states that fertility rate is a neutral factor to economic growth. This study developed an Econometric Model taking Nigeria as a case study and adopts a time series data from 1981 to 2015, with the aim of providing additional evidence to the ongoing debate and to examine the nature of the causality that exists between them. This is followed by examination of the stochastic characteristics of each time series by testing their stationarity using Phillip-Perron (PP) test. To obtain the long-run and short-run estimates, the reduced form of vector Auto-regressive (VAR) model approach, using accessories of impulse-response functions (IRFs), forecast error variance decomposition (VDC) and Pair-wise Granger causality technique were employed in analyzing the data. The results of the study revealed that there is a direct relationship between gross domestic product (GDP), public health spending (PHES) and life expectancy (LEB) while fertility rate (FR) showed an inverse relationship in Nigeria within the period under study. Furthermore, the results established Uni-directional causality between fertility rate and economic growth in Nigeria over the reviewed years at 5% significance level without a feedback. However, no causality exists between fertility rate and public health spending in Nigeria. The study also confirmed that there is bi-directional causality between public health spending and economic growth in Nigeria. Premised on the findings of this study, recommendations were offered so as to serve as a panacea for Nigeria's economic backwardness.*
Keywords: *Causality, VAR, Fertility Rate, GDP, Nigeria.*

I. Introduction

The global demographic trend has become a subject of discussion among researchers, policymakers and the mass media. Thus, economic growth performance in any country is to a substantial degree affected by the country's demographic situation. In recent times, the developed countries have been experiencing decline in the fertility rates that caused a high level of reduction of the workforce. The plunging fertility rates have also led to the phenomenon called "ageing population" which has become a socio-economic reality in many developed countries and has put a big strain on their pension systems. Furthermore, in 2014, there was a campaign tagged "Do it for Denmark" where Danes were encouraged to go for more babies to check the decreasing birth rates. On the other hand, the poor economic growth performance of developing economies is related to their demographic growth, therefore, funds are allocated for campaign against their population growth. The importance of the relationship between fertility rate and economic growth has been well recognized by development economists. As Dawson and Tiffin (1998) have pointed out, "most textbooks on economic development include a section on fertility and development". Despite the numerous research studies on the relationship between fertility and economic growth or development, there is no universal consensus as to whether fertility expansion is beneficial, detrimental or neutral to economic growth. Thirlwall (1994) observes a historical evidence of ambiguity, especially in the area of trying to provide answers to the cause and effects of the relationship between fertility rate and economic growth.

In another perspective, human development is understood as an intergenerational process of human capital accumulation that is slowed down by market failures, capable of moving a high population of people towards the poverty traps. In turn, human development has a dynamic interaction with long-term economic growth and development drawing from the economy, their resources for human capital investment and returning it to a generation (Weisbrod, 2009). In this long-term context, it is easy to see that health and early child development plays a crucial role in human capital investment with a resultant effect on long-term economic growth. Human capital and its impact on economic growth and welfare are also closely interrelated. If a country is aimed at ensuring sustainable growth and development, the government will ensure that a reasonable percentage of her expenditure is directed towards health care as part of a developmental process. This is a very important change of the mindset, the mechanism by which health and health care lead to economic growth, which is centered on the development of human capital, a term that refers to education, training and health

(Scheffler, 2009).

The health expenditure as a percentage of GDP was averaged at 0.32 in 1986 and no record of significant changes within 1995 and 1999 with an average of 0.33 percent. When comparing the performance of Nigeria with other African countries, it was observed that in 1990, government expenditure on health as a fraction of GDP was 2.7 percent as against 3.5 percent in Ghana, 4.3 percent in Kenya and between 1995 and 1997, 4 percent in Seychelles (Olaniyi & Adam, 2008). Poor expenditure on health sector in most developing countries is worsened by an inverted nature of health expenditure pyramid. About three quarters of all public expenditure on health is for expensive medical care that benefits a small proportion of the population living in the urban areas. A high percentage of the budget for health of about 80 to 90 percent in some countries is spent on hospitals, almost all of which are located in the cities. At the same time, only about 60 percent of the people have access to primary health care. A high proportion of the poor and those living in rural areas are not reached by the health care system and are forced to rely on home remedies and traditional medicine (Griffin & Mckinlay, 2006).

However, the Nigerian health sector has witnessed various turbulent periods that have negatively affected the wellbeing of the citizens and subsequently the productivity of the people which has in turn affected the economic growth and development of the country. In a nut shell, inadequate funding of the health sector is highly responsible for the poor performance of the sector and hence, poor productivity which results in poor economic growth in Nigeria. Evidently, there is high cost of obtaining health care services among the people who patronize private hospitals since the available resources in public hospitals cannot cater for the entire populace. The study of public health expenditure, fertility rate, life expectancy and economic growth will therefore justify the attempt to adopt market economies, with respect to the sector that would be the best portion for the sustainability of Nigeria health sector.

Consequently, this study focuses on the linkage between fertility rate and economic growth in Nigeria. It provides an avenue for more critical appraisal of the direction of causality by the inclusion of fertility rate (FR) variable which was not examined in the past studies. Premised on the foregoing, the objectives of this study are to: (i) analyse the dynamic relationship between vector of exogenous fertility rate variables and economic growth in Nigeria; (ii) examine the causal relationship between vector of exogenous fertility rate variables and the growth of Nigerian economy and; (iii) ascertain the shocks transmission among the exogenous variables and the growth of Nigerian economy. The study is structured into five sections including the introduction as section one. While section two deals with theoretical and empirical review, section three discusses the research methodology of the study which includes the specification and estimation of the model, section four discusses the empirical results, while section five concludes and draws policy recommendations.

II. Review Of Related Literature

Conceptual Clarifications

The concept of natural fertility has evolved over time (Henry, 1999, 2000; Leridon, 1999; Leridon and Menken, 2003) and has found its culmination point in the model of proximate determinants as developed by Bongaarts (Bongaarts, 2002; Bongaarts and Potter, 2003). Earlier, Davis and Blake (1999) provided a seminal contribution with the development of an analytical framework of intermediate determinants of fertility that affected either the exposure to inter- course or the exposure to conception or gestation and successful parturition. Divided over these three categories they identified eleven behavioural and biological factors "through which, and only through which, any social, economic and environmental variable can influence fertility" (Davis and Blake, 1999, p. 214).

Bongaarts further developed this framework by quantifying the effect of Davis and Blake's intermediate variables and collapsing them into eight, and later seven, proximate determinants of fertility. This resulted in a simple but powerful model for analyzing how fertility changes over time or differs from one group to another: Any level of fertility in a population can always be traced to variations in one or more of the following determinants: i) the proportion of married women within the reproductive age (as a measure of the proportion exposed to sexual intercourse), ii) the use and effectiveness of contraception, iii) induced abortion, iv) postpartum infecundability (as primarily determined by the duration and intensity of breast-feeding), v) the frequency of intercourse (including the effect of temporary separation and abstinence practices), vi) the onset of permanent sterility (particularly as related to menopause), and vii) spontaneous intrauterine mortality.

Each of the above stated factors contributes to the reduction of approximately 15 children a woman can have during her reproductive career. The empirical evidence shows that marriage, contraceptive practices, abortion, and postpartum infecundability have the strongest effect on levels and differentials of fertility (Bongaarts, 1993; Bongaarts and Potter, 1983). The model suggests therefore that the total fertility rate can be described as:

TFR = C(m) x C(c) x C(a) x C(i) x TF

Where: TFR is the total fertility rate, C(m) is the index of proportion of married women , C(c) is the index of non-contraception, C(a) is the index of induced abortion, C(i) is the index of lactational infecundity, and TF is the potential total fertility. The framework's exceptional clarity and organizational power had an enormous impact on the research agenda of fertility studies - particularly for economic growth and developing countries, but also for historic populations and the WFS and DHS provided the necessary data to apply the model in a comparative perspective. The significance of the model is partly situated in the structuring of attention and efforts in the search for the ultimate determinants of fertility and fertility change. Fertility itself is no longer the sole subject of research, in addition we need to look for the institutional and behavioural backgrounds of marriage, contraceptive use, breast-feeding, abstinence practices or to cite Freedman, we are faced with "the challenge of specifying the determinants of the proximate determinants" (Freedman, 1986, p.30; Hull, 1983; Leridon, 1982). Whereas any such attempt was completely absent in the work of Bongaarts. Davis and Blake, in fact, used their framework of intermediate variables as a starting point to determine and analyze the institutional factors affecting fertility. Their explanation of fertility rests on the comparative analysis of social organization, which largely boils down on an explanation in terms of family and kinship organization. Whereas Bongaarts' model of proximate determinants, as well as the version of Davis and Blake, analyzes fertility at the level of populations and societies, several researchers try to translate it to the individual level. Hobcraft and Little (1984) state that fecundity and fertility as the outcome of the fecundity - reducing effects associated with the particular set of states that describe women's positions in their reproductive career (relating to pregnancy, absence from sexual relations, contraceptive use, post- pregnancy infecundity).

In Becker's (1993) model of adolescent fertility, he identifies conditional probabilities of live birth, conception, and coitus on the basis of individual data. Hull (1983) and de Bruijn (1999) explicitly incorporate the proximate determinants in a decision-making approach. The value of this integration is that fertility is not seen as the product of one single decision, but as the possible combined effects of numerous decisions with regard to the behavioural - proximate determinants such as marriage and divorce, contraceptive use, abortion, frequency and patterns of sexual intercourse, and breast-feeding practices. This reformulation represents a means to increase the relevance of the concept of individual choice for situations under conditions of natural fertility.

