



A Causality Analysis of Public Health Expenditure and Economic Growth in Nigeria

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ABSTRACT

This study examined the relationship between public health expenditure and economic growth in Nigeria. Using time series data for the period 1977 to 2010, this study employed both multiple regression analysis and the granger causality test estimation techniques to examine the relationship. Result from the multiple regression show that both Capital and Recurrent expenditure on health has positive effect on economic growth in Nigeria. The causality test shows that there is a bi-directional causality between recurrent expenditure on health and economic growth, while a unidirectional causality exist between capital expenditure on health and economic growth as causality runs from economic growth to capital expenditure on health in Nigeria. Based on the above findings, the study recommends increased current and capital health expenditure to improve healthiness of the inhabitants and invariably economic activities in Nigeria.

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Introduction

Health care is a superior good whose importance to human capital development and sustenance cannot be overemphasized. The importance attached to good health by WHO, has made it to recommend for all economies in the LDCs an allocation of 14% of total annual budget and 5% of annual GDP. However, how much a country put to health depends on; the level of income, and political commitment and budget system¹

The way a health system is financed is a key determinant of population health and wellbeing.

This is particularly true in the poor countries where the level of spending is still insufficient to ensuring equitable access to needed health services and interventions. Health is an important form of human capital, but health care provision is incredibly complex (Grossman, 1972 and Tobing and Jeng, 2012).

The Nigerian government is under a constitutional obligation to make a budget every fiscal year. The budget is the most important economic policy instrument for governments, because it reflects a government's social and economic policy priorities more than any other document. It translates policies, campaign promises, political commitments and goals into decisions on where and how funds should be spent because a well-functioning budget system is vital to the formulation of sustainable fiscal policy as it facilitates economic growth. According to Olayide and Ikpi (2010) the Nigerian economic problems are exacerbated by the weak budget systems in all tiers of government and faulty budget choices. Most of the time, the expected targets of the budget are not realized. The work of Blumentritt (2006) also pointed to the above stand point as he recognizes the need for an economy to integrate strategic management and budgeting. What seems rather unfortunate

according to Blumentritt (2006) is the fact that most economies still treat the budgeting and strategic management processes separately, and by extension, how budget and the objective target interact and the direction of relationship. Thus, a reflection on the public health expenditure and the targeted health outcomes in Nigeria revealed some unmet gaps. To what extent then do these gaps reflect on economic growth in Nigeria? The main objective of the study is therefore to investigate the relationship between public health expenditure and economic growth in Nigeria.

The rest of the paper is divided into four sections. Section two contains the review of literature, Section three has the methodology, section four presents and analyse the results, while section five conclude and recommend for the study.

Literature Review

Conceptual and Theoretical Framework

Health spending consists of health and health-related expenditures. Expenditures are defined on the basis of their primary or predominant purpose of improving health, regardless of the primary function or activity of the entity providing or paying for the associated health services.

Health includes both the health of individuals as well as of groups of individuals or population.

Health expenditure consists of all expenditures or outlays for medical care, prevention, promotion, rehabilitation, community health activities, health administration and regulation and capital formation with the predominant objective of improving health. Health-related expenditures include expenditures on health-related functions such as medical education and training, and research and development.

Public health expenditure measures the spending by governments to organize and deliver health services and to prevent or control health problems. Government administration

¹ Budget system encompasses the allocation, execution, monitoring and performance evaluation

and the net cost of health insurance covers spending for the cost of running various government health care programs, and the difference between premiums earned by insurers and the claims or losses incurred for which insurers become liable.

On the other hand, Economic growth is a known driver tool of growth in health care expenditure (Cylus, et al. 2011). Economic Growth is an increase in the capacity of an economy to produce goods and services, compared from one period of time to another. Economic growth can be measured in nominal terms, which include inflation, or in real terms, which are adjusted for inflation. For comparing one country's economic growth to another, GDP or GNP per capita should be used as these take into account population differences between countries. Economic growth is usually associated with technological changes. An example is the large growth in the U.S. economy during the introduction of the Internet and the technology that it brought to U.S. industry as a whole. The growth of an economy is thought of not only as an increase in productive capacity but also as an improvement in the quality of life to the people of that economy.

