HEALTH IMPACT ANALYSIS ON ECONOMIC GROWTH IN NIGERIA; AN ARDL CO-INTEGRATION APPROACH

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Abstract

The study examined health impulse on sustainable economic growth in Nigeria. The study adopted Autor Regressive Distributed Lag Model as well as annual time series data for the period of 1986 to 2019.The variables considered in the study include the dependent variable; real gross domestic product (RGDP) a proxy for economic growth, and independent variables; labour force participation rate (LFP), life expectancy (LER), morbidity rate (MBR) and public expenditure of health (PEH). Each of the variables was tested for stationarity using Augmented Dickey-Fuller test and were cointegrated at different order of 1(1) and 1(2) level of stationarity. However, ARDL Bounds Test for Co-integration, was carried out to evaluate the long run relationship among the variables. The study established that health in term of labour force participation has a negative and significant impulse on economic growth in both short-run and long-run, while in term of life expectancy, its showed positive impulse in both short-run and long-run. The study showed health in terms of morbidity showed a negative impulse in the short-run, while in the long-run the impulse association is positive and insignificant. More so, the public expenditure on health showed a positive and significant impulse on economic growth in the short-run, while in the long-run the impulse dynamics is positive and insignificant. We conclude that in the long-run, LFE, MBR and PEH does not exert a significant influence on economic growth in Nigeria for the period under study. Therefore, the study recommends that in order to achieved sustainable economic growth in Nigeria, policies that can address the quality of health care availability to the population should be put in place. Such policy should include the quality of health infrastructure and pharmaceutical development, to safeguard the quality of drugs, cost and availability.

Keyword: *Health, economic growth, life expectancy, labour force Participation, morbidity rate, labour force participation*

Introduction

Health as a component of human capital has attracted substantial undivided autopsies by scholars in the field of economics in particular. The importance of health human capital in attaining sustainable economic growth has been recorded. Empirical research outcome has shown that a positive causation exists between health condition and sustainable economic growth. Thus, according to Spring (2005) restitution in health exhibits both level and growth impulse, thereby stimulate per capita income. In the palace of Spring's study outcome, Level effects arose from better-quality health, amounts to increases in effective labour inputs. Better health influences this in two major ways: first, the improvement in the quality of labour results to increase in efficiency of labour input when individuals are healthier. More so, due to lower incidence of rise in infectious diseases, higher rate of economic growth is attained as a return to investment in health-human capital. Consequently, in a bid by developed countries to enhance the quality of their labour force, they embarked on widespread investment in health and health care availability, with the ultimate goal of not just having to attain economic development goals, but for sustainable and continued existence. This has led the developed countries to invest a large lump of their gross domestic income (GDP) on health care and health infrastructural development because they trust that healthy workforce can act as a major driver that can stimulate economic activities for growth. This is fastened on the believe that the principal aim of government in inflating its resources on the economy is to attain specified macroeconomic objectives that will arouse economic growth.

Nevertheless, in Nigeria, between 1986 and 1990, health expenditure as a percentage of GDP, stood at 0.32 percent, while between 1995 and 1999 it averaged 0.33 percent. (Olaniyi and Adam, 2000). Upon the recognition of the crucial role healthy population can play in stimulating economic growth, the federal government of Nigeria made concerted effort at increasing her health investment. As an evidence of commitment, health sector restructuring was carried out in its fiscal operation. Available data indicates that on the average about 2.1% to 5.8% of total government expenditure were expended on health between 2000 and 2017 while the country's public expenditure on health as a percentage of GDP is 4.1 percent against 4.6 percent African average and over 6.3 percent in developed countries (Olarinde and Bello, 2014).

Incidentally, the global pandemic known as COVID-19 has harassed even the developed economies of the world. Moreover, the effect of the pandemic in Nigeria has revealed the devastating shortfall in the health sector. Before the pandemic, the Nigerian government had been battling with feeble salvage from the 2014 shock in oil price, with growth rate of GDP narrowing around 2.3 percent in 2019. Nigeria