Theoretical Literature

Economic Theories of Fertility

Theoretically, the framework for understanding economic theories of fertility over the long-term is rooted through Malthus theory in the classical and Marxist school of economics which emerged in the 19th and early 20th centuries, and later identified in the economic analysis of population, growth and development in less-advanced countries, particularly in view of their unprecedented rates of population growth (United Nations, 1973). These macro-economic approaches never became standard material in demographic theorizing, unlike the micro-economic orientations that was introduced into the field in the 1960s. Harvey Leibenstein (1957) may be called the progenitor of the view that the number of children is the result of individual decision making within an economic context of income and prices. Among others, Nerlove (2001), Willis (1999), Schultz (2003), and, most prominently Gary Becker (G. A. Becker, 1960, 1965, 1976, 1981, 1991; Becker and Lewis, 1999) developed the consumer choice theory into what became known as the new home economics of the Chicago school. This micro-economic approach, not only involves the traditional variables of income and prices, but also the quality of children and budget constraints in terms of allocation of time and opportunity costs. Given these variables, households are assumed to produce a bundle of consumer commodities—including children - in accordance with the maximization of household utility. The model thereby links fertility decisions to other household decisions, including labour force participation and consumption. The notion of child quality became a key factor in Becker's work to account for the inverse relation between income and number of children as experienced in the fertility transition. The quality of children is assumed to be elastic with respect to income, whereas the quantity of children is not. This implies that the desired number of children may fall as income increases because the average cost per child may increase even faster.

The economic growth approach to fertility rate has experienced immense debate in the literature from varying perspective. Part of the criticism can be traced back to the concepts of choice and decision maker that underlie micro-economic theories: strongly individualistic, de-contextualized, static, relying on a narrow, substantive notion of rationality, and without a sufficient degree of (psychological) realism (de Bruijn, 2001). Obviously, representatives of rival disciplines embark upon such general criticism, but it is also clarified by a number of (behavioral and institutional) economists themselves (e.g., Simon, 1987; Lea et al., 1987; North, 2001). Among the economists working in the field of demography, Leibenstein and Arthur share some of these concerns. Arthur, in a critical review of Becker's Treatise of the Family "call[s] for the use of rules, rights, agreements, hierarchies, organizational institutions - in short, structure" (Arthur, 1982, p. 395). These remarks emphasise the neglect by most economists of the social, cultural, and political environment of decision making. Leibenstein (1999, 2001, 2002) articulates that the concept of choice as used in economic choice theory is only selectively applicable in the study of reproductive behaviour, and much of the fertility outcome must be seen as

the result of routine and rule following procedures.

With regards to the static nature of the new home economics, it can be observed that by and large, economic analysis in demography does not allow for changes in preferences over lifetime as the result of learning and personal experience, and it assumes couples to have defined these preferences at the onset of marriage. Changes in behaviour over time, are in this perspective considered to be the result of variations in restrictions facing the decision-maker. However, a number of economists provide a more dynamic perspective by applying a life-cycle approach to fertility or accept the possibility of preference shifts (e.g., Moffit, 1984; Namboodiri, 1980, 1983; Rosenzweig and Wolpin, 1980; Siegers, 1987; Turchi 1991). Although crucial to Becker's interpretation of fertility, the notion of child quality is not free from controversy, both in terms of conceptualization (e.g., Robinson, 1997) and with regards to the assumption that all children born in a family embody the same quality. The last assumption is refuted by the empirical findings that the value of children may differ by parity (Bulatao, 1981; Bulatao and Fawcett, 1981; Namboodiri, 1983) and by sex (e.g., Miller, 1981; Koenig and Foo, 1995; Nag, 1991; UNICEF, 1991). Criticism of the new home economics growth approach to fertility also refers to the assumption of a single joint household utility function. It assumes that altruism with which Becker (1981) tries to deal with both partners does not seem very plausible as both power and the distribution of costs and benefits of children may differ substantially between them (Caldwell and Caldwell, 1987; Lee and Bulatao, 1983; Fawcett, 1983; Simmons, 1985). Economic decision-making models are usually completely silent about the bargaining processes that settle conflicting interests with regards to progeny.

In several societies, even the absolute authority on fertility decision-making by the parents themselves may be seriously questioned (Khan and Singh, 1987; Koenig and Foo, 1992; Ryder, 1983). Furthermore, the definition of the household concept is difficult, not only with regards to relevant criteria, but also because of possible shifting and rotating membership of both parents and children. The widespread phenomenon of child fostering, especially in West Africa (e.g., Bledsoe, 1990, 1995; Page 1989), puts the standard economic view on direct and substitution costs of raising children in a different perspective. For these reasons, and because in many instances fertility is not a matter of demand but of supply, the new home economics model is still relatively ill-suited for the analysis of fertility in developing countries (Simmons, 1985). With regards to the neglect of supply mechanisms in the standard consumer choice theory and its new home economics version, a very important extension was provided by Richard Easterlin and collaborators (Easterlin, 1975, 1978a, 1978b; Easterlin and Crimmins, 1985; Easterlin et al., 1980). Easterlin's approach complements the strictly demand-oriented model of new home economics with notions concerning the production side of fertility as derived from the intermediate variables framework of Davis and Blake and that of Bongaarts and the concept of natural fertility. In this synthesizing effort, he brings together the scientific paradigms of economics and sociology; but this effort clearly should also be considered as an attempt to bridge the gap between fertility analysis in contemporary Western situations and that under non-Western or historic conditions. This Easterlin synthesis has gained wide acceptance in demographic research and provided the basis of the agenda of the U.S. National Academy of Sciences (Bulatao & Lee, 1983). The model assumes that all determinants of fertility-public health, education, urbanization, family planning programs, work through the categories of the demand for children (depending on household tastes for children and alternative goods, income, and costs and benefits of children), the supply of children (reflecting natural fertility determinants like exposure and frequency of intercourse, postpartum amenorrhea, spontaneous intrauterine mortality, and sterility) and the costs of fertility regulation (lumping together attitudes toward and access to fertility control methods and supplies, as well as the time and money required to obtain the birth control methods).

Easterlin contributed another important theoretical proposition to the economic perspective of fertility behaviour. This contribution (Easterlin, 1978b, 1980) provided a dynamic element to the analysis of fertility and stands out as the sole fully developed cohort theory in demography. The Easterlin hypothesis concerns the adaptivity of fertility preferences (and subsequent fertility behaviour) to the realization of a preconceived lifestyle. It asserts that an individual's desired lifestyle is moulded by experience during the formative period in adolescence at the parental home. The degree of affluence promised by (male) labour market perspectives during the reproductive period determines the number of children that can be sustained while maintaining the standard of living that was experienced during the formative period. The labour market or income-earning opportunities, in turn, are assumed to be negatively related to cohort size. This implies that the tastes for children or reproductive goals are not given, as assumed in traditional economic theory, but formed during the experience of the income effects caused by the entry of differently sized cohorts on the labour market.

Wiseman-Peacock Hypothesis

This theory also dwells on the growth of public expenditure which was put forth by Wiseman & Peacock in the study of public expenditure in UK for the period 1890 to 1955. The main result of the thesis is that public expenditure does not increase in a smooth and continuous manner, but in jerk or step like fashion. At times, some social or other disturbance takes place creating a need for increased public expenditure which the existing public revenue cannot meet. An insufficient pressure for public expenditure and the revenue constraint

was dominating and restraining an expansion in public expenditure but under changed requirements such a restraint is not necessary. The public expenditure increases and reveals the inadequacy of the present revenue. The movement from the older level of expenditure and taxation to a new and higher is the displacement effect. The inadequacy of the revenue, as compared with the required public expenditure, creates an inspection effect. The government and the people review the revenue position and the need to find a solution to the existing problems and agree to a required strategy to finance the increased expenditure.

The attainment of a new level of tax tolerance leads to a greater burden of taxation which consequently results in general level of expenditure and revenue increase. However, the public expenditure and revenue will be established at a new level till another disturbance occurs which can result in a displacement effect. Thus, each major disturbance leads to the government assuming a larger proportion of the total national activities. In other words, there is a concentration that can cause the central government economic activities to grow faster than the state and local level government economic activities (Wagner, 1915)

This theory also explains the relative role of government health spending or health infrastructure on the health status of the people. An economy that pursue an expansionary health fiscal policy will increase expenditure to health sector of the economy, this will enhance the improvement in maternal health care treatment, improvement in life expectancy at birth and also reduce infant mortality rate. Also, if contractionary health spending policy is pursued, the allocation to the health sector of the economy would reduce and this would also affect the health sector significantly. Therefore, the synthesis from the study shows that government health spending on infrastructure / health status of the people influences health indicators.

Empirical Literature

A myriad of literature in recent years has tried to examine the link between health expenditure and health outcome especially as it affects under-five mortality, infant mortality and life expectancy at births. The available studies so far, document a range of effects from no impact to limited impact, and to impact on only specific interventions. Early studies as summarized by Musgrove (2010) found no evidence in the relationship between total spending on health and child mortality. Filmier and Pritchett (2009) present empirical evidence which suggests that public spending on health is not the dominant drive of child mortality outcome, income inequality, female education, and cultural factors such as: the degree of ethno linguistic fractionalization explain practically all of the variation in child mortality across countries. Based on these findings, policy that encourage economic growth, reduce poverty and income inequality and increase female education would do more for attaining child mortality reductions than increasing public spending on health.