Theoretical Framework

Access to good standard of living is a dynamic process that involves the person seeking care, the system providing care, and the various factors that facilitate or impede this exchange. People may, therefore, not receive the care they need due to diverse circumstances ranging from the health care delivery system itself the cost of services to consumers, personal circumstances and attitudes. Thus, not receiving the care by the people concerned may create problem for the economy as a whole. World Bank (1993) however sees the importance of improved health to economic growth and sustainability from three areas;

- i) reducing production losses usually caused by workers illness
- ii) effective utilization of resources
- iii) encouraging enrolment of children in school and makes them better and able to learn

There have been divergent opinions on the expected relationship between government expenditure and economic growth. Some schools of thought believed that increase in government expenditure promotes economic growth (Al-Yousif, 2000; Coorcy, 2009; Barro, 1991) while other schools of thought believed that higher or increasing government expenditure may slowdown overall performance of the economy. According to them, higher expenditure might lead to increase in taxes or borrowing, whereas higher income tax discourages individual from working for long hours or even searching for jobs. The multiplier effect of this is reduction in income and aggregate demand. On the production side, higher profit tax tends to increase the cost of production which will in-turn reduce investment expenditure, therefore large government expenditure will have negative impact on economic growth (Laudau, 1983; Barro, 1991; Engen and Skinner, 1992; Folster and Henrekson, 2001).

Issues relating to the quantity of resources a country devotes to medical care have continued to get attention from researchers and policy makers. Many studies have found a strong and positive correlation between GDP of a country and the national expenditure on health care. Most studies employed a demand function approach to specify their model. In this case, the real per capita health care expenditure is expressed as a function of real per capita GDP and other selected variables.

Empirical Framework

The correlation between government expenditure on health care and economic growth in Nigeria has continued to generate series of debate among scholars. According to Abdullah (2000) governments all over the world are expected to perform two functions; protection (security) and provision of certain public goods. In terms of protection, government is expected to enforce the rule of law, while under the provision of public goods; government is expected to provide roads, education, and health care, or mostly social services.

Olayide and Ikpi (2010) examined the political systems, national budgets and how the resulting budget performance affects economic growth in Nigeria between 1970 and 2004. They employed both descriptive and econometric methods to establish evidence of the performance of national budgets and its impact on economic growth in Nigeria. Their findings show that the economy performed better under democratic dispensation. The economy performed least during the military period (1984-1998). The results of their parsimonious error correction model show that economic growth is in variant with political systems in the country. This finding however, shows that democracy in Nigeria is yet to transform into growth in the Nigerian economy. Okoye and Yohanna (2009) examined Budget and fiscal management system in Nigeria. They provided a general objective and empirical report of the macro economic framework upon which the state and national budgets and fiscal management processes are formulated so as to identify areas of weaknesses which may require some rethink. The study employed both primary and secondary data including documents pertaining to national development plans and budgeting process. On the whole, the study revealed that, rebranding the budget system must be targeted at four major problem areas, namely, the country's fiscal dependence on oil revenue and its volatility, the external debt overhang, the huge budget deficits and uncontrolled public spending. Ekpo (1995) reveal that capital expenditures on transport, communication, agriculture, health, and education positively influence private investments in Nigeria. The expenditure types invariably enhance the growth of the overall economy.

A study by Bello (2002, 2005) revealed a negative relationship between public health expenditure and health outcome with a conclusion that the expenditure might not have been diverted to the area where it can affect health outcome. Several studies (WHO, 2001; Gallup and Sachs 2000, Faisal, 2009) for example attempt the connection between health status of population and economic performance. It was shown generally that the interaction between health and economic performance goes beyond income to include the improvement it makes on human quality of life. The moment there is improvement in the measures, there is the likelihood that there is general quality of life. It is however the transformation of these relations that in turn promotes productivity and longevity of labour force and living much more for resources for further production. This, Faisal (2009) saw as highly mutually in exclusive because good health is critical to poverty reduction, economic growth and sustainable development.