been a mono economy that rely solely on crude oil to make her investment projections, the fall in the price of crude as a consequence of COVID-19 implied a fall in government revenue. This has worsened the revenue generation of the government, amidst the fact that tax evasion is the in-thing and a recalling decimal in Nigeria. These constraining factors as an implication of fall in government revenue generation, will further worsen the economic impact of the COVID-19 pandemic and make it tougher for the government to withstand the disaster. Whereas many developing countries have logged relatively fewer cases, Nigeria presently has 2802 confirmed cases and 93 deaths, according to NCDC report (2020). The feeble capacity of health care and infrastructure in Nigeria is expected to aggravate the pandemic and its impact on Nigeria economy. The continued lockdown of interstate movement and social distancing amongst other measures aimed at mitigating the spread will result to wastage of labour time and consequently productivity will adversely be affected, as a result sustainable economic growth will become unattainable. Moreover, there is nothing desiring about Nigeria overall health status indication outcomes. According to Word Health Report (2018), Nigeria overall health performance was ranked 187th among the 195 Member States to come beneath Egypt 64th, Kenya 112th, South Africa 119th and Rwanda 173rd. With less than 15% budgetary allocation recommended by World Health Organization, reduction in life expectancy and high infant mortality and morbidity rate, cast doubt on the attainability of the projected 2.5 GDP growth in 2020 by the IMF. The broad objective of this study is to evaluate the effect of health care dynamics on economic growth in Nigeria.

Conceptual Literature Review

Health

According to (WHO, 1948), health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. By 1986 World Health Organization further elucidate that health is an asset for daily life, and not the objective of living. Moreover, researchers in recent time have attempted to redefine health as an ability of the body to embrace new susceptibilities and maladies. They anchored this on the understanding that modern science has considerably raised human cognizance of diseases and how they act in the past few decades. Consequently, health means (i) no critical indication of illness and that the person is performing normally (ii) Numerous organs of the body are performing sufficiently as well as in relation to one another homeostasis. Nevertheless, within the context of this study, health is defined as the ability for man to stay active and productive. Essentially, health is a fundamental human right and the crux for productive life.

Moreover, health is a vital part of economic development, which comprises individuals, government and international responsibility. Ultimately, health is a crucial factor to stimulate productivity and since labour is a factor of production, good health implies increase productivity. On one hand, studies have shown that at a micro level, a healthy person is more productive than a sick person. While at a macro level, a health population are more productive than a population that is ill-health. Though, the advantages of good-quality health are even more stirring when observed at a national (macro) level than at an individual (micro) level (Bloom, Canning & Sevilla, 2004).

Economic Growth

Economic growth implies a regular and continuous shift in aggregate production as a result of steady increase in the rate of productivity, savings and skilled labour force. Hence, economic growth means more output (Jhingan, 2007). Moreover, according to Jim Chappelow (2019), economic growth represents an upward shift in the aggregate production of economic commodities, measured from one time period to another. Consequently, an increase in economic growth is stimulated by efficient use of factor inputs (factors of production, which labour is inclusive). Usually, gross domestic product (GDP) is a proxy for measuring aggregate economic growth. Thus, rise in capital stock, labour force, technology, and health-human capital can stimulate economic growth. More so, growth does not only connote more output attained from greater amounts of inputs but also greater efficiency. Put differently, per unit increase of an output that results from a given input represent growth. Nevertheless, economic growth is likened to a quantifiable prolonged increase in per capita output or income of an economy, complemented by expansion in its healthy productive labour force. Incidentally, an economy can grow but may not develop because poor health care, poor health infrastructure, menace of poverty and unemployment, as well as inequalities may linger due to the absence of technological and structural changes.

2.2 Empirical Literature Review

Khobia H and Mbeki, Z.M (2018) examined health and economic growth in vista countries. They adopted neo-classical Solow's growth model alongside with auto regressive distributed lag methods in the study to determine the presence of long run causality among the variables. They employed time series data covering the period of 1990 to 2016. The ARDL bound test revealed that a long run causality exists between economic growth and health, capital and labour in all the countries except for Argentina. The result found that in Vietnam, Indonesia and south Africa, long run

positive and significant relationship exist between health and economic growth. They therefore, concluded that policies geared towards enhancing the productivity of labour force will stimulate Vista countries long term growth.

Rico et al. (2005) investigated the impact of health on economic growth, for a period of 1970 to 1990 with a sample size of 52 to 72 countries. Through the use of the Generalized Least Square, the results revealed that health has a significant positive impact on economic growth. More so, the study recommends that investment in health as means of mitigating the vicious cycle of poverty.

Bloom et al. (2004) investigated the effects of health indicators on economic growth. The study adopted panel data from various countries for a period of 1960 to 1990. The findings revealed that good health has a positive and statistically significant impulse on aggregate output. More so, improvements in the education system may result in a rise in output through labour productivity as well as capital stock.

