
Any Nexus between Public Health Expenditure and Economic Growth in Nigeria?

¹Ibe, Reginald Chijioke & ²Olulu-Briggs, Omiete Victoria

Department of Finance and Banking,
University of Port Harcourt

[1ribec2000@gmail.com](mailto:ribec2000@gmail.com), [2firstvikes@yahoo.com](mailto:firstvikes@yahoo.com)

ABSTRACT

This study investigated the impact of public health expenditure on economic growth in Nigeria between 1981 and 2013. Data was sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin and Annual reports of various issues. The stationarity of the variables were tested using the Augmented Dickey-Fuller (ADF) unit root test. The ordinary least square (OLS) multiple regression, equation estimation, Johansen multivariate cointegration and Granger Causality analytical techniques were the econometric methods used to analyze the data. Results indicate a significant and positive long run relationship between public health expenditures and economic growth. There was a unidirectional causality between economic growth proxied by GDP and all public health variables in the model namely; Gross Capital Formation (GCF), Total Education Expenditure (TEE) and Total Health Expenditure (THE). The major policy recommendation that emerged from the study is the need for Nigerian policy makers to pay more attention to the health sector and increase its budgetary allocation. Nevertheless the key to good results lies in establishing a strong institutional system that, to the extent possible, links specific expenditure and revenue decisions so as to ensure the usage of the allocated fund as transparently as possible.

Key Words: Cointegration, Capital Formation, Unit Root, Causality, Regression

1. INTRODUCTION

One of the vital public services provided by governments across the globe is health care. However, developed countries spend a high proportion of their Gross Domestic Product (GDP) on health care because they believe that their resident health can serve as a major driver for economic activities and development. There is a strong economic case for governments to increase public health expenditures. This is anchored on the fact that the main objective of government in expending its resources on the economy is to achieve certain macroeconomic objectives that will stimulate economic growth. To achieve this broad goal, governments certainly need productive and active workforce so that any investment centered at enhancing human capital will in turn enhance economic growth. The above scenario is justified by the views of (Bloom and Canning (2005) on how human capital development plays a major role for sustainable economic growth and that health is an integral part of human capital development which enhances the productivity of workers by increasing their physical strengths and capacities.

The World Health Organization Report in 2006 indicated that Nigeria's public health expenditure as a percentage of gross domestic product (GDP) is low compared to global standards. Understanding the extent of the connection between the size of public health expenditure on the GDP and changes in the standard of living is necessary to enhance proper accounting of any notable growth in the health sector. This is validated by the recommendation of the World Health Organization (WHO) that a country's public health expenditure should be at

least 5 percent of GDP. Public health expenditures as a percentage of GDP in Nigeria for 2007, 2008, 2009, 2010 and 2011 were, 4%, 2.4%, 2.1%, 1.7% and 2.0% respectively (WHO National Health Accounts). The budgetary allocations to the Federal Ministry of Health (N1.38.2B, N154.5B, N161.8B, N235.8B, and N284.9B for 2008, 2009, 2010, 2011 and 2012 respectively) shows an erratic growth of health expenditure, the magnitude of allocations with regards to the GDP was still not enough to propel the needed economic growth to meet global standards.

Available data indicates that public health expenditure in Nigeria has been on the increase in the past 10 years, but in spite of the increase, much impact has not been made in the reduction of infant, under age five and maternal mortalities since 1970. For instance, Nigeria's rate of infant mortality (91 per 1000 live births) is among the highest in the world, immunization coverage has dropped below thirty percent while the mortality rate for children under age five is 192 deaths per one thousand. By year 2007, it was reported that more than one hundred and thirty four thousand (134,000) women died from pregnancy complications. In addition, the life expectancy ratio on the average has been on the decline over the study period. Despite the increase in government expenditure in health care in Nigeria, the contribution of this to health is still marginally low whereas the extent and magnitude of its impact on economic growth is undetermined. Most studies on Nigeria's public health expenditure like Aigbokhan (2000), Ali (2000), Amaghionyeodiwe and Osinubi (2004), Addison and Wodon (2007) have related growth to poverty while omitting the human capital (both in terms of education and health) dimension of the analysis. There is no doubt that a possible relationship between health and economic growth could exist. However, there are so many reasons why it is difficult to reach a definitive conclusion one of which is the prioritization that is involved in the determination of a nation's income and expenditure. There is no consensus on the relationship between public health expenditure and economic growth in Nigeria. This is particularly worrisome as several questions have been raised on the situation such as: How has the expenditure profile impacted on health? Is there a causal relationship between public health expenditure and economic growth?