Odiro (2011) using computable general equilibrium (CGE) model found that government expenditure on health in Nigeria is significant in explaining economic growth in Nigeria and that moving resources from other sectors to provide quality health will stimulate economic growth.

Growth literature has adequately recognised the role of human capital in stimulating economic growth. The early take-

off of most developed nations has largely been attributed to investment in human capital and not physical capital, thus, human capital is a key determinant of growth (Barro, 1996; Solow, 1956 and Swan, 1956).

Using infant mortality or child mortality, a lot of studies found that the contribution of health care spending to health status is either small or statistically insignificant (Odior, 2011; Musgrave, 1996; Filmer and Pritchett, 1977). Some other studies (Gupta et al., 2003; Bello, 2012) have found a positive correlation between expenditure on health care and health status of the poor. A micro-study by Grossman (1972), Muurinen (1982) and Wagstaff (1986) observed slight correlation between income and utilization of expenditure on health care. On the contrary, Newhouse (1977) found that over 90 per cent of the variance in per capita medical expenditure is explained by variation in per capita GDP. It was found that the income elasticity for health care spending is greater than one indicating that medical care is a luxury.

Health Expenditure in Nigeria

Health expenditure in Nigeria over the years is no longer a story. This is as a result of the fact that developing countries have always been seeking for a way to ensure adequate health facilities to the citizenry which will help reduce poverty in the country. In Nigeria, health care funding comes from a variety of sources that include budgetary allocation from government at all level (Local, State and Federal), loans and grants, private sector contribution, donors and out of pocket expenses. The Federal government recurrent health expenditure between 1970 and 1975 rose by approximately 42% while the capital expenditure for the same period rose by 153%. This continued to increase until 1979 when recurrent expenditure declined by 62% as against 31% in capital expenditure. Thereafter, the figure picked up in 1982 after decline; capital had 59% and by 1984 the recurrent expenditure also declined by 46%, thus the decrease in capital expenditure on health persisted till this period. These figures picked up again but expenditure declined in 1987. While current expenditure became 74%, capital expenditure had 9% but quickly picked up in 1988 and the figures continue to rise till date, capital expenditure however experienced a decline between 1991 and 1992 (CBN 1993.; Bello, 2002).

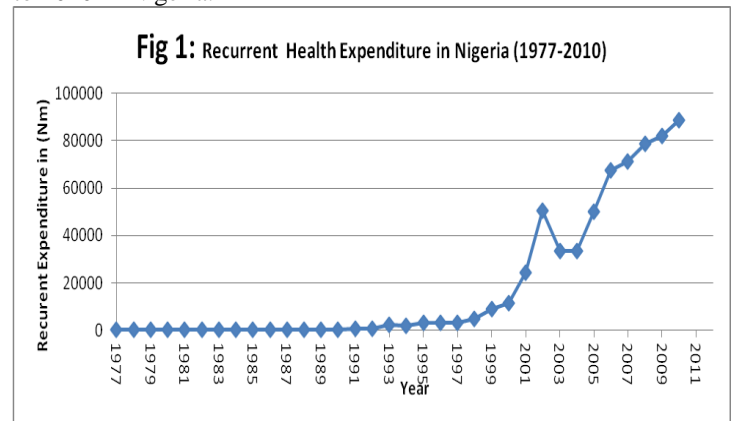
The National Health Insurance scheme (NHIS) was introduced by NHIS Act 35 of 1999. It is an avenue to better the lot of workers and their families. The programme is made compulsory for those in formal sector where the employees are expected to contribute 7.5% of their basic salary and the employers are to pay 7.5% towards the scheme. The programme also gives room to those in informal sector to participate in the scheme though optional. The informal sector programme is of two types: Community – Based Health Insurance (CBHI) and Worker-Based Health Insurance (WBHI). The benefit under the informal Sector is decided by the members in conjunction with the regulatory body. The scheme allows a person to decide which centre he / she wishes to register with and also free to change from one service provider to another at a specific period and in line with the laid down procedure for such transport (NHIS Act 1999; WHO, 1999).

Health Maintenance Organizations (HMOS) and Mutual Health Organization (MHOs) are expected to play a major role of coordinating the health centers providers, while the overall regulation of the scheme rests with the National Health Insurance Council (NHIC).