Onisanwa (2014) examined the impact of health on economic growth in Nigeria. Cointegration and Granger causality techniques were employed in estimating quarterly time series data for a period of 1995 to 2009. The findings showed that in the long run, economic growth is positively influenced by health indicators. Which denote that health indicators have a long run impact on economic growth. The study concluded that a high level of economic growth can be achieved by improving the health status of the populace.

Anyanwu and Erhijakpor (2007) Investigated health expenditures and health outcomes in Africa. Their study adopted Robust Ordinary Least Squares (ROLS) method along with Robust Two Stage Least Squares (R2SLS) techniques to postulate econometric evidence connecting African countries per capita total, government health expenditures and per capita income to infant mortality and under-five mortality. The finding showed that health expenditures have a statistically significant effect on infant mortality and under-five mortality. More so, both infant and under-five mortality were found to have positive and significant association with Sub-Saharan Africa while the reverse holds true for North Africa.

Theoretical Literature

The Harrod-Domar growth model of economic growth was principally conditioned on the incident of developed economies. The model focused on sophisticated economy and endeavored to analyzed the prerequisite for achieving continued growth in such economy. Put differently, both Harrod and Domar were concerned with ascertaining the rate of growth that can guarantee a steady and persistent functioning of the economy. They saw investment as the main indicator that can stimulate economic growth. They postulated that investment plays a dual character

in an economy; first, it stimulates income creation, and secondly, it enhances the productive capacity of the economy by stimulating increase in capital stock. The first effect may be regarded as demand effect, while the second is supply effect. Consequently, Dommar constructed his model by building a link between aggregate demand and aggregate supply through investment. This he did in an attempt to address the question of, at what rate does investment need to increase in order to make the increase in income equal to the increase in productive capacity so that full employment is attained. Thus, according to Domar, productivity of investment = ΔY/I. Therefore, Iα (total net potential increase in output of the economy) is less than I.s. Accordingly, this connote the supply side of the system. The demand side is however explained by Keynesian multiplier. To maintain full employment equilibrium level of income, aggregate demand should equal the aggregate supply. Thus, we have $\Delta I\frac{1}{\alpha}$ = Iα. On the contrary, Harrod tried to show in his model how stable growth can be maintained in an economy. He opined that once stable growth is disrupted, economy slides into disequilibrium. Harrod built his model around three distinct growth rates. He denoted the first as the actual growth rate G, which is determined by savings ratio and the ration of capital output. He referred to the second one as the warranted growth rate denoted by Gw which implies full capacity growth rate of income. More so, there is natural growth rate denoted by Gn, which is taken as welfare optimum. Incidentally, while Domar saw investment as the essential ingredient in the process of growth, Harrod saw income as the key determinant for economic growth. Consequently, Solow developed his growth model as a modification and alternative to Harrod-Domar model. Solow's model implies a steady production function of output to input linkages where capital and labour are substitutable. The assumption of substitutability of labour and capital gives the growth process an adjustability and provides a touch of realism. Solow in his model maintained some features of Harrod-Domar model such as homogeneous capital, proportional saving function as well as a given rate of labour force growth. Thus, Solow consider output as the solely commodity in the economy and thus yearly production is denoted as Y(t) which hitherto represents the real income of the household, part of which is consumed and rest is saved and invested. While the stock of capital is denoted as K(t). According to Solow, net investment is the rate of increase in capital stock; that is dK/dI. Solow postulated that since output is produced with capital and labour, technological opportunities are epitomized by the production function, thus denoted as Y = f (K, L). Since labour force increases at a constant relative rate n, thus, $L(t)=L_{oe}^{nt}$. Solow regards n as Harrod's natural growth in the absence of technological change, and L(t) as the available supply of labour at time (t) (ML Jhingan, 2007). Though Solow's model has been criticized on the

following ground: lack of strong empirical support for the model as it has been observed that developed economies have grown faster than developing countries and this contradicts the convergence expectation except for exceptional countries like Japan that appear to have converged with developed economies, failure to take account of innovation or entrepreneurship and the strength of institutions which helps in driving growth. It also does not explain how or why technological progress occurs.