Similar findings on the lack of significance of public health expenditure on health status of the people have been presented by others (see Kin & Moody, 2008; Musgrove, 2009 and; Filmier & Pritchett, 2008) who found out that government health expenditure accounts for less than one-seventh of one percent variation in under-five mortality across country, although the result was not statistically significant. They conclude that 95 percent of the variation in under-five mortality can be explained by factors such as: a country's per capita income, female educational attainment, and choice of region. A number of other studies have linked changes in mortality rates in terms of resource use at hospital, managed care, educational status of parents, females and children technological change (Filmier et al 2007; Cutler 2005; Geweke et al 2003; Kesseler and Mc Clellion 2000; Mc Clellan and Noguchi; 1998; Mazunde 2007; Goldman & smith (2002); Glied & Lieras Muney 2003).
In the work of Burnside and Dollar (2009), there is no significant relationship between health expenditure spending and the change in infant mortality in low-income countries. The good policies and institutions (as measured by the World Bank's country policy and institutional assessment or CPIA index) are important determinants of the impact of government health expenditures on outcomes. The quantity of government policies and institution improves (as the CPIA index rises) the impact of government health expenditures on maternal mortality, underweight children, under-five and tuberculosis mortality also increase and is statistically significant (Wagstaff & Cleason 2004). However, they conclude that impact of government expenditures on under-five mortality remains not significant different from zero. The effects of public financing of health expenditures, insurance coverage and other factors on health outcomes are examined by Berger & Messer (2002) with health production models estimated, taking 1960-1992 data across 20 0ECD countries. They find that mortality rates depend on the mix of health care expenditures and the type of health coverage. Therefore, the increases in the publicly financed share of health expenditures are associated with increase in mortality rates. These authors conclude that as countries increase the level of their health expenditures may not lead to a corresponding increase in the proportion of their expenditures that are publicly financed.

Furthermore, Nixon and Umann (2006) show that health expenditure and the numbers of physicians have made significant contribution to improvements in infant mortality and health care expenditure has made relatively marginal contribution to the improvement in life expectancy in the countries over the period of the analysis covering 1980-1995. Also in a cross-sectional data covering 117 countries for the year 1993; Zakar and Wunnva (2007) found that government expenditure on the health care as a percentage of GNP does not play a major role in determining infant mortality rates. They provide a detailed review of 16 studies that have

examined the relationship between health care inputs and health outcome, using macro- level data. They also undertook their own study using data for 15 European countries over the period 1980-1995. They conclude that health expenditure and the number of physicians have made a significant contribution to improvements in infant mortality.

See wananyana and Younger (2004) found that in Uganda, increase in health care expenditures, particularly on vaccination, is expected to impact positively on infant mortality rate in Uganda by 2015. According to researchers, the increase in vaccination rate to 100 percent would have the largest and probably most cost effective and impact reducing infant mortality by 16 deaths per thousand births.

Baldacci *et al* (2003) and Gupata *et al* (2002) establish that social spending is an important determinant of health and education outcomes. These studies found that the effect of social spending on human development indicators is stronger in cross-sectional samples that when the time dimension is also added. They opine that education spending has a greater effect on social indicators than health outlays. The positive effect of social spending on social indicators is also supported by Anand & Ravallion (1993), who equally found a positive relationship between public expenditure on health care and the health status of the poor. Day and Tousignant (2005) examine the relationship between health outcomes and health spending in Canada for the periods 1960-1997, 1950-1997 and 1926-1999 and find some causal relationship between a measure of the health status of the population and real per capita health expenditure to be statistically significant. These relationships were not very strong. The authors indicate that their findings may be due to model mis-specification or may reflect the impact of high level of population health and a small corresponding increase in health spending.

Crémieux, Meilleur, Ouellette, Petit, Zelder, Potvin (2005) also examine the statistical relationship between drug spending in Canadian provinces and overall health outcomes. The analysis relies on more homogenous data and includes a more complete set of controls for confounding factors than previous studies. Results show a strong statistical relationship between drug spending and health outcomes, especially for infant mortality and life expectancy at 65. This relationship is almost always stronger for private drug spending than for public drug spending. The study further indicates that substantially better health outcomes are observed in provinces where higher drug spending occurs. Simulations show that if all provinces increased per capita drug spending to the levels observed in the two provinces with the highest spending level, an average of 584 fewer infant deaths per year and over 6 months of increased life expectancy at birth would result.

Crémieux, Ouellette and Pilon (1999), investigate the relationship between health care spending and health outcomes using annual data collected from the ten Canadian provinces over 15 years. While previous researchers found it difficult to establish such a relationship based on international comparisons, the results based on rather homogenous province-specific Canadian data show that lower health care spending is associated with a statistically significant increase in infant mortality and a decrease in life expectancy in Canada.

Kambiz et al., (2011) examine the relationship between health status and economic growth in Organization of Islamic Conference Member States using time series data from 2001 to 2009 given to other effective factors on economic growth such as life expectancy, fertility rate etc. through a panel model in the framework of a semi log regression model. Their results show that increased life expectancy propels economic growth and there is an inverse relationship between fertility rate and economic growth in those countries.

Ogundipe and Lawal (2011) study the effects of health expenditure on Nigerian economic growth between 1985 and 2009 using data on life expectancy at birth and fertility. They find out that funds judiciously utilized on health matters propel economic growth. Ayoola *et al.* (2012) examine the relationship between health care expenditure and economic growth in Nigeria from 1970 to 2009 using the multivariate co-integration technique and found the existence of one co-integrating vector asserting a long run relationship between economic growth, foreign aid, health expenditure, total savings and population. However, the literature on the relationship between income/growth and health at the macro level is generally inconclusive (Gupta & Mitra, 2003; World Bank, 2004).

In a study of 15 states from India for the period 1973/74, 1977/78, 1983, 1987/88, 1993/94, 1999/2000, Gupta and Mitra (2003) show that per capita public health expenditure positively influence heath status, that poverty declines with better health, and that growth and health have a positive two-way relationship. Also, in a study of India, the World Bank (2004) examines the impact of per capita GDP, per capita health expenditure and female literacy on infant mortality using state-level data over the period 1980-99. The study observes that both per capita public spending on health and per capita GDP are inversely related to infant mortality rate, but the results were observed not to be very robust to alternative specification of the model. By using the adult survival rate as an indicator of health status, Bhargava, et al. (2001) find positive relationship between adult survival rate and economic growth. Results remain similar when adult survival rate is replaced by life expectancy. However, fertility rate has a negative relationship with economic growth. Due to the fact that life expectancy is highly influenced by child mortality, growth in workforce is mostly lower than population growth. Consequently, high fertility rate reduces the economic growth by putting extra burden on scare resources.

Bloom, *et al.* (2004) by using 2 Simple Linear Square technique establish that life expectancy and schooling have a positive and significant effect on GDP. Improvements in health increase the output, not only

through labour productivity, but also through the capital accumulation. The study also finds that improvement of one year in a population's life expectancy resulted into an increase of 4 percent in output. By using the average height adult survival rate and life expectancy as an indicator of health status, Weil (2007) finds that health is an important determinant of income variations in different countries. Approximately 17-20 percent of the cross-country variation in income can be explained by cross-country differences in status of health. Arora (2001) adopts the life expectancy at birth and at ages five, ten, fifteen, twenty, and structure of adulthood as health indicators for 10 industrial countries. The Study finds that improvement in health status has increased the pace of long-term economic growth by 30-40 percent. It also concludes that high rate of disease prevalence and deaths are among the main reasons for poor long-term growth in developing countries.

Lorentzen, *et al*. (2005) analyse the impacts of adult mortality rate on economic growth. The study establishes that high mortality rate reduce the economic growth by curtailing the time horizon. People take actions that yield short-term benefits at the long-term cost. Study also concludes that fertility, investment in physical and human capital, is the channel through which adult mortality rate affect economic growth. Measuring health status by infant mortality rate, life expectancy rate and crude health rate and per capita GNI as indicator of economic growth, Malik (2005) finds that if OLS is used then there is no significant relationship between health status and economic growth. However, when 2SLS is used then study finds highly significant effect of health indicators on economic growth. Again, there are some studies that find an inverse relationship between health indicators and economic output. For example, Acemoglu, Johnson, and Robinson (2003) argue that health differences are not large enough to account for much of the cross-country difference in incomes, and that the variations in political, economic, and social institutions are more central factors. They argue that health does not have a direct effect on growth, but serves in growth regressions as a proxy for the pattern of European settlement, which was more successful in countries with a low burden of infectious disease. The study finds that an increase in the demand for health services caused by an ageing population will negatively affect the economic growth. Other studies that finds a negative relationship between health and growth includes Bhargava, et al (2001) at -0.048%, Caselli, et al (2005) at-0.001% and Sachs and Warner (2006) at -5.40% among other studies.

Nevertheless, the health-wealth causal relationship has implications for the role of a healthy work force in influencing other key policy objectives such as poverty reduction. A priori, one would expect that increase in real GDP per capita would lead to a concomitant reduction in the number of people living in poverty, in as much as the distribution of income remains more or less constant (Duraisamy & Mahal, 2005). Without economic growth, policies to promote distributional improvements may be counter-productive and difficult to sustain. Among several studies, Barro & Sala-i-Matin (2004) provide evidence that regions of the world that are experiencing higher economic growth rates are also experiencing sharp decline in poverty. Bourgoignon (2004) reviews several studies that provide evidence about the poverty-reducing effect of growth when income distribution remains largely the same and also of increase in poverty when income distribution worsens. Ahluwalia (2001) posits that poverty levels have declined significantly in India during the period the country experienced highest growth rates (in the 1990s). Also, Srinivasan (2003) argues that there was no perceptible decline in poverty in India until growth rose in the 1980s. Thus, the study concludes that a necessary condition for eradicating mass poverty is to accelerate annual growth rate of aggregate GDP growth to at least 8%-10% and sustain it at that level for a sufficiently long period.

In the case of Nigeria, most of the studies have related growth to poverty while omitting the human capital (both in terms of education and health) dimension of the analysis. Some of such recent studies include Aigbokhan (2000), Ali (2000), Amaghionyeodiwe and Osinubi (2004) and Addison and Wodon (2007). In general, there is no consensus on the relationship between growth and poverty in Nigeria. While some studies observe increasing growth and poverty (and increasing inequality) some are of the opinion that growth in Nigeria has translated to poverty reduction.