Nigeria has just of recent kick started the process towards estimation of National Health Accounts (NHA) with technical and financial support from WHO. In view of the current developmental stage of NHA system, Nigeria is just at the point of tapping the full benefit of NHA such as the provision of tool for evidence based decision making in health policy, health financings and health intervention (WHO, 2007).

According to the World Bank source, the public spending per capita in Nigeria is less than 5 USD and can be as low as USD 2 in some parts of Nigeria. This is a far cry from USD 34 recommended by WHO for low income. Although, the Federal Government’s recurrent health budget as a percentage of recurrent expenditure showed an upward trend between 1996 and 1988, a decline in 1999 from 2.73% to 1.95% and rose to 2.52% in 2002. It stood at 4.25% in 2003, 5.38% in 2004 and declined again to 3.38% in 2005. Available evidence indicates that the bulk current health expenditure goes to personnel. Beyond budgetary allocation, a concern in funding health sector in Nigeria is the gap between budgeted figures and the actual trends released from treasury for health activities.

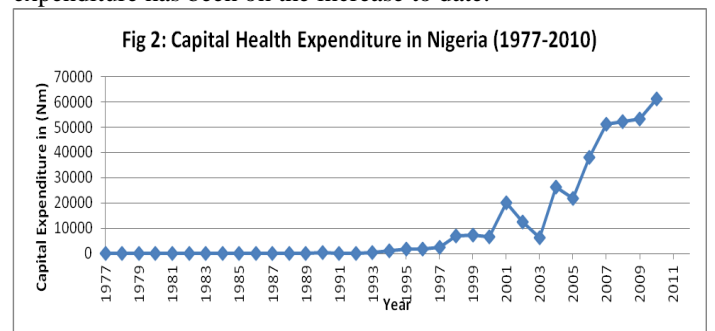
Today, the country has not stopped allocating money to the health sector; yet, the country is still battling with a high rate diseases and poverty. Below are the trends of both capital and recurrent expenditures of the government for the period of 1977 to 2010 in Nigeria.



Source: Authors

Source: Central Bank of Nigeria (2007, 2008 and 2010)

Fig 1 above shows the trend of recurrent expenditure on health in Nigeria. From 1977 to 1994, the trend of expenditure has been so minimal. From mid-1994, recurrent expenditure of the government started rising until 2002. The expenditure falls in 2002 and 2003. Since 2004, the trend shows that Government expenditure has been on the increase to date.

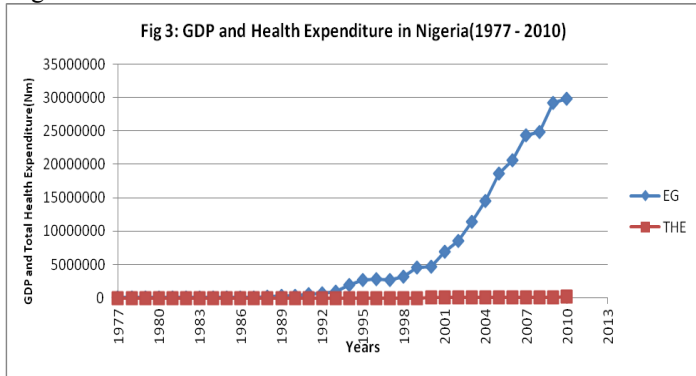


Source: Authors

Source: Central Bank of Nigeria (2007, 2008 and 2010)

Fig 2 above shows the trend of capital expenditure on health in Nigeria. The graph shows that from 1977 to 1997, the trend of expenditure has been so minimal. Government increases their

capital expenditure a little bit higher between 1997 and 1999. It fell again in 2000, however, from the mid of year 2000, capital expenditure rose and fell in 2003. From 2003 to 2010, there has been an increase over these periods except in 2005 when there was a little reduction in the capital expenditure on health but since then the trend of government capital expenditure on health in the economy has been on the increase. The question is ‘how much has the increase transform to economic growth in Nigeria?’