Theoretical Framework

The theoretical proposition of this study is anchored on new classical Solow growth model. The model buttressed that economies will tentatiely meet at the same plane of income if the rates of savings, depreciation, labour force growth and productivity growth converge to the same level. Consequently, the model allows for substitution between capital and labour supposing that there are diminishing returns to these inputs. More so, the mechanism through which health impacts economic growth is incised in the Solow's growth model. This model highlights the importance of health human capital to economic growth. Solow's growth model described economic growth as a function of savings and growth of population. Solow emphasized that economies with higher savings will have higher per capita income holding other things constant. Put differently, in Solow's growth model, savings rate and population are the principal contributing factors of per capita income across different economies. The theoretical model established in this study draw a functional causation between health and economic growth, thus health is one of the components of human capital. Therefore, Health as a component of human capital is stimulated via health investment, and so is the life expectancy of the population that summed up the labour force. This study also emphasized on the importance of the morbidity as a condition to achieving economic growth: empirical evidences has shown that healthier labour force stimulate production increase through higher productivity (Serge M.P & Julius CT, 2017).

Model Specification

Based on the theoretical framework discussed above, this study was deeply anchored on the Solow neoclassical growth model and draws from the model specification of Khobia H and Mbeki, Z.M (2018), who examined health and economic growth in vista countries using ARDL Bounds testing procedure over a period of 1986 -2019. Ex-post research design was adopted. Therefore, the model for this study can be specified in an implicit or functional form below:

RGDP= f (LFP, LFE, MBR, PEH) ……..…..…. (1)

Where:

RGDP= Real Gross domestic product per capita income as a proxy for economic growth

LFP = Labour force Participation

LFE= Life expectancy rate

MBR = HIV (infectious disease) Prevalence Rate as a proxy for morbidity rate

PEH= Public Expenditure on Health

For the purpose of estimation, equation (1) was re-specified in a log-linear functional form in order to linearize non-linear variables.

$InRGDP_t = a_0+\delta_1 InLFP_t + \delta_2 InLFE_t + \delta_3 InMBR_t + \delta_4 InPEH_t + u_t$ …… (2)

In estimating the Autoregressive Distributed Lag Techniques model, Bound test technique of the ARDL outline was employed to examined the long run co-integration causality among the variables. Hence, the Bound Testing approach to co-integration is denoted as:

$\Delta In(RGDP_{t-1}) = a_0+\varphi_1 In(LFP_{t-1})+\varphi_2 In(LFE_{t-1})+\varphi_3 In(MBR_{t-1})+\varphi_4 In(PEH_{t-1})+\sum\lambda i\Delta In(RGDPt\text{-}i)+\sum \lambda j\Delta In(LFP_{t-j})+\sum\lambda k\Delta In(LFE_{t-k})+\sum\lambda m\Delta In(MBR_{t-m})+\sum\lambda n\Delta In(PEH_{t-n})+\varepsilon_t$ ……. (3)

From equation (3), Δ represents the difference notation, while $\varphi_i - 4$ are the long run multipliers, a_0 is the intercept and ε_t is the stochastic error term. In order to estimate the long run relationship, the following hypothesis shall be tested H0; $a_0 = \varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = 0$ against the alternative H1; $a_0 \neq \varphi_1 \neq \varphi_2 \neq \varphi_3 \neq \varphi_4 \neq 0$

The, short run and long run coefficient of health effect on economic growth is depicted in the equations below:

$In(RGDP_{t-1}) = \sum_{i-1}^{p} \varphi 1 In(RGDP_{t-1}) + \sum_{k-0}^{q1} \varphi 2 In(LFP_{t-k}) + \sum_{j-0}^{q2} \varphi 3 In(LFE_{t-j}) + \sum_{m-0}^{q3} \varphi 4 In(MBR_{t-m}) + \sum_{n-0}^{q4} \varphi 5 In(PEH_{n-1}) + \varepsilon_t$ …… (4)

This requires selecting the orders of the ARDL (p, q1, q2, q3, q4) model in the four variables using Aikaike Information Criteria (AIC). Consequently, the short run dynamic parameters were obtained by estimating an error correction model related with the long run estimates. This is denoted as:

$InRGDP_{t-1} = \sum\lambda i\Delta In(RGDPt\text{-}i) + \sum\lambda j\Delta In(LFPt\text{-}j) + \sum\lambda k\Delta In(LFE_{t-k}) + \sum\lambda m\Delta In(MBR_{t-m}) + \sum\lambda n\Delta In(PEH_{t-n}) + \lambda ecm_{t-1} + \varepsilon_t$ …… (5)

In equation (5) λ connotes the short run dynamic coefficients. The procedure was employed because it is pertinent regardless of whether the regressors in the model are of different order of integration or mutually cointegrated. The apriori expectation for the causation between the regressors and the dependent variable in the model was anchored on economic theory as explained below. It is expected that $a > 0$, $\alpha > 0$, $\delta_1, \delta_2, \delta_4 > 0$, while $\delta_3 < 0$.