Against this background, this study becomes imperative in terms of establishing the linkage, direction, causation, the channels in the relationship, and the extent to which public health expenditure can propel the desired economic growth. Following this introduction, the rest of the study is organized as follows: Section 2 presents the theoretical framework and literature review. Section 3 is the methodology adopted for this study. Data analysis and interpretation of results is in section 4 while section 5 is conclusion and policy recommendation.

2. LITERATURE REVIEW/THEORETICAL FRAMEWORK

The theoretical framework of this study is anchored on Wagner's Growth Theory of Increasing State Activities.

2.1 WAGNER'S LAW OF INCREASING STATE ACTIVITIES

Adolph Wagner (1835-1917) a German economist based his law of increasing state activities on historical facts, primarily Germany. Wagner's hypothesis deals with the growing relative importance of government activity and has come to be known as Wagner's Law. He posited that, there are three (3) reasons to expect an expanding scope of public activity: first, as nations develop there is an increased complexity of legal relations and communications – along with greater urbanization and population density – and it forces government to produce the

regulatory framework that will accompany the greater intricacy of relations among economic agents. Second, as income increases, societies demand more education, entertainment, a more equitable distribution of income, and generally more public services. Finally, the technological needs of an industrialized society require larger amounts of capital infrastructure than are forthcoming from the private sector, hence the need for government to step in and fill the gap. Wagner's law has been tested empirically for various countries and the results differ considerably.

2.2 THEORETICAL LITERATURE

Abizadeh and Gray (1985) analyze the period 1963-1979 and find support for Wagner law in wealthier countries but not in poorer ones. Diamond (1977), Ram (1986), Afxentiou and Serletis (1996), Chang, et al. (2004), and Akitoby, et al. (2006) analyze different countries and time periods and find limited support for the law. Afxentiou and Serletis (1991), and Ahsan et al. (1996) have analyzed Wagner's Law for Canada, with findings generally in support of the law. Mann (1980), Nagarajan and Spears (1990), Murthy (1993), Ashworth (1994), Hayo (1994) and Lin (1995) found mixed results for Mexico. Vatter and Walker (1986), and Yousefi and Abizadeh (1992) examined the law for the United States with results generally in favour of the law. Olaniyi and Adams (2000) descriptively analyzed the adequacy of the levels and composition of public expenditures and concluded that education and health expenditures have faced lesser cuts than external debt services and defense, but allocations to education and health sectors are inadequate when related to the benchmark and the performance of other countries. Wu, et al. (2010), on the other hand, utilizing a dataset of 182 countries for the period 1950-2004, found strong support for Wagner's law. Tobin (2005) focused on China and found support for the law. Furthermore, Gupta and Verhoeven (2001), concentrated on health and education expenditures and found inefficient spending on a set of 37 African countries; Abu-Bader and Abu-Qarn (2003), found a negative, bidirectional causality between military expenditures and economic growth in Egypt, Israel and Syria.