In the same vein, Awe and Ogungbenle (2012) in their study titled social spending, human capital formation and output expansion in Nigerian economy using annual time series data spanning from 1977 to 2005, exploited an Autoregressive Distributed Lag (ARDL) model approach and found that there exist a casual linkage among social spending, human capital formation and output expansion in Nigeria. Using demographic and health survey (DHS) data, Wang (2002) investigates the low-income countries both at the national level; and for rural and urban areas separately. He discovers that at the national level, public health expenditure significantly reduces child mortality. While Harttgen & Misselhorn (2006) assert that access to health infrastructure is important for child mortality and socio-economic factors are often found to be good determinants of health outcomes Notre & Mc Kee (2004); Young 2001; Strheger 2001). Numerous studies (especially those using micro-data) show a close association between child mortality and socio-economic status (for example, Preston 2004 & 2006; Hobcraft et al 1999; Hill 1998; World Bank 2005).

III. Methodology

Theoretical Framework

Like any scientific discipline, demographic research has been governed by theoretical framework. Demographic transition theory (DTT) is the principal theory which tries to explain the process of achieving low fertility in different country. The model of demographic transition suggests that a population's mortality and fertility would decline as a result of social and economic development (Weeks, 1999). Demand theory, Wealth flow theory and the theory of diffusion are among theories of demographic transition, which emphasise the role of socio-economic characteristics of individual, as factors affecting fertility. Demographic transition theory (DTT) posits that every society that undergoes modernization will have a decline in fertility (Kirk, 1996). According to the proponent of this theory, the end result of modernisation is a drop in fertility rates. Education is often identified as one potential stimulant to this fertility decline. Rational choice theory furthermore posits that human behaviour is the result of individual making calculated cost-benefit analyses about how to act and what to do. According to this theory, people will have large families if it is beneficial to them (Robinson, 1992; Boserup, 1985). The traditional demand theories hypothesize that the demand for children will decline with change in socio-economic condition (Bongaarts, 2002; Bongaarts and Walkins, 1996; Cleland & Wilson, 1987). Wealth flow theory (Caldwell, 1982) states that high or low fertility depends on social conditions: essentially the direction of intergenerational wealth flow. The net wealth flow is according to this theory, from younger to older generation in traditional societies, whereas, in modern societies, it is from older to younger generations. Modernization eventually results in the tearing apart of large, extended family units into smaller, nuclear unit that are economically and emotionally self-sufficient. In other words, nuclearization is, according to the theory, the key force in fertility change. However this theory has been criticised.

Theory of Diffusion: This theory states that fertility change happens mostly through adoption of innovation ideas and corresponding behaviour by some people, which are likely to spread to be adopted by others (Montgomery et al, 1993: 457-479). Evidence in support of diffusion thesis is the fact that fertility decline has occurred under a wide variety of social and economic circumstances, with the pace of decline in terms of ethnic boundaries (Rosero-bixby & Casterline, 1993; Lesthaeghe, 1983). In other words, according to the diffusion approaches, the higher fertility of the poor does not reflect their economic rationality, but is rather explained by the fact that the idea of fertility control and the driving force for fertility decline is socio-economic development. In particular, declines in mortality and information on contraceptive methods have not reached the poor, and/ or that contraception is not available to them. Therefore, fertility will decline among the poor with some delay (Birdsall, 1980; Cleland, 1994).

Premised on these theories, it is noticed that socio-economic factors play a great role in fertility regulation. It is in this line that an UN (2002) study concludes that the driving force for fertility decline is socio-economic development, in particular a decline in mortality, and increased female education and labour force participation. Higher mortality among the poor tends to increase their fertility through various mechanisms, such as replacement and insurance effects (Heer, 1983). Lower levels of female education among poor may also partly explain their higher fertility (Birdsall & Griffin, 1988). The implication of these theories to the current study is that in informal settlements characterised by poor socio-economic conditions, fertility is high.

In view of the foregoing, the theoretical base of this study adapts an economic model that explains the economic growth and relative role of government health spending or health infrastructure on the health status of the people and previously used by Scarpetta and Basairini (2001); and Mankiew et al. (1992) to determine the nexus between public health expenditure, fertility rate and economic growth (Yt). Hence, their work which had earlier been reviewed in the empirical studies made use of Gross domestic product (GDP), public health spending (PHES) and life expectancy (LEB) as shown in equation (i) below:

$Y_t = GDP_t = f(PHES, LEB)$ (i)

Model Specification

On the Premises of theoretical exposition and following the extant literature in the work of Scarpetta and Basairini (2001), and Mankiew et al. (1992), this study however, modifies their work by introducing one (1) additional vector of health independent variable of interest as an indicator to health status. Thus, the model becomes:

$GDP = f(PHES, LEB, FR)$ (ii)

The model in its linear form could be re-written as follows:

$Y_t = GDP_t = \phi + \omega LEB_t + \delta PHES_t + \alpha FR_t + \psi_t$ (iii)

Where: ϕ = constant intercept

LEB = Life Expectancy at Birth

PHES = Public Health Spending

FR = Fertility Rate

ω, δ and α are parameters to be estimated

ψ_t = Stochastic error term

All variables are expressed in natural log as expressed econometrically as presented below:

$$InGDP_t = \phi + \omega InLEB_t + \delta InPHES_t + \alpha FR_t + \psi_t \quad \text{(iv)}$$

Based on equation (iv) the parameter must satisfy the following sign restrictions:

$$\phi \neq 0;\ \omega>0;\ \delta>0;\ \alpha>0$$

Description/Identification of variables

The variables used in the research model are specified below:

(i) Economic Growth in Nigeria ($GDP_t=Y_t$) proxied by Gross Domestic Product (GDP_t): In line with economic theory, it is expected that health status components (life expectancy at birth, Public health spending and Infant mortality rate) determine in part the level of economic growth in Nigeria.

(ii) Public health Spending ($PHES_t$): This is also expected to have positive and significant sign on the growth of economy, since an increase in public health spending is expected to improve the health status of the labour force and consequently increase productivity of a Nation.

(iii) Life Expectancy (LEB_t) is the average number of years a child would live if prevailing patterns of mortality of the total population at the time of his/her life. This also is expected to have direct relationship with the rate of economic growth in the economy. This is because as the living condition improves, human longevity is expected to be enhanced and vice-versa. This is achieved when there is improvement in health care expenditure.

(iv) Fertility Rate (IMR_t) is the average number of children that would be born per woman if she experiences no mortality and is subject to a given set of age-specific fertility thr+-oughout her lifetime. If there is increase in expenditure on health, there will be improvement in fertility rate. This is expected to have positive impact on economic growth.

Sources of Data and Measurement

The study relies on secondary data which involves variables consisting of the annual data of the Nigeria economy for the period of 1981 to 2014. These are sourced from Central Bank of Nigeria (CBN) statistical bulletin (2014) various issue, human development reports (2014) and WBWDI World Bank World Development Indicator (2014) various issues on life expectancy at birth(measured by average number of years) and fertility rate (measured by births per woman).

Estimation Techniques and VAR Modelling Approach

The estimation technique employed in this study is the Vector Autoregressive (VAR) model which is discussed as follows:

Stationarity Test

In the literature, most macroeconomic time series variables have unit roots and regressing non stationary variables in the model might lead to spurious regression results (Granger, 1986). In this study, unit root test is conducted on all the variables in order to ascertain the stationary status of the variables. The first or second difference terms of most variables will usually be stationary (Ramanathan,1992). The stochastic characteristics of each time series were tested at levels for stationary in this study by considering their order of integration. The order of integration assisted us in determining the subsequent long run relationship among the variables. The study used Philip-Perron (1988) method unit root test for this purpose, because Philip-Perron (pp) test statistics, which is a modification of the Augmented Dickey Fuller (ADF), takes into account the less restrictive nature of the error process. Moreover, this replaces the use of lags of the Augmented Dickey Fuller (ADF) test which has been arbitrary (Nyong 2003)

Co-integration Regression

In order to buttress stationarity, the null hypothesis of no co-integration is rejected, if the estimated (pp) test statistics is larger than its critical value of 1%, 5% or 10% level of significance. After conducting the stationarity test, we test for co-integration among the series. Co-integration indicates the presence of a linear combination of non stationary variables that are stationary and the variable does not have a mean (drift) to which it returns. The presence of co-integration however implies that a stationary long run relationship among the series is present. The procedure adopted in this study is a representation of the approach of analysis of multivariate co-integrated systems developed and expanded by Johansen and Juselius (1990,1992, and 1994).

Unlike the Engle-Granger static procedure, the Johansen vector autoregressive (VAR) procedures allow the simultaneous evaluation of multiple relationship and imposes no prior restrictions on the co-integration space. In addition, the adoption of VAR was informed by the fact that VAR technique is commonly used for analyzing the dynamic impact of random disturbances (shocks) on the system of variables. Also since few restrictions are placed on the way in which the system variables interact, this method is well suited for examining the channels through which a variable operates. In effect, the strength of the VAR model lies in its ability to incorporate the residual from the past observation into the regression model for the current observation. The technique also has the advantage of being easy to understand, generally applicable and easily extended to nonlinear specifications and models that may contain endogenous right hand side variables (Philips 1987). Pesaran *et al* (2001) further

asserts that this technique allows a mixture of I(0) and I(1) variables as regressors, that is, the order of integration of relevant variables may not necessarily be the same.

Vector Error Correction Model (VECM)

VECM is a kind of Vector autoregressive model used with co-integration restrictions. The purpose of the VECM is to focus on the short run dynamics while making them consistent with long run solution. If a number of variables are found to be co-integrated with at least one co-integrating vector, then there always exists a corresponding error-correction representation which implies that changes in the dependent variable can be formulated as a function of the level of its disequilibrium in the co-integration relationship and fluctuation in other explanatory variables. According to Pesaran et al (2001), Vector Error Correction Model (VECM) can be developed as follows:

$$\Delta \text{InGDP}_t = \phi + \omega \Delta \text{InLEB}_t + \delta \Delta \text{InPHES}_t + \alpha \Delta \text{FR}_t + \sigma_{t-1} + \psi_t \qquad \text{(v)}$$

where Δ is the first difference operator, σ is the estimated residual from equation (iii) ie (*GDP* – ωLEB – δPHES – αFR) and ψ_t the error term. The Granger representation theorem requires that the coefficient of the error term in short run equation (6) be negative and statistically significant to confirm the co integration of the variables.