Source: Central Bank of Nigeria (2007, 2008 and 2010)

Fig 3 above shows the trend of Total expenditure on health and GDP in Nigeria. The graph shows that from 1977 to 2010, the trend of expenditure has been so minimal. However, Economic growth in the country has been increasing over the years. Although, from 1977 to 1991, the increase was minimal, after this it was a little bit higher from 1992 to 1995. After, these periods, the increase has been steady though sometimes increasing at a decreasing rate.

Methodology

i) The Model

Effort has been made (see Sollow, 1956; Odusola, 2002; Olubokun and Bakare, 2011 and Ayoola et.al 2012) to provide an insight into some of the theoretical and empirical issues underlying the relationship between public health expenditure and economic growth both in the developed and developing countries. Most of these studies focus on the argument that human capital impact positively on economic growth. Based on this theoretical direction and following Odusola (2002) as adopted in Olubokun and Bakare (2011) and Ayoola et al, (2012), we postulate the relationship between economic growth and public health expenditure (recurrent and capital) as;

$$EG = f(RHE, KHE)..... (1)$$

Where

EG = Gross Domestic Product (this is derived from the d (GDP_{t-1} – GDP/GDP*100)

RHE= Recurrent Health Expenditure

KHE = Capital Health Expenditure

In mathematical form, the model can be specified as

$$EG = \beta_0 + \beta_1RHE + \beta_2 KHE+ U.....(2)$$

Where; β_0 : is the constant or intercept. β_1 : Coefficient of recurrent expenditure on health. β_2 : is the coefficient of capital expenditure on health and U is the error term.

On a priori, we expect both β_1 and β_2 to be positive, with the postulate that the correlation between public health expenditure and economic growth is linear and that the relationship portends a causal relationship.

In order to pursue the above suspected causal relationship, we introduced the Granger Causality test. A simple definition of Granger Causality; in the case of two time-series variables, X and Y:

"X is said to Granger-cause Y if Y can be better predicted using the histories of both X and Y than it can by using the history of Y alone." Thus, the presence of Granger causality was tested by estimating the following VAR model where there are two models with different dependent variables; first by one using Economic Growth (EG) and second, by using public expenditure on health as the dependent variables.

Public expenditure in this sense is divided into both the capital and recurrent expenditure on health. Hence, the granger causality equation is specified as

$$EG_t = c_0 + c_1EG_{t-1} + + c_pEG_{t-p} + d_1RHE_{t-1} + + d_pRHE_{t-p} + v_t \quad (3)$$

$$RHE_t = a_0 + a_1RHE_{t-1} + + a_pRHE_{t-p} + b_1EG_{t-1} + + b_pEG_{t-p} + u_t \quad (4)$$

$$EG_t = m_0 + m_1EG_{t-1} + + m_pEG_{t-p} + q_1KHE_{t-1} + + q_pKHE_{t-p} + n_t \quad (5)$$

$$KHE_t = w_0 + w_1KHE_{t-1} + + w_pKHE_{t-p} + l_1EG_{t-1} + + l_pEG_{t-p} + k_t \quad (6)$$

$$KHE_t = x_0 + x_1KHE_{t-1} + + x_pKHE_{t-p} + r_1RHE_{t-1} + + r_pRHE_{t-p} + z_t \quad (7)$$

$$RHE_t = y_0 + y_1RHE_{t-1} + + y_pRHE_{t-p} + n_1KHE_{t-1} + + n_pKHE_{t-p} + j_t \quad (8)$$

Where it is assumed that v_t, u_t, n_t, k_t, z_t and j_t are uncorrelated. Equation (3) shows that variable GDP is decided by lagged variable RHE and EG, so are other equations from (4) to (8) except that its dependent variable is Y instead of X as the case may be.

Then, testing $H_0: b_1 = b_2 = \dots = b_p = 0$, against $H_A: 'Not H_0'$, is a test that X does not Granger-cause Y. Similarly, testing $H_0: d_1 = d_2 = \dots = d_p = 0$, against $H_A: 'Not H_0'$, is a test that Y does not granger causes X. In each case, a rejection of the null implies there is Granger causality.