2.3 EMPIRICAL LITERATURE

Oduola (1998) studied the nexus between investment in human capital and economic growth using Nigerian data. He estimated three models and found that human capital formation was a crucial determinant of the growth process. Chete and Adeoye (2002) studied the empirical mechanics through which human capital influences economic growth in Nigeria by using vector Auto regression (VAR) analysis and ordinary least square (OLS) to capture the influences. They however concluded that there was an unanticipated positive impact of human capital on growth which the various Nigerian governments post-independence appreciated by prodigious expansion of educational infrastructure across the country; but they were quick to point out that the real capital expenditure on education and health were rather low. Baldacci (2004) explored the role played by health expenditures. He constructed a panel data set for one hundred and twenty developing countries from 1975-2000 and found that spending on health within a period of time affected growth within that same period while lagged health expenditures appear to have no effect on growth. He inferred from this result that the direct effect of health expenditure on growth is a flow and not a stock effect. Bloom et al (2004) estimate a production function of aggregate economic growth as a function of capital stock, labour and human capital (education,

experience and health). Their main result was that health has a positive and statistically significant effect on economic growth. They however, do not consider how health was created. Other studies such as Strauss and Thomas (1998) Greiner (2005), Martins (2005) and Agenor (2007) studied other countries and all emphasized that health expenditure is positively related to economic growth. What differed from one country to another was the extent and magnitude of its contributions. Kambiz et al (2011) examined the relationship between health 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 showed that increased life expectancy propels economic growth and there was an inverse relationship between fertility rate and economic growth in those countries.

Ogundipe and Lawal (2011) studied the effects of health expenditure on Nigerian economic growth between 1985 and 2009 using data on life expectancy at birth and fertility. They found out that funds judiciously utilized on health matters propel economic growth. Ayoola et al (2012) examined 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.

3. METHODOLOGY

This study employs multiple regressions, Ordinary Least Squares (OLS), Johansen and Juselius multivariate cointegration, equation Estimation and Granger Causality techniques to estimate the relationship between health expenditure and economic growth in Nigeria. The model expresses Economic growth proxied by (GDP) as a function of capital stock proxied by Gross Capital Formation (GCF); human capital proxied as Total Health Expenditure (THE) and labour Factor proxied as Total Education expenditure TEE).

The functional form on which our econometric model is based is given as:

$$Y = f(X_1, X_2, X_3)$$

This can be specifically stated as follows:

$$RGDP = f(GCF, TEE, THE) \quad \text{Eq. (1)}$$

The above model is specified linearly in the form of an equation as follows:

$$RGDP = \beta_0 + \beta_1 GCF_t + \beta_2 TEE_t + \beta_3 THE_t + U_t \quad \text{Eq. (2)}$$

Where

RGDP = Real Gross Domestic Product

GCF = Gross Capital Formation

TEE = Total Education Expenditure

THE = Total Health Expenditure

U = Error or disturbance term

β_0 = Constant

β_1 , β_2 and β_3 are the Coefficients

Equation (2) is transformed into an econometric log linear form thus:

$$\ln RGDP_t = \beta_0 + \beta_1 \ln GCF_t + \beta_2 \ln TEE_t + \beta_3 \ln THE_t + U_t \quad \text{Eq. (3)}$$

Where: $\ln RGDP_t$ = log of real gross domestic product; $\ln GCF_t$ = log of Gross Capital Formation; $\ln TEE_t$ = log of Total Education Expenditure; $\ln THE_t$ = log of Total Health

Expenditure. The coefficients in the models $\beta_1 - \beta_3$ define elasticities of the logged variables. A priori expectation: $\beta_1, \beta_2, \beta_3 > 0$.

Eviews 8.0 software is used to estimate the model above.

A PRIORI EXPECTATION OF THE VARIABLES

Based on economic theory it is expected that public health expenditure, the level of capital formation and labor productivity determines in part the level of economic growth. An increase in Public health expenditure is expected to improve the health and productivity of the labour force and consequently a positive impact on the economy, a positive sign is expected. An increase in labour productivity will inevitably increase gross domestic output. An increase in Gross Capital formation is expected to have a positive sign because it represents an increase in investments and this is expected to increase national output. The effect of labour force productivity is expected to be positive. This is because increase in labour force productivity means greater output to national economy.