Similarly, this VAR model approach also permits us to perform a regression for a system of equations to examine the interrelationship that exist between economic variables using minimal assumption about the underlying structure of the economy. The VAR equation contains lagged values of all the variables in the system where all the Variables are predetermined (no exogenous variables). The aim was to provide good statistical representation of the past interaction between the variables. This technique of estimation was introduced by Sim (1980), and is advantageous in that it avoids the imposition of potentially spurious a-prior constraints that are employed in the specification of structural models and also there is no issue of simultaneity since only lagged values of the endogenous variables appear on the right hand side of the equation. The VAR approach is equally unique in analyzing the determinants of public health expenditure in Nigeria, since one can estimate the dynamic aspects between these variables without having a specified full structural model. The approach also has the advantage of being easy to understand, and easily extended to non linear specifications model (Forgha & Mbella (2013). Since the VAR involves series of equations, we can assume that each equation contains K lagged values where we can estimate the equation using the Ordinary Least Squares approach. Specifying a VAR model of order k, the general form of an unrestricted reduced form of a VAR is as shown below:

$$V_t = \phi \quad +\sum_{j=1}^{k} \phi_t + V_{t-} \psi_t \qquad \text{(vi)}$$

Equation (v) presents a VAR (k) process where:

V_t is a vector of stationary endogenous variables, ϕ is a vector of constants, ϕ is the elasticities, k is the total number of lags and ψ_t is the vector of error term. The VAR general model is further decomposed in its matrix form as presented below.

The empirical model is presented as follows to ascertain the shock transmission between vector of fertility rate variables and economic growth using the VAR reduced form.

$$\text{GDP}_t = \phi_{1t} + \sum_{j=1}^{k=2} \psi_{1j} \text{GDP}_{t-j} + \sum_{j=1}^{k=2} \mu_{1j} \text{PHES}_{t-j} + \sum_{j=1}^{k=2} \lambda_{1j} \text{LEB}_{t-j} + \sum \beta_{1j} \text{FR}_{t-j} + \text{Ơ}_{1t} \qquad \text{(vii)}$$

$$\text{PHES}_t = \phi_{2t} + \sum_{j=1}^{k=2} \psi_{2j} \text{GDP}_{t-j} + \sum_{j=1}^{k=2} \mu_{2j} \text{PHES}_{t-j} + \sum_{j=1}^{k=2} \lambda_{2j} \text{LEB}_{t-j} + \sum \beta_{2j} \text{FR}_{t-j} + \text{Ơ}_{2t} \qquad \text{(viii)}$$

$$\text{LEB}_t = \phi_{3t} + \sum_{j=1}^{k=2} \psi_{3j} \text{GDP}_{t-j} + \sum_{j=1}^{k=2} \mu_{3j} \text{PHES}_{t-j} + \sum_{j=1}^{k=2} \lambda_{3j} \text{LEB}_{t-j} + \sum \beta_{3j} \text{FR}_{t-j} + \text{Ơ}_{3t} \qquad \text{(xi)}$$

$$\text{FR}_t = \phi_{4t} + \sum_{j=1}^{k=2} \psi_{4j} \text{GDP}_{t-j} + \sum_{j=1}^{k=2} \mu_{4j} \text{PHES}_{t-j} + \sum_{j=1}^{k=2} \lambda_{4j} \text{LEB}_{t-j} + \sum \beta_{4j} \text{FR}_{t-j} + \text{Ơ}_{4t} \qquad \text{(x)}$$

From the above, the estimated ƓƆ's are the stochastic error terms which is also called impulse or shock elements, ψ, μ, λ, β are the unknown coefficients/parameters and ϕ is the autonomous/constant term. This helps to provide a clear distinction between correlation and causality as the impulse responds function. We also logged the Variables for direct estimation and interpretation of the coefficients as degree of responsiveness or elasticity. From the VAR models, the estimated ƓƆs are a vector of residuals. The residuals ƓƆs, represent the unexplained movement of the variables reflecting the influence of exogenous shock. It also represents a composite of the various exogenous shocks affecting the endogenous variables in the model. However, the standard VAR used in this work is limited to two lagged as explained by the Lagged Distributive Model. Before our estimation, we tested for stationarity of the variables using Phillip Peron test to ascertain the level of stationarity of the included variables and to avoid spurious results. The granger causality test like the Johansen Co-integration test was conducted to enable the result show the level of causality between the variables used in the model given that the variables were stationary at the same level. The Akaike Information Criteria and the Schwarz Criteria were employed in determining the number of lags used in the model.

Impulse Response Functions (IRFs)

VAR model is the best method for investigating shocks transmission among variables. A shock to the i-th variable not directly affects the i-th variable but is also transmitted to all of the other endogenous variables through the dynamic (lag) structure of the VAR. An impulse response function of the VAR traces the effect of a onetime shock to one of the innovations on current and future values of the endogenous variables. It is customary to specify ten periods (a decile) for each observation in an impulse response analysis and the analysis is best expressed in VAR form Adrangi & Allender (2006). The accumulated response is the accumulated sum of the impulse responses.

Variance Decomposition (VDC)

While impulse response function traces the effects of a shock to one endogenous variable to the other variable in the VAR, variance decomposition separates the variation in an endogenous variable into the component shocks to the VAR. Thus, the variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the VAR.

IV. Discussion Of Results

Table 1: Philips-Perron Unit Root Test Results.

Remark	Order of Integrt.	C.V. 1%	C.V. 5%	1st Diff. PP- Test	@ Level PP-Test	Variables
Stationary	I(1)	-3.661661	-2.960411	-9.498764	-0.280504	GDP
Stationary	I(1)	-3.661661	-2.960411	-6965370	2.736349	PHES
Stationary	I(1)	-3.653730	-2.957110	-5.996729	-0.663634	LEB
Stationary	I(1)	-3.653730	-2.957110	-4.932449	1.216073	FR

Source: Author's Regression Output

The Philip-Perron (pp) test was conducted on all the variables at levels I(0), and first differences I(1). The results are presented in table 1. The result shows that all the variables were stationary at their first differencing 1(1). This implies that the hypothesis of non-stationary was rejected for all the variables at their difference form, and thereafter resulted to proceed to co-integration test in the next sub-section.

Johansen Co-integration Test Result

Following the properties exhibited by the time series variables above, a co-integration test was carried out to examine the long-run relationship among the variables. The framework established by Johansen (1990) was employed to carry out the test. The result of the co-integration test for the model is presented in table 2.

Table 2 Johansen co-integration Test Results

Unrestricted Co-integration Rank Test (Trace)

Prob.**	5% Critical value	Trace Statistic	Eigen Values	Hypothesis no. of CE(s)
0.0005	47.85613	65.81745	0.738724	None *
0.1917	29.79707	24.20989	0.312856	At most 1
0.1312	15.49471	12.57834	0.238346	At most 2
0.0419	3.841466	4.138184	0.124964	At most 3 *

Trace test indicates 2 co-integrating equation(s) at 0.05 level

*denotes rejection of the hypothesis at the 0.05 level

**Mackinnon-Haug-Michelis(1999) p-value

Source: Author's Regression Output

The variables included in the co-integration test are the GDP, PHES, LEB and FR. The co-integration test result shows the existence of two co-integration equations in the model variables. This confirms the existence of a long-run relationship between the variables in the model at 5 per cent significance level. The result further shows that the maximum Eigen value statistic affirms the existence of a long-run relationship between public health expenditure, fertility rate and economic growth in Nigeria and can be used in forecasting

long term policy for Nigeria.

Table 3: Parameter Estimates Vector Auto-Regressive (VAR) Model Results

FR	LEB	PHES	GDP	
1.62E-09	3.40E-09	-0.004382	-0.631131	GDP(-1)
6.68E-09	5.68E-08	0.002647	0.042764	GDP(-2)
8.28E-07	1.88E-05	1.476906	216.9484	PHES(-1)
-7.97E-07	-1.58E-05	-0.042074	39.66088	PHES(-2)
0.005501	0.713126	2115.017	-1737860	LEB(-1)
-0.010168	-0.176650	-1905.968	671509.0	LEB(-2)
1.094508	1.260486	-24661.03	-6425145	FR(-1)
0.057213	-0.778614	13079.06	-1578015	FR(-2)
-0.830391	18.08072	69215.98	1.04E+08	C
0.990018	0.813654	0.986893	0.887711	R^2
272.7390	12.00751	207.0626	21.74029	F-statistic

Source: Author's Regression Output

The results in table 3 indicates that there is strong relationship existing among the GDP, PHES, LEB and FR which further implies that all the variables leads to a rise in the growth of the economy. The coefficient of the lags indicates that they both have significant and insignificant interpretations of some of the variables in the model. The results show the level of endogeneity of the selected variables. Comparing the critical F-values and the R^2s, it can be deduced that GDP, PHES, LEB and FR are more exogenous than being endogenous variables having R^2 ranging from 81% to 99% respectively.

Vector Error Correction Estimates Analyses

As evidenced in table 4 of the appendices, the vector error correction estimates indicates that short run changes in GDP at fist lag, PHES and FR at all lags are inversely related with GDP in the current period. This suggests a possible adverse economic policies and actions that had affected public healthcare spending and fertility rate in Nigeria and the inability of the health sector to make appropriate budget provision for the citizenry in the short run. This result supports the long run direct relationship of the various health reforms with GDP as explained above. Furthermore, some of the vectors of health variables are insignificant in explaining changes in GDP in the short run. This also supports our initial position on the expansion and development of the health sector in the short run. The absolute value of the error term returned the expected sign and is significant. It shows that the model returns to equilibrium at the speed of 42 per cent when the variables are above their equilibrium.