As a precondition, this study employed the unit root tests to assess the stationary properties of the time series data based on the Augmented Dickey-Fuller (ADF) test before estimating causality relationship between public health expenditure and Economic Growth. This is done to guide against what Granger and Charbold called a spurious regression, whereby the result obtained suggest that there are statistically significant relationships between the variables in the regression model when in fact all that is obtained is evidence of a causal relations. The series EG is integrated of order d, which is $EG \sim I(d)$, if it is stationary after differencing it d times. A series that is $I(0)$ is stationary. The Augmented Dickey fuller (ADF) test is based on an estimate of the following regression:

$$\Delta EG = \beta_0 + \beta_1 t + \beta_2 EG + \sum_{j=1}^p \gamma_{t-j} \Delta EG + e_t..... (9)$$

Where β_0 is a drift, t is representing a time trend and p is a lag length large enough to ensure that e_t is a white noise process. Adopting the results of Dickey fuller, the null hypothesis that the variable GDP is non-stationary ($H: \beta_0 = 0$) is rejected if β_0 is significantly negative. However, since ADF tests are sensitive to lag length, we determine the optimal lag length by using Akaike information criteria (AIC). The same is applicable for GDP variable.

ii) Data Requirement and Source

The data for this study include the gross domestic product GDP at constant price of which the difference between the current and lagged data divided by the GDP multiply by 100 stand as the value for economic growth, recurrent health expenditure and capital health expenditure for the period from 1977 to 2010. The data were sourced from the Central Bank

statistical bulletin for various years and the International Financial Statistics (IFS).

Empirical Result

The augmented Dickey Fuller Unit Root Test was employed and the result is presented in table 4.1 bellow.

Table 4.1 Unit Root Test

Variables	Critical Values	Adf at Level	ADF at 1 st Diff.	ADF at 2 nd Diff.	Order of integration and significant level
ED	1% = -3.653730 5% = -2.957110 10% = -2.617434	6.609481	0.454850	-13.73429	I(2). Sig. 1%
RHE	1% = -3.646342 5% = -2.954021 10% = -2.615817	1.475406	-5.004625		I(1). Sig. 1%
KHE	1% = -3.653730 5% = -2.957110 10% = -2.617434	2.144173	-6.627381		I(1). Sig. 1%

Source: Authors

Among all the variables tested for stationarity in table 4.1, none of the variable was integrated of order zero I(0). Recurrent Expenditure RHE and Capital Expenditure KHE on health were integrated after their first difference ie I(1) and were both stationary at 1% while only Economic Growth (EG) was integrated at the second difference.

Table 4.2 Linear Regression Result

Variables	Coefficient	t- statistics	Prob.
C	500917.3	1.576788	0.1253
RHE	192.9398	5.574612	0.0000
KHE	209.8081	3.791588	0.0007

Source: Authors computation 2012

R- Square = 0.97,

Adjusted R- Squared = 0.97

F- Stat= 473.7

D.W= 1.58, AIC= 31.4, SC= 31.6

From the result above, the outcome shows a good result as both variables conform to their a priori expectation. The constant value though positively related with economic growth EG was not significant as $P > 0.1$. Recurrent expenditure and capital expenditure on health shows a positive relationship with economic growth. These outcomes conform to the a priori expectation as stated in section 3. The results were also significant at 1 percent for both results as their probability values stand at $P < 0.01$ for both results. However, capital expenditure on health shows about 20900% increase in economic growth with a 1% increase in government capital health expenditure and about 19300% increase in economic growth with a 1% increase in recurrent expenditure in the Nigerian economy. Based on this result therefore, an increase in public health expenditure (both capital and recurrent) will lead to economic growth as this will help to improve the standard of living of the citizens, increased healthiness, increased productivity and hence economic growth.

The R^2 and the adjusted R^2 of about 97 percent shows that about 97 percent of Economic Growth (EG) in Nigeria is accounted for by the explanatory variables. The F – Statistics

value of about 473.7 shows the overall fitness of the model, the D.W value of 1.58 shows that the model is free from serial correlation; hence, it may be white noise. Both the Akaike and Schwarz criteria proved the model selection good with their values being approximately 31.4 and 31.6 respectively.