Presentation and Analysis of Result

Table 1: Augmented Dickey Fuller (ADF) Test for stationary

Variables	Level	1st Difference	2nd Difference	Mackinnon	P-value	Order of Integration
RGDP	0.010947	-	-5.905341**	-2.963972	0.0000	I(2)
LFP	-3.264585	-5.718314**	-	-2.957110	0.0000	I(1)
LFE	-1.959274	-	-6.385704**	-2.960411	0.0000	I(2)
MBR	-3.131125	-	-6.141474**	-2.986225	0.0000	I(2)
PEH	1.908007	-6.084137**	-	-2.960411	0.0000	I(1)

Source: Authors commutated Result, Eviews 9.0, 2020

** denotes significant at 5 In the above table. The ADF test reveals that the time series of the variables LFP and PEH are stationary at the 1st difference since the value for each is greater than the MacKinnon at 5% critical value. While the time series of the variables RGDP, LFE and MBR are cointegrated of 1(2) since the value for each is greater than the Mackinnon at 5% critical value. Based on the different order of cointegration, the condition to adopt ARDL model is satisfied. Consequently, the stationarity results lend credence for cointegration test, which evaluates the long run relationship among the variables.

Model Estimation Results

Table 2: ARDL Bounds Test for Co-integration

MODEL		F-statistics = 9.847321
RGDP% LFP% LER% MBR% PEH%		K = 4
Critical Value	Lower Bound I(0)	Upper Bound I(1)
10%	3.03	4.06
5%	3.47	4.57
2.5%	3.89	5.07
1%	4.4	5.72

Source: Authors commutated Result, Eviews 9.0, 2020

From the above result, since the computed F-statistic (9.847321) is greater than the Critical Value Bounds for the upper bound I(1) (4.57) at 5% level, we conclude that there is cointegration among the variables (RGDP,LFP,LER,MBR and PEH) that is a

long-run relationship exist. With this finding, both long run and short run cointegration are estimated to critically determine the level of relationship amongst the variables.

Short Run Error Correction Model Using the ARDL Approach

Table 3: ARDL Short-Run Analysis (2,2,0,3,3)

Regressors	Coefficient	t-statistic	P-value
D(LFP)	-10.51411	-2.114929	0.0605
D(LFE)	1.120306	0.443285	0.6670
D(MBR)	0.170454	1.303485	0.2216
D(PEH)	0.007622	0.648959	0.5310
ECM(-1)	-0.525706	-3.303348	0.0080
R-squared= 0.999686	F-statistic =2121.345 Pro F-statistic= 0.000000	Akaike info criterion= -5.538632 Schwars Creterion= -4.764419	Durbin Watson= 3.014213

Source: Authors commutated Result, Eviews 9.0, 2020

Table 3 represents the short-run dynamic coefficients result. The result revealed that ECM is negative and statistically significant, showing the speed of adjustment from short-run equilibrium to long-term equilibrium. Thus, implying that any variation in economic growth as a function of health status in the short-run would quickly adjust back to equilibrium in the long-run. Furthermore, the log-linear regression results revealed that the explanatory ability of the model is 0.999. This showed that about 99.9% of the total variation in Real Gross Domestic Product (RGDP) is explained by Health Care while the remaining 0.1% is captured by the error term. More so, the estimated model revealed that Durbin Watson (DW) value of 3.014213 which is approximately 3.0, implied that the model is free from autocorrelation. Hence, the model is valid for policy formulation and forecasting. Consequently, the coefficient of LFP is negative and statistically significant in the short run. This implies that LFP has significant negative impact on economic growth in Nigeria for the period under review. The logical explanation to this could be a result of dwindling reduction in health care and health infrastructures currently been witnessed in Nigeria. Thus, health is a crucial factor to stimulate productivity and since labour is a factor of production, good health implies increase productivity and vise versa. Based on

economic theory, a healthier labor force means more output which ultimately translate to economic growth. The coefficient of LFE, is positive and statistically not significant. This implies that a 1 per cent rise in LFE results to 1 per cent rise in economic growth. Hence, it was concluded that in the short run, LFE contributed to economic growth but has no significant impact on (RGDP) in Nigeria for the period under study. The coefficient of MBR is positive and statistically not significant. This does not conform with the apriori expectation, apparently because the intervention of the WHO and other international bodies at mitigating the prevalence of infectious diseases in Nigeria is yielding desired result. Thus, such effort has drastically erased the stigma associated with persons infected with such diseases as HIV, which affects their productivity. Thus, according to (WHO, 1948), health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. Consequently, a good mental balance and social wellbeing of persons leaving HIV will enhance their productivity and thus economic growth in the short run. Incidentally, the coefficient of PEH is positive and statistically not significant. Thus, denoting that in the short run, public health expenditure (PEH) has positive relationship with economic growth but has no significant impact on economic growth (RGDP)in Nigeria. More so, this conforms with the apriori expectation.