VAR Granger Causality / Block Exogeneity Wald Test Analyses

The pair-wise granger causality test was used to assess the causal relationship between the level of economic growth (GDP) and among the variables used in the study. From table 5 of the appendices, it can be deduced that there is no causality between PHES and FR in the model. The result also revealed that there is a two-way causality between GDP and PHES in the model. However, uni-directional causality exists between GDP and LEB, FR and GDP, PHES and LEB and between FR and LEB at 5% significance level without a feedback.

Impulse Response Analyses

The following analysis are reported from the results of VAR impulse response functions as evidenced in table 6 and figure 2 respectively of the appendices.

i. A standard deviation change (shocks) in GDP was initially around zero equilibrium but gradually increased at a decreasing rate up till 2nd period and further oscillated to 3rd and 4th period up to about 100%

ii. A standard deviation change (shocks) in GDP was initially less than 1% but gradually drifted positively to 2nd period and later decreased to 4th period, produced unstable effects on PHES both negative and positive up till the 9th period when the effect diverged drifting more above zero equilibrium and became more explosive towards the positive drift.

iii. A standard deviation change in GDP to LEB was around zero equilibrium but later drifting negatively to 2nd period before it increased to 3rd & 4th period when the shocks had stable effect on the LEB to the 9th period confirming that LEB is a better predictor of GDP in Nigeria.

iv. A standard deviation in GDP to FR was at zero equilibrium from 1st period having unstable effect on GDP drifting negatively away from equilibrium by 1% to 3rd period but later increased to 4th period at a decreasing rate to 9th period negative drift.

v. A standard deviation change (shocks) in PHES to GDP and drifted negatively down initially up to 2nd period from zero equilibrium thereafter, increased to 3rd period up to the 4th and 5th period before it became explosive to the 9th period drifting away from equilibrium position

vi. A standard deviation change (shocks) from PHES to PHES was initially around zero equilibrium, increased positively to 2nd period at a decreasing rate to 3rd period before it finally increased to 9th period.
vii. A standard deviation change from PHES to LEB was at zero equilibrium, drifted towards 2nd period, later rose positively to 3rd period and became more explosive towards 9th period positive drift.
viii. A standard deviation change from PHES to FR was around zero equilibrium moving towards 4th period and slightly produced a stable effect on PHES from 4th period to 10th period implying that PHES is a better determinant of LEB in Nigeria
ix. A standard deviation change (shocks) from LEB to GDP was around zero equilibrium before oscillatory to 2nd, 3rd & 4th period decline slightly to 6th period and later drifting away to 9th period
x. A standard deviation change (shocks) from LEB to PHES was initially around zero equilibrium drifting from negative to positive position at 2nd period and became more explosive towards the positive drift up to 9th period
xi. A standard deviation change (shocks) from LEB to LEB was at zero equilibrium which marked a decline from positive side at 1% to 3rd period at a decreasing rate to 5th period drift up to 9th period
xii. A standard deviation change (shocks) from LEB to FR was initially at zero equilibrium increasing positively to 2nd period thereafter had a stable effects on FR negatively up till the 9th period.
Xiii. A standard deviation change (shocks) from FR to GDP was initially at zero equilibrium, negatively increasing to 3rd period and later slightly drifting up till 9th period from equilibrium position.
xiv. A standard deviation change (shocks) from FR to PHES produced a stable effect on PHES throughout the period confirming that PHES is also a better predictor/determinant of FR in Nigeria.
xv. A standard deviation change (shocks) from FR to LEB initially produced a stable effect at zero equilibrium up to 3rd and slightly decreasing to 4th period before it became explosive to 9th period drifting away from equilibrium position.
xvi. A standard deviation change (shocks) from LEB to LEB was initially at zero equilibrium level, it had positive and stable effect to its feedback throughout the periods from equilibrium position.

Variance Decomposition Analyses

The variance decomposition is shown in table 7 of the appendices comprising (Panel A to D) and also the variance proportion in figure 2 of same appendices. Therefore, the results in table 7 suggests that, shocks from GDP had 100% effect on GDP in the 1st period but the effect gradually decreased to about 83% in the 2nd period and to about 41% in the 10th period. On the other hand, the shocks from PHES to GDP gradually increased from 1% to about 14% at 2nd period and further increased to 44% in the 10th period. It shows that GDP has positive impact on PHES in the long-run in Nigeria. The contribution from LEB increases from 0% in period 1 to 2% in period 3 and further increased to 4% in the 10th period. Also the contribution from FR increases from 0% in period 1 to 4% and to about 11% in period 10.

The contribution of GDP to shock in PHES ranges from about 16% in period 1 and increases to about 56% in period 2 which gradually decreased to 13% in the 10th period. On the other hand, shocks from PHES to PHES was about 84% and decreases to 43% in period 2 and further increased to 80% in the period 10. The contribution from LEB increases from 0% in period 1 to 6% in the 4th period and later decreased to 4% in the period 10. Also, shocks from PHES to FR seemed to be stable throughout the period (around zero equilibrium level) and increases to 3% in period 10. Thus, confirming that PHES is a good determinant of FR in Nigeria.
A shock received by LEB from GDP was as a result zero equilibrium level in period 1 up to 2% in the period 10. On the other hand, the contribution from PHES decreases from 14% in period 1 to 12% in the period 3 and later increases from 16% to 68% in period 10. Shock from LEB increases from 85% in period 1 to 88% in period 2 and later decreased to 26% in the 10th period. The contribution from FR increases from 0% in period 1 to 3% in period 4 and later decreased to 1% in 10th period.

Shocks from FR to GDP seemed to be stable throughout the period (around zero equilibrium level). The Confirmation of FR as a good determinant of GDP in Nigeria is revealed as the contribution from PHES increases from 0% in period 1 to 40% in the 10th period. Also, shocks from FR to LEB appear to be stable throughout the period (around zero equilibrium level). It is also obvious that FR is also a good determinant of LEB in Nigeria. Finally, the shocks from FR to FR decreases from 94% in period 1 to 56% in the period 10 confirming that its own shocks affected FR predominantly.

Descriptive Trend Analysis

Figure 3 as reported in the appendices shows the trend analysis of fertility rate in Nigeria during the period under study (1981-2015). The graph shows that the period 1981-1986 was characterised by a rise in fertility rate in Nigeria, which was immediately preceded by a slight decrease in the fertility rate of Nigeria in the period 1986-2011 before a sporadic increase in the trend of Nigerian fertility rate within 2011 to 2015.
Furthermore, figure 4 of same appendices reported a line graph showing the trend analysis of the GDP in Nigeria for the period under study (1981-2015). A cursory look at the graph revealed that the GDP growth rate of Nigeria was characterized by a steep increase in GDP of Nigeria in the period 1981-2009 up to 2010 having

a sharp decrease in the GDP and later increased from 2010-2011 before it finally rose year 2015.

Discussion of Findings

The results of this study reveal that positive relationship exists among gross domestic product (GDP), public health spending (PHES) and life expectancy (LEB) in Nigeria; while fertilty rate (FR) showed an inverse relationship as evidenced in table 1. This result is in agreement with earlier studies carried out by Sewancyana and Younger (2004); Anand and Rewillion (2003); Hojiman (2006); Bidani and Ravallion (2007) and Gupta et al (2003) as they all found a positive relationship between public expenditure on health and health status.

The result of the study also indicates that gross domestic product (GDP), public health spending, life expectancy and fertility rate in Nigeria are more exogenous variables than being endogenous variables implying that the selected variables are the major determinants of each other in the model as evidenced in table 4. This result is in congruence with the outcomes of the studies carried by Berger and Messer (2002), Cremieux et al. (2010), Kee (2001), Cremieux et al (2005) who found a statistically significant relationship between infant mortality rate, life expectancy and age standardized mortality rate health status and both health spending and per capita income.

The result in table 5 confirms that there is no causality running from public health spending (PHES) in Nigeria and Fertility rate (FR) and conversely running from public health spending (PHES) in Nigeria implying that public health spending and Fertility rate does not granger cause each other.

On the other hand, the study reveals that there is bi-directional causality running from public health spending and economic growth in Nigeria. This result is in agreement with Awe and Ogungbenle (2009) who found that there is causal linkage between social spending and economic growth in Nigeria. Also, uni-directional causality exist between GDP and LEB; FR and GDP; PHES and LEB and; between FR and LEB at 5% level of significance without a feedback.

The results obtained from impulse response function and variance decomposition of the vector Autoregressive (VAR) model reveals that PHES is a better predictor for both LEB and FR in Nigeria. Summarily, the GDP is equally found to be a better predictor for both LEB and FR in Nigeria. The GDP is predominantly affected by its own shocks confirming that it is the most exogenous variable among the selected variables of interest.

Synthesis and Policy Recommendations

Premised on the findings of this study, the study sequentially concludes that there is no causal linkage between fertility rate and public health spending over the years in Nigeria. Therefore, from the empirical analysis, the following recommendations are made:

(i) For fertility rate to improve in Nigeria, it is imperative for government to embark on women sensitization programmes that will create awareness, the exact current age-specific fertility rates of women in the country which in turn shows a good pointer to her public health spending.

(ii) It has been established in this study that there is a Uni-directional causality between gross domestic product (GDP) and life expectancy at birth (LEB) in Nigeria at 5% level of significance without a feedback, implying that for Nigeria to experience a sustainable economic growth, it has become necessary for government to put in place measures to boost the life expectancy of her citizenry as this will serve as a panacea for her economic backwardness.

(iii) The study further establishes causal linkage between public health spending and economic growth in Nigeria. This indicates that government should increase her public health spending in Nigeria that will invariably boost her economic growth.