Table 4.3 Granger Causality Text Result

Direction of Causality	No of lags	F. Values	Prob.	Decision
RHE→EG	1	2.09494	0.05851	Reject H ₀
EG→RHE	1	18.7554	0.00016	Reject H ₀
KHE→EG	1	1.67370	0.20597	Accept H ₀
EG→KHE	1	42.9151	3.6E-07	RejectH ₀
RHE→KHE	1	10.0799	0.00345	RejectH ₀
KHE→RHE	1	7.98762	0.00830	RejectH ₀

Source: Authors Computation 2012

From the result above, the null hypothesis in each case is that the variable under consideration does not granger cause the other variable. From the result, the null hypothesis is rejected from the following directions; RHE to EG and EG to RHE; RHE to KHE and from KHE to RHE; hence, from the result there are bi-directional causation as both variables does granger cause one another. This acceptance was as a result of the significant F–statistic value in both cases. A one way causality occur between EG and KHE, as the result shows that causality runs from EG to KHE and not from KHE to EG since the estimated F-value is significant at 1 percent level; the critical F-value from EG to KHE is 42.92 while from KHE to EG is 1.67. Hence, a unidirectional causality exists between them. Based on the overall result therefore, it is evident that in Nigeria, government expenditure on recurrent expenditure granger cause economic growth and economic growth on the other hand granger causes increment on recurrent health expenditure. Also, for capital expenditure on health and economic growth, the findings show that it is economic growth that engender capital expenditure on health and not a reverse causation. For capital expenditure and recurrent expenditure on health, the result shows that both of them engender one another as recurrent expenditure engender capital expenditure and capital expenditure also engender recurrent expenditure in Nigeria.

Conclusion And Recommendations

The study focused on the empirical analysis of the relationship between public health expenditure and economic growth using data set from the Central Bank of Nigeria and IFS the period from 1977 to 2010. Multiple regression of ordinary least squares analysis and the granger causality test were applied to the time series data for purposes of analysis. The study has found that Public health expenditure both recurrent and capital has a positive and significant effect on Economic growth in the long run. The granger causality test also indicate a one a unidirectional causality from EG to capital health expenditure, thus, changes in Economic Growth lead to later changes in capital health expenditure in Nigeria. However, a bi – directional causality exist between recurrent expenditure and economic growth in Nigeria.

Based on the result, the study has provided the new line of thinking and has shown that if health resources are increased, the economy overall achieves growth. This implies that increased health resources improve the health status of the population, thus affecting human capital through improved work productivity and wages to be earned, and therefore contributing to economic growth in Nigeria. A very important policy option is to ensure some levels of coherence between the foreign aids and the health expenditure plans through some appreciable proportion of the budget devoted to health care services. This would pave way for

better plans in health expenditure programmes thereby improving health outcomes vis-a-vis promotion of economic growth in Nigeria. Moreover, government should be charged to channel more expenditure on the health sector and strictly monitored all these expenses so as to make sure they are judiciously utilized.

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Appendix

Dependent Variable: EG

Method: Least Squares

Date: 12/22/12 Time: 08:57

Sample(adjusted): 1977 2009

Included observations: 33 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	500917.3	317682.0	1.576788	0.1253
RHE	192.9389	34.61029	5.574612	0.0000
KHE	209.8081	55.33517	3.791588	0.0007
R-squared	0.969308	Mean dependent var		5611364.
Adjusted R-squared	0.967261	S.D. dependent var		8540804.
S.E. of regression	1545357.	Akaike info criterion		31.42592
Sum squared resid	7.16E+13	Schwarz criterion		31.56196
Log likelihood	-515.5276	F-statistic		473.7199
Durbin-Watson stat	1.577539	Prob(F-statistic)		0.000000

Pairwise Granger Causality Tests

Date: 12/22/12 Time: 08:59

Sample: 1977 2010

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Probability
RHE does not Granger Cause EG	32	2.09494	0.05851
EG does not Granger Cause RHE		18.7554	0.00016
KHE does not Granger Cause EG	32	1.67370	0.20597
EG does not Granger Cause KHE		42.9151	3.6E-07
KHE does not Granger Cause RHE	33	10.0799	0.00345
RHE does not Granger Cause KHE		7.98762	0.00830