Estimated ARDL Long Run Analysis

Table 4: ARDL Long Run Coefficients. Dependent Variable: DPI ARDL (2,2,0,3,3)

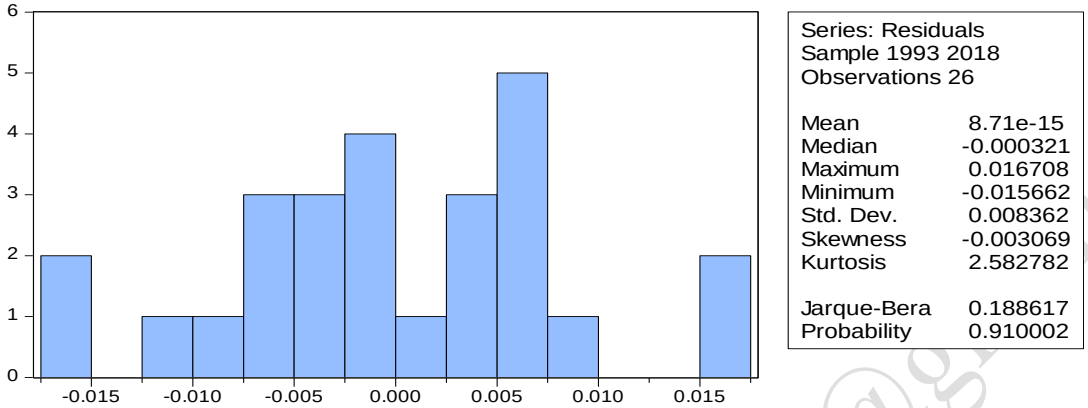
Regressor	Coefficient	t-statistic	P-value
LFP	-13.303265	-3.234137	0.0090
LER	2.131052	0.493784	0.6321
MBR	-0.479159	-1.154642	0.2751
PEH	0.216995	2.675686	0.0233
C	54.910336	2.077940	0.0644

Source: Authors commutated Result, Eviews 9.0, 2020

The results of long run analysis in table 4 revealed that labour force participation (LFP) is negative and statistically significant in the long run. Life expectancy is positive and not significant. Morbidity rate is negative and not significant. This implies that in the long run the rate of morbidity will negatively affect economic growth in Nigeria. Thus, this conforms with the apriori expectation. The coefficient of public health expenditure is positively and significantly related with economic growth in the long run. Implying that in the long run public health expenditure will have a significant impact on economic growth in Nigeria.

4.5 Diagnostic Test

4.5.1 NORMALITY TEST



Source: Authors commutated Result, Eviews 9.0, 2020

Normality test revealed that, regression residual was normally distributed since JB – statistics of 0.188 and the corresponding P-value of 0.91 is greater than the 5% (0.05) level of significance.

Conclusions and Recommendations

The study examines the effect of health care on economic growth in Nigeria for a period of 1986 to 2019. The is significant at time because the findings are expected to not only add to the existing body of knowledge but also for utilization by the necessary authorities. The study utilized annual time series data obtained from the central bank statistical bulletin and world fact book. The variables considered in the study were tested for stationarity using Augmented Dicky-Fuller test. Thus, the variables were cointegrated of different order 1(1) and 1(2), hence, justifying the use of Autoregressive Distributed Lad Model. More so, to establish for the existence of long-run relationship, ARDL Bounds Test for Co-integration was conducted. Consequently, the study found that long-run relationship exist amongst the variables (GDP, LFP, LFE, MBR, and PEH). Thus, the null hypothesis of no significant effect between health care and economic growth was rejected. This implies that health care influences economic growth through increasing the productivity of the labour force. The study therefore recommends that in order to achieved sustainable economic growth in Nigeria, policies that can address the quality of health care availability to the population should be put in place. Such policy should include the quality of health infrastructure and pharmaceutical development, to safeguard the quality of drugs, cost and availability. Low quality and high cost of drugs could mean unavailability and certain death of labour, while morbidity will remain high due to prevalence of infectious diseases.

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