4. DISCUSSION OF RESULTS AND ANALYSIS

This study utilizes the Augmented Dickey Fuller (ADF) unit root test for the variables, namely gross domestic product, gross capital formation, total education expenditure and total health expenditure. The test included an intercept but not a linear trend. The test results are presented in table 4.1 below.

Table 4.1: Unit Root Test Result

VARIABLE	ADF TEST STATISTIC	ORDER OF INTEGRATION
D(LOGGCF) 1% 5%	-4.457334 -3.670170 -2.963972	I (1)
LOGGDP 1% 5%	9.525660 -3.653730 -2.957110	I (1)
D(LOGTEE) 1% 5%	-4.841437 -3.661661 -2.960411	I (1)
D(LOGTHE) 1% 5%	-6.359051 -3.661661 -2.960411	I(1)

Source: compiled from evIEWS 8.0 printout

The ADF test results indicate that the GDP variable was stationary at level while the GCF, TEE and THE variables were stationary at first difference I (1) at a maximum lag of 1. In each case, the test statistic exceeded the critical value at the 5 percent significance level. That is, the model follows an integrating I (01) and I (1) process.

Co-integration Test

Following the ADF test, if all variables are I (0) or I (1), the cointegration test is usually undertaken. The existence of co-integration implies that the variables share mutual stochastic trend and are linked in a common long run equilibrium relationship. In this study we utilized the Johansen and Juselius (1990) approach of testing the number of co-integrating vectors. More specifically, the study performed the cointegration procedure with unrestricted intercepts and unrestricted trends in the vector auto-regression. The Johansen test employs two different likelihood ratio tests of significance of the correlations and thus the reduced rank of the Π matrix. These are the trace and the maximum eigenvalue tests. The trace test analyzes the null hypothesis of τ cointegrating vectors against the alternative of n cointegrating vectors whereas the maximum eigenvalue, tests the null hypothesis of τ cointegrating vectors against the alternative hypothesis of $\tau + 1$ cointegrating vectors.

Table 4.2: Johansen Multivariate Co-integrating Result

Date: 10/13/15 Time: 10:55
Sample (adjusted): 1983 2013
Included observations: 31 after adjustments
Trend assumption: Linear deterministic trend
Series: LOGGDP LOGGCF LOGTEE LOGTHE
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.864982	93.69150	47.85613	0.0000
At most 1 *	0.469732	31.61876	29.79707	0.0305
At most 2	0.242029	11.95323	15.49471	0.1592
At most 3	0.102801	3.362815	3.841466	0.0667

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.864982	62.07274	27.58434	0.0000
At most 1	0.469732	19.66553	21.13162	0.0791
At most 2	0.242029	8.590416	14.26460	0.3218
At most 3	0.102801	3.362815	3.841466	0.0667

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: **evIEWS 8.0 printout**

We estimate equation (3) to determine the cointegrating rank of the system of variables. The lag length is automatically selected and the constant is restricted to allow for an intercept but no

trend in the cointegrating equation. Table 4.2 above shows the results from the cointegration test. Both the trace test and the maximum eigenvalue test reject the null hypothesis of no cointegrating vectors at the 5% level, but they indicate at most one cointegrating equation. Trace test also indicates at most one cointegrating equation. Based on this evidence, we posit that there exist a long run equilibrium relationship between gross domestic product, gross capital formation, total education expenditure and total health expenditure.

Table 4.3: Long run relationship between GDP, GCF TEE and THE

1 Cointegrating Equation(s):	Log likelihood	-556.4626	
Normalized cointegrating coefficients (standard error in parentheses)			
LOGGDP	LOGGCF	LOGTEE	LOGTHE
1.000000	-0.529831 (0.05549)	-12.27081 (1.78420)	30.48656 (3.20484)

Source: EVIEWS 8.0 Printout.