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References

[1]. Adedeji, A.S.R and Morisson, M. Eds. (1998).“The Human Dimension In Africa’s Persist Economic Crises”. United Nations Economic Commission for Africa. Hans Zell Publisher, pp. 377-391.

[2]. Arjona, R.M. Ladiaque, Person, M. (2001).“Growth; Inequality and Social Protection, “OECD Labour Market and Social Policy Occasional Paper No.51 (Paris:OECD)

[3]. Awe, A.A and Ogungbenle, S, (2009).“Social spending, human capital formation and output expansion in Nigerian economy: 1977-2005” international journal of administrative studies and research, Vol1, 1127-53.

[4]. Baldacci, E.B Clement, Gupta S. and Cui, O. (2004).“Social Spending, Human Capital and Growth in Development Countries Implications for Achieving the MDGs”. International Monetary Fund (IMF) Working Paper. Wp/04/217, Washington. DC:pp3-8

[5]. Barro, R. and X, Sala-I-Martin, (1995). Economic Growth, McGraw- HillBook Company New York.

[6]. Bassanmi, A. and Scarpetta, S. (2001). “Does Human Capital MATTER FOR Growth in OECD Countries? Evidence from Pooled Mean-Group Estimates,” OECD Department of Economics Department Working Paper No. 282(Paris: OECD)

[7]. Becker Gary S. and Lewis H. Gregg, (2000). On the interaction between quantity and quality of children. Journal of Political Economy, vol. 82, p. 29–88. Becker Gary S., 1976. The economic approach to human behaviour. Chicago, University of Chicago Press, 314 p.
[8]. Becker Gary S., (1960). An economic analysis of fertility, in: Gary S. Becker (ed.), Demographic and economic change in developed countries, p. 209-240. Princeton (New Jersey), Princeton University Press, National Bureau of Economic Research, 356 p.
[9]. Becker Gary S., (1999). Atheory of the allocation of time, The Economic Journal, vol. 75(299), p. 493–517. Becker Gary S., 1981. A treatise on the family, Cambridge (Mass.), Harvard University Press, 288 p. (2nd ed., 1991, 424 p).
[10]. Becker Stan, (2001). The determinants of adolescent fertility with special reference to biological variables, in: Ronald Gray, Henri Leridon and Alfred Spira (eds.), Biomedical and demographic determinants of reproduction, p. 21–49. Oxford, Clarendon Press, 482 p.
[11]. Bokhari F.A.S., Gai Y. and Gottret, P. (2006). "Government Health Expenditures and Health Outcomes", Health Economics, May.
[12]. Cremieux, P.Y, Meilleur, M.C., Ouellete, P., Zelder, M. and Potvin, K. (2005). '' Public and Private Pharmaceutical Spending Determinants of Health Outcomes in Canada." Health Economics 14(2), 107-116
[13]. Cremieux, P.Y, Ouellette, P. and Pilon, C.(2010). "Health Care Spending as Determinants of Health Outcomes." Health Economics 8(7), 627-639.
[14]. Cutler, D.A., and Lieras-Muney, A. (2006). "The determinants of Mortality". Journal of Economics Perspective, January.
[15]. Day, K. and Julie, T. (2005). "Health Spending, Health Outcomes, and Per Capita Income in Canada: A Dynamic Analysis", Working Paper 2005-07 (Department of Finance, Canada), June
[16]. Engle, R.F and Granger, C.W.J. (1987)."Co integration and Error Correction: Representation, Estimation and Testing". Econometrical. Vol.55.pp251-76.
[17]. Fogel, R.W. (2002). Nutrition, Physiological Capital, and Economic Growth." Pan America Health Organization and Inter America development Bank. Glewwe, P. (1996): "The Relevance of Standard Estimates of Rates of Return to Schooling for Education Policy: A Critical Assessment", Journal of Development Economics, Vol.51, pp. 267-290.
[18]. Glewwe, P. (1997). "How Does Schooling of Mothers Improve Child Health ?", Living Standard Measurement Study, 128 World Bank: Washington DC
[19]. Granger, C.W.J. (1986). "Development in the study of Co-integrated Economic Variable", Oxford Bulletin of Economics and Statistics. Vol. 48, No3.
[20]. Griffin and Mckinlay (1992). A high proportion of the poor and of those living in rural areas vol. 22, pg 34.
[21]. Johansen, S. (1995). Likelihood-based inference in Co-integrated Vector Autoregressive Models. Oxford, Oxford University Press.
[22]. Johansen, S. and Juselius, K. (1990)."Testing Structural Hypothesis in a Multivariate Co-integration Analysis of the PP and the UIP for UK", Journal of Economics, 53, 211 -244.
[23]. Johansen, S. and Juselius, K. (1990)."Maximum Likehood Estimation and Inference on Cointegration- with Application to the Demand for Money". Oxford Bulletin of Economics and Statics 52, pp. 169-210
[24]. Johansen, S. and Juselius, K. (1994)."Identification of the Long-Run and Short-Run Structure: An Application to the ISLM Model", Journal of Economics, 63,7-36,56,69-75.
[25]. Ilori, I.A. and Ajiboye, M.O. (2015). The impact of health expenditure on the growth of the Nigeria economy: The ARDL Approach vol.III Issue 12 pg361-389. S
[26]. Kee, G.S (2001)."An Empirical Analysis of Canadian Public Health Care Spending and Health: 1975 to 1996." Master's thesis, Calgary, University of Calgary.
[27]. Mankiw, G.N., Romer, D. and Romer, D. and Weil, D.N. (1992)."A Contribution to the Empiricism of Economic growth", Quarterly Journal of economics, Vol. 107, pp. 407-37.
[28]. Matteo, C., and Uwe S. (2003)."GHuman Capital Formation, Life Expectancy and the Process of Development ." JEL, University of Bonn.
[29]. Mayer-Foulkes (2004)."The intergenerational impact of Health on Economic Growth". A Paper Written for the Global Forum for Health research, Forum 8, Mexico City 16-20, November.
[30]. Niloy B. and Haque, M.E. and. Osbron, D.R (2003)."Public expenditure and Economic Grwoth: A Disaggregated Analysis for development Countries" Centre for Growth Business Cycle Research, School of Economic Studies, University of Manchester, M139PL, UK.
[31]. Nixon, J. and Ulmann, P. (2006)."The Relationship Between Health Care Expenditure and Health Outcomes". European Journal of Health economics, 7, 7-18.
[32]. Nolte, J. and Mckee, M. (2004). "Does Health Care Save Lives"? The Nuffield Trust, London, 58.
[33]. Hicks, N. and Streeten, P.P. (1979)."Indicators of Development: The Search for a Basic Needs Yarstick," World Development, Vol.7.
[34]. Nyong, M.O. (2003): in Ndiyo, Ndem Ayara (2007)."A Dynamic Analysis of Education and Economic Growth in Nigeria" Journal of Development Area. The Fall.
[35]. Olaniyi, O.O and Adam, J.A (2003); (2008)."Public Expenditure and Human Development in Nigeria". In Human Resources Development: Selected Papers for the Year 2002 Annual Conference, the Nigerian Economic Society (NES), Part Three, Pp. 157-197.
[36]. Pesaran, H.M., Shin, Y. and Smith R.J. (2001)."Bounds Testing Approaches to the Analysis of Long-run relationships". Journal of Applied Economics, 16,289- 326.,P.C.B (1987): "Towards a United Asymptotic Theory of Autoregressive". Biometrical, 74:535-48
[37]. Philips, P.C.B, and Perron, P. (1988)."Testing for a Unit Root in Time Series regression". Biometrical, 75:335-46
[38]. Scheffler, R.M. (2004)."Health expenditure and Economic Growth: An international Perspective". A Paper Presented at the University of South Florida Globalization Research Centre, November.
[39]. Sewancyana and Younger (2004); Anand and Rewillion (2003); Hojiman (2006); Bidani & Ravallion (2007) and Gupta et al (2003). Found a positive relationship between public expenditure on health and health status.
[40]. Weisbrod (2009). Human development has a dynamic interaction with long-term economic growth and development drawing from the economy Vol II. Pg 2-7

Appendices

Appendix 1: Table 4: Vector Error Correction Model Estimates

T-stat	Std Error	Coefficient(s)	Variables
0.81190	3796683	3082523.	C
-1.60779	0.42007	-0.675388	D(GDP(-1))
1.33899	0.22238	0.297762	D(GDP(-2))
-0.48021	0.00318	-0.001526	D(PHES(-1))
-1.38458	0.00458	-0.006337	D(PHES(-2))
0.19223	3031653	582774.2	D(LEB(-1))
2.50536	2841657	7119377.	D(LEB(-2))
-0.15635	2.1E+07	-3259527.	D(FR(-1))
-0.01769	2.0E+07	-348482.8	D(FR(-2))
-0.60478	0.68693	-0.415439	VECM(e_{t-1})
		0.67	R^2
		0.53	Adjusted R^2
		4.83	F- stat.