Table 4.3 depicts the long run cointegrating equation showing the nature and magnitude of the observed long run relationships. The equation is normalized for LOGGDP – the dependent variable. The normalized beta coefficient representing the long run relative statistical relationship between the LOGGDP and LOGGCF is shown to be -0.529831 and Standard error of (0.05549), suggesting a t-statistic of 9.55. This is significant at 5% level. By implication, there exist a statistically significant relationship between the LOGGDP and LOGGCF variable. The sign implication suggests a negative relationship which disagrees with a priori expectation. On the other hand the normalized beta coefficient representing the long run relative statistical relationship between the LOGGDP and LOGTEE is calculated to be -12.27081 with a standard error of 1.78420 (t-statistic = 6.88). The computed t-statistic is significant at 5%. Thus, the long run relationship between LOGGDP and LOGTEE is negative contrary to a priori expectation; it is statistically significant at the conventional 5% level.

The normalized beta coefficient representing the long run relative statistical relationship between the LOGGDP and LOGTHE is shown to be 30.48656 and Standard error of (3.204849), suggesting a t-statistic of 9.51. This is significant at 5% level. By implication, there exist a statistically significant relationship between the LOGGDP and LOGTHE variable. The sign implication suggests a positive relationship which agrees with a priori expectation.

Short run relationship between GDP, GCF, TEE and THE

Table 4.4: Equation Estimation result

Dependent Variable: LOGGDP
Method: Least Squares
Date: 10/14/15 Time: 11:47
Sample (adjusted): 1982 2013
Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.560380	15.49046	-0.229843	0.8202
LOGGCF	0.011779	0.009092	1.295503	0.2075
LOGTEE	-0.077705	0.165218	-0.470317	0.6424
LOGTHE	0.152617	0.269154	0.567025	0.5760

LOGGDP(-1)	1.039482	0.051343	20.24602	0.0000
LOGGCF(-1)	-0.009608	0.014546	-0.660564	0.5152
LOGTEE(-1)	0.192784	0.222288	0.867271	0.3944
LOGTHE(-1)	-0.198351	0.296501	-0.668975	0.5099
R-squared	0.997742	Mean dependent var	454.8156	
Adjusted R-squared	0.997083	S.D. dependent var	204.4275	
S.E. of regression	11.04035	Akaike info criterion	7.853308	
Sum squared resid	2925.344	Schwarz criterion	8.219742	
Log likelihood	-117.6529	Hannan-Quinn criter.	7.974771	
F-statistic	1514.937	Durbin-Watson stat	1.511412	
Prob(F-statistic)	0.000000			

SOURCE: EVIEWS 8.0 Printout

The result obtained from equation estimation regression shall be analysed and interpreted on the basis of 5% significance level. The result as shown in Table 4.4 above reveals that gross capital formation (GCF) with a coefficient of (-0.009608) has a negative and insignificant (0.5152) impact on gross domestic product (GDP), the negative sign is in disagreement with a priori expectation. Total education expenditure (TEE) with a coefficient of (0.192784) has a positive and insignificant (0.3944) impact on GDP which is in conformity with a priori expectation. On the other hand total health expenditure (THE) has a negative (-0.198351) coefficient and insignificant (0.5099) relationship with GDP all in the short run. The insignificant relationship could be attributed to the relatively low government expenditure on the health sector which is in agreement with the assessment of the World Health Organization (WHO) in its National Health Accounts.