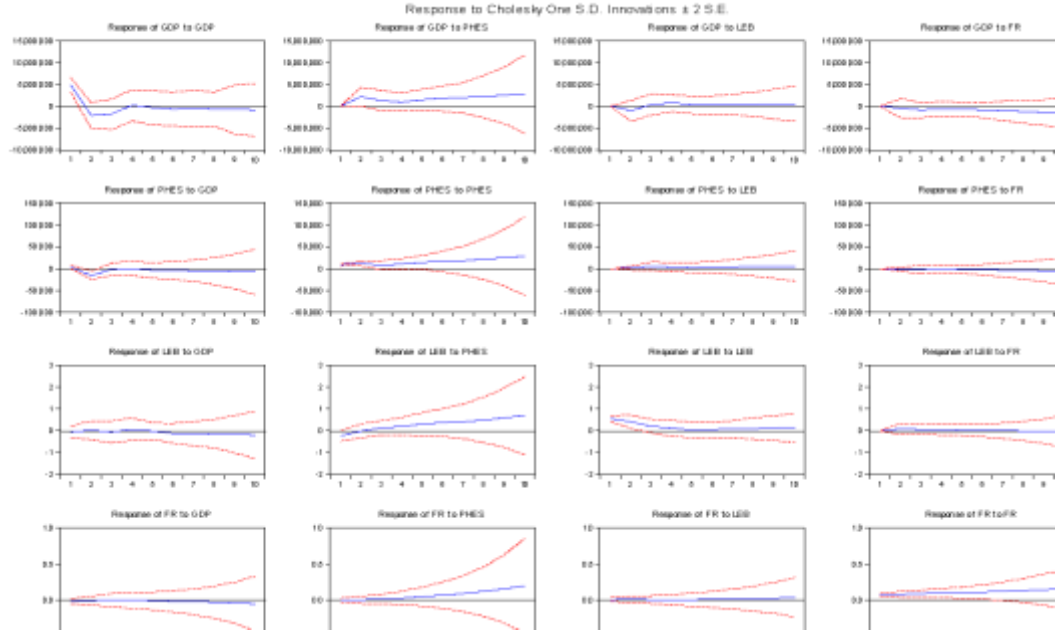
Appendix 2: Table 5: VAR Granger Causality / Block Exogeneity Wald Test Results

	Dependent variable: GDP		
Prob.	Df	Chi-sq	Excluded
0.9552	2	0.091580	FR
0.0121	2	8.834173	PHES
0.1936	2	3.284070	LEB
0.0000	6	44.12096	All
	Dependent variable: FR		
Prob.	Df	Chi-sq	Excluded
0.0284	2	7.120326	GDP
0.0029	2	11.68180	PHES
0.1316	2	4.056409	LEB
0.0063	6	17.97807	All
	Dependent variable: PHES		
Prob.	Df	Chi-sq	Excluded
0.3979	2	1.842947	GDP
0.0978	2	4.650277	FR
0.6340	2	0.911363	LEB
0.0440	6	12.93771	All
	Dependent variable: LEB		
Prob.	Df	Chi-sq	Excluded
0.4070	2	1.797646	GDP
0.8472	2	0.331726	FR
0.1555	2	3.722721	PHES
0.3777	6	6.420770	All

Appendix 3:Table 6: The Impulse Response of GDP

FR	LEB	PHES	GDP	Period
0.000000	0.000000	0.000000	1.000000	1
-13680639	917596.5	0.000770	-0.335310	2
-13430472	4448771.	-0.001348	0.360335	3
-11154670	1808132.	-0.001416	0.168587	4
-7320242.	-466516.9	0.002425	-0.143892	5
-5030808.	205514.8	0.003573	0.177471	6
-9574619.	771480.7	0.002527	0.292451	7
-17062558	1170185.	0.001878	0.220340	8
-23058452	1606661.	0.001507	0.250669	9
-27463903	1475233.	0.001529	0.263275	10

Appendix 4: Figure 1. Impulse Response



Appendix 5: Table 7: Variance Decompositions

Panel A: Variance Decomposition of GDP

FR	LEB	PHES	GDP	S.E	Period
0.000000	0.000000	0.000000	100.0000	4926650.	1
0.631492	3.058019	13.68340	82.62709	5908014.	2
2.459645	3.079763	15.88826	78.57233	6381424.	3
3.225273	4.233291	17.60448	74.93696	6539054.	4
3.962903	4.202357	21.77186	70.06288	6772018.	5
5.132103	4.064621	26.24552	64.55776	7093743.	6
6.491671	4.008455	30.66484	58.83504	7459736.	7
7.962722	3.901449	35.23633	52.89950	7913287.	8
9.574632	3.799303	39.60573	47.02033	8462076.	9
11.27880	3.718618	43.63778	41.36480	9107048.	10

Panel B: Variance Decomposition of PHES

FR	LEB	PHES	GDP	S.E	Period
0.000000	0.000000	84.06293	15.93707	8998.080	1
0.680375	0.200603	42.86076	56.25826	21846.38	2
0.926795	5.623723	46.05705	47.39243	23869.93	3
0.807080	6.025431	54.41325	38.75424	26413.30	4
0.928608	5.028014	62.75398	31.28940	30422.86	5
1.263193	4.690562	68.47078	25.57547	34842.61	6
1.595918	4.516332	73.01359	20.87416	39930.38	7
1.979106	4.326829	76.33066	17.36340	46011.90	8
2.419782	4.211752	78.69602	14.67245	53072.27	9
2.895354	4.122880	80.38955	12.59221	61253.20	10

Source : Author's Regression Output

Panel C: Variance Decomposition of LEB

FR	LEB	PHES	GDP	S.E	Period
0.000000	85.10844	14.20386	0.687701	0.609997	1
1.538871	88.25899	9.599834	0.602305	0.742471	2
2.232659	85.29887	11.50648	0.961985	0.791405	3
2.545980	79.46584	16.35386	1.634317	0.830480	4
2.454948	69.74675	26.34484	1.453469	0.887993	5
2.070001	58.23382	37.10351	2.592670	0.973930	6
1.698089	48.33697	46.48093	3.484016	1.075944	7
1.364752	39.63164	54.93414	4.069460	1.200494	8
1.089161	32.00531	62.31252	4.593007	1.354310	9
0.899055	25.63828	68.46099	5.001678	1.540844	10

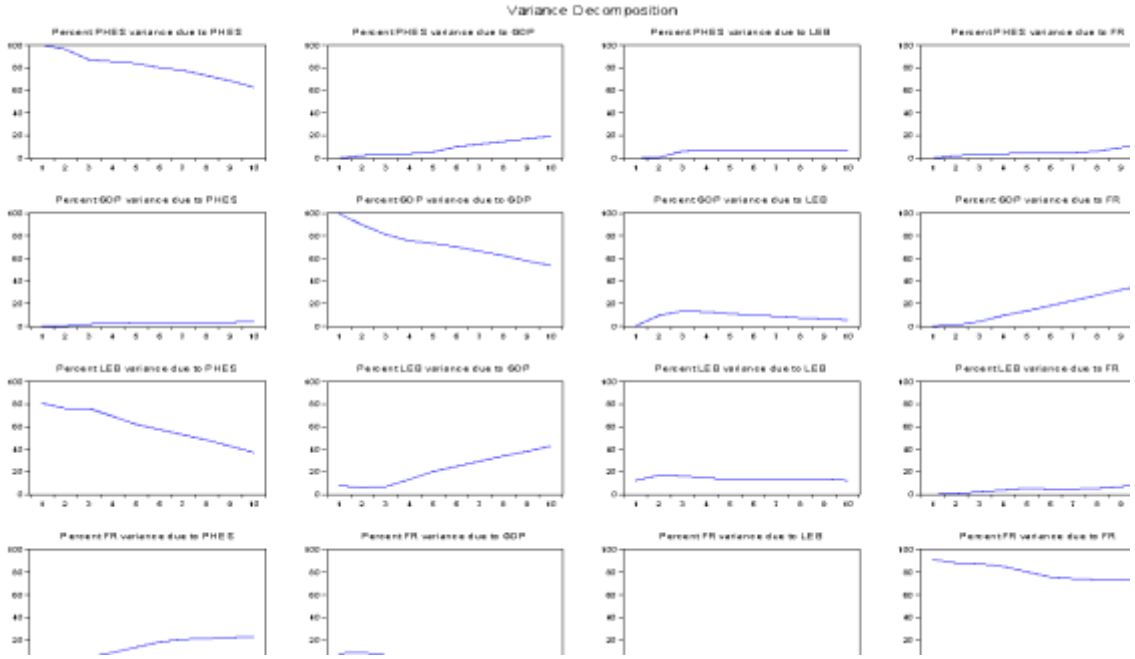
Source : Author's Regression Output

Panel D: Variance Decomposition of FR

FR	LEB	PHES	GDP	S.E	Period
94.02247	1.298282	0.006504	4.672740	0.075358	1
95.24729	1.865182	0.318491	2.569038	0.111000	2
95.38468	1.571914	1.388564	1.654841	0.144185	3
93.54614	1.156902	4.203630	1.093333	0.177505	4
89.84765	0.945292	8.244910	0.962150	0.212839	5
84.93957	0.936419	13.10827	1.015737	0.252014	6
78.90742	1.051222	18.85109	1.190272	0.296966	7
71.93415	1.242000	25.34852	1.475332	0.349539	8
64.34258	1.482378	32.34166	1.833388	0.411779	9
56.46931	1.748946	39.53663	2.245118	0.486125	10

Source : Author's Regression Output

Appendix 6: Figure 2. Forecast Error Variance Decomposition



Appendix 7: Figure 3- Line graph showing the trend of fertility rate in Nigeria (1981-2015)

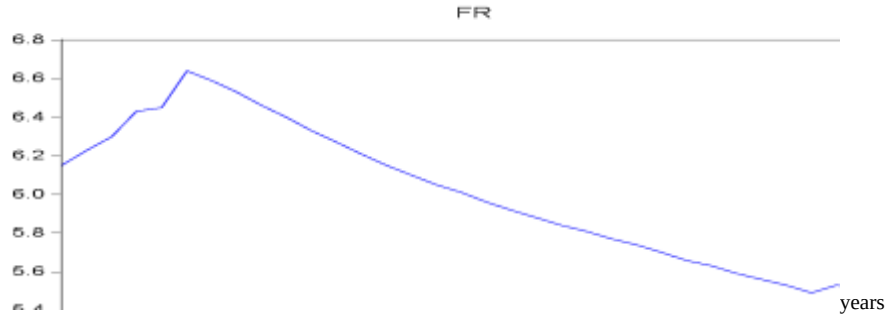


Figure 4: Line graph showing the trend of GDP in Nigeria 1981-2015