The R^2 is otherwise known as the coefficient of determination, shows the percentage of the total variation of our dependent variable (Y) that can be explained by the independent variable(s) (X1,X2, X3), and the lower of R^2 shows the percentages of the total variation of our dependent variable that can't be explained by our independent variables. Therefore, the R^2 is expressed as a percentage, and that part of the variation of the dependent variable (i.e. $100-R^2$) which is not explained by the regression line is attributed to the existence of the disturbance or error term (U). The R^2 gives 0.997742 or 99.7% meaning that the model is good i.e. the variations in the dependent variable (GDP) is 99.7% attributable to the changes in the independent variables, gross capital formation (GCF), total education expenditure (TEE) and total health expenditure (THE). This result is also supported by the high value of the adjusted R-Square (0.997083). The F-statistic of (1514.934) with a probability of 0.000000 is significant at 5% and this implies that the independent variables are important determinants of economic growth proxied by (GDP). The Durbin-Watson (DW) at 1.511412 is below the bench mark of 2 indicating that there is the possibility of positive auto or serial correlation.

Granger Causality Test

In the previous section, we reported the result of cointegration but cointegration does not necessarily imply causation. The Granger (1969) approach is used to show how much of the current value of a variable 'y' can be explained by past values of 'y' and then to see whether adding lagged values of 'x' can improve the explanation. 'y' is said to be Granger-caused by 'x' if 'x' helps in the prediction of 'y', or equivalently if the coefficients on the lagged 's are statistically significant.

Table 4.5: Granger Causality Test Result

Pairwise Granger Causality Tests

Date: 10/13/15 Time: 10:57

Sample: 1981 2013

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LOGGCF does not Granger Cause LOGGDP	31	0.35531	0.7043
LOGGDP does not Granger Cause LOGGCF		4.70476	0.0180
LOGTEE does not Granger Cause LOGGDP	31	0.08402	0.9197
LOGGDP does not Granger Cause LOGTEE		3.75222	0.0370
LOGTHE does not Granger Cause LOGGDP	31	0.08203	0.9215
LOGGDP does not Granger Cause LOGTHE		6.71762	0.0044
LOGTEE does not Granger Cause LOGGCF	31	7.57005	0.0026
LOGGCF does not Granger Cause LOGTEE		13.4550	0.0001
LOGTHE does not Granger Cause LOGGCF	31	4.74503	0.0175
LOGGCF does not Granger Cause LOGTHE		38.5570	2.E-08
LOGTHE does not Granger Cause LOGTEE	31	0.21282	0.8097
LOGTEE does not Granger Cause LOGTHE		0.42636	0.6574

SOURCE: EVIEWS 8.0 Printout

Based on the pairwise granger causality test result in table 4.5, there is unidirectional causality between GDP, GCF, TEE and THE, with the flow from GDP in all cases. There is bidirectional causality between TEE and GCF; between THE and GCF, with the flow from both directions.

5. Conclusion and Recommendations

This study investigated the trend and impact of public health expenditure on economic growth in Nigeria between 1981 and 2013, using ordinary least square, equation estimation, Johansen multivariate cointegration and Granger Causality techniques. The findings show a positive relationship between public health expenditure and economic growth which is in conformity with a priori expectation in the long run but negative in the short run. On the other hand Gross Capital Formation has a negative relationship with GDP in both the short and long run. This is in disagreement with a priori expectation. Total education expenditure has a negative relationship with GDP in the long run but a positive relationship in the short run. With regards to direction and causality, there is unidirectional causality between GDP, GCF, TEE and THE, with the flow from GDP to the other variables in all cases. There is bidirectional causality between GCF, TEE and THE. Based on the findings, an improvement in public health enhances labour productivity and leads to gains in economic growth. Nevertheless, improved public health care outcomes alone are not sufficient for sustained economic growth. Education, strong macroeconomic policies and efficient institutional set-ups are equally significant. In order for it

to be effective, greater emphasis on public health sector improvement is required at the local, state and national levels. Results also indicate that gross capital formation (GCF) has the greatest impact on economic growth in Nigeria. The major policy recommendation from this study is the need for Nigerian policy makers to pay more attention to the health sector by increasing its budgetary allocation. Nevertheless, the key to good results lies in the establishment of a strong institutional system to the extent possible that links specific expenditure and revenue decisions so as to ensure the usage of the allocated fund as transparently as possible.

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