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SOCIAL INFRASTRUCTURE, MATERNAL MORTALITY AND ECONOMIC GROWTH IN NIGERIA

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Abstract

This research was conducted to investigate social infrastructure, maternal mortality and economic growth in Nigeria. Annual time series data covering the period of 1981 to 2019 were utilized. Data for the study were obtained from the Central Bank of Nigeria (CBN) and the World Bank. The Ex-post facto research design was employed, while the Augmented Dickey Fuller (ADF) unit root was used to analyse the data. The unit root test showed that at levels, the variables were not stationary but became stationary after first differencing. The long-run relationship was further tested using the Johensen co-integration, and the result indicated that, long-run relationship exists between the variables. Also, the ECM result

Keywords: Life Expectancy, School Enrollment, Per Capita Income, Economic Growth.

INTRODUCTION

Background to the study

Social infrastructure (specifically, quality health service) is one of the most important services provided by the government in every country of the world. In both developed and developing nations, a significant of the nation's wealth is devoted to health sector. For instance, the world health organization (WHO) report (2020), gave Nigeria's government contribution to health as a percentage of the nation's economic growth (GDP) in the year 2020, as 4.7 percent. This is to show that the Nigeria government placed social infrastructure, specifically health not in absolute terms, but relative to the Gross Domestic Product (GDP), because it is believed that the country's resident

showed that Life Expectancy (**LEXP)** and per capita income have a positive and significant relation with Real Gross Domestic Product (RGDP), while school enrollment showed a negative and insignificant relationship with real gross domestic product (RGDP). From the findings, it is recommended that, in other to reduce maternal mortality in Nigeria, governments at all levels should provide social infrastructure to the citizens, especially among the school age pupils in the country.

Health serves is a major driver for economic activities in the country. It is the quest for increase in social infrastructure such as quality health for Nigerians, to ensure that citizens live socially and economically productive life that informed the health sector reform of September, 2021. This reform aimed at improving the health status of Nigerians, and reverses the vicious cycle of poverty, ill-health and underdevelopment.

The estimated growth rate of the Nigerian population is 2.38 percent yearly, with over 140 million people National Population Commission (2006), made up of 99.13 million females and 101.33million male (NPC, 2019). Out of the ages of 15 and 49 years are childbearing. Similarly, the Maternal Mortality Rate (MMR) as at 2020 was 814 (per 100,000 life birth). In its annual statistical bulletin, the NPC in 2020, put the lifetime risk of a Nigerian woman dying during pregnancy, childbirth, post-partum or post-abortion to 1 in 22, in contrast to the lifetime risk in developed countries estimated at 1 in 4900 women. More worrisome is the increasing mortality rate in Nigeria. For instance, in 2018, to mortality rate per 100 births was 814.00, with an annual percent change of-0.80%. in 2019, it increased to 885.00, at -0.80%, and in 2020, it rose to 893.00 and at an annual percentage change of -0.75%.

It is generally believed that an active labour force is pivotal to economic growth and development, and the labour force of a country can be active when the death pattern discriminates between the working and dependent population. A death pattern that centers on the active population is a minus to economic growth, both the health sector and other social infrastructures of the country. This is because higher efficiency stimulates greater production and quality services, thus, the saying "a healthy labour force and good infrastructures are pivotal to economic growth and development". Economic growth, from the early period of economic history engaged the attention of man and his government. As far back as 17th and 18th centuries, writer like Adam Smith, David Ricardo, e.t.c, have all been preoccupied with the quest of unearthing the forces and the processes that cause a change in the material progress of man. In Nigeria, for instance, the broad objective of the national economic policy has been the desire to promote

sustainable economic, growth for the vast majority of Nigerians through the adaption of various monetary and fiscal policies. Unfortunately, her economic growth has been characterized by fits and starts, and the prospect of her rapid economic growth appears unachievable as reflected in her inability to realize sustainable full-growth potential and to significantly reduce the rate of poverty in the country Anyanwu, (2018).

Several governments/countries that have achieved rapid economic growth have two common features: first they invest in social infrastructure, and second, they invest in capital market. However, an emphasy is on social infrastructure – health. Ill-health affects economic growth directly through labour productivity and the economic burden of illnesses. Ill-health also indirectly affects economic growth because poor-child-health affects the future income of the people thorough the impact health has on education. For instance, when a family is healthy, both father and the mother can hold a job, earn money which allows them to feed, protect and send their children to school. Healthy and well-nourished children will perform better in school, and better performance in school will positively impact their future income.

With the introduction of the Millennium Development Goals (MDGs) and the associated increase in foreign aids to the health sector, it is expected that healthcare status of Nigeria would improve. Rather than this, the Nigerian Human Development Index(HDI) and Life Expectancy (LE) is one of the lowest in the world, with an "abnormal" mortality ratio" (FMOH, 2020). More so, with the introduction of Medium and Small-Scale Enterprises (SMEs) and other economic growth policies, it is expected that economic growth would increase, rather than that, the economy has been witnessing a dismay movement in economic growth indices. For instance, in 2017, the GDP growth rate was 0.81%, in 2018, it increases to 1.92%, in 2019, 2.21% and in 2020, -4.8%. Therefore, the key questions to ask are: is the Nigeria social infrastructure viz-a-viz, the health sector efficient in contributing to the GDP? Is there any need for improvement, and by how much can it be improved? It is against this backdrop that this study is set to investigate the extent health care delivery (as one arm of social infrastructure in Nigeria) and ascertain how it has contributed to economic growth of the country

Literature Review

Theoretical Literature

Theory of unbalanced growth

This theory was propounded by Albert O. Hirschman (1947), and it states that, no less developed country (LDC) has sufficient endowment of resources as to enable it invest simultaneously in all sectors of the economy in order to achieve

balanced growth. The theorist maintained that "investments in strategically selected sectors of the economy will lead to new investment opportunities and so, paves the way to further economic development". He identified convergent and divergent series of investments. Convergent series of investments are those projects that appropriate more external economies than they create while divergent series create more external economies than they appropriate. According to Jhinghan (2014), development policy should aim at the prevention of convergent series of investments and the promotion of divergent series. Thus, for development to take place, a deliberate strategy of unbalancing the economy should be adopted. "This is possible by investing either in social overhead capital (SOC) or in directly productive activities (DPA). Investment in social overhead capita is advocated not because of its direct effect on final output, but because it permits and in fact invites DPA to come in. Some social overhead capita investment is required as a prerequisite of directly productive activities investment".

Theory of Data Envelopment Analysis (DEA)

Data Envelopment Analysis was developed in operations research and management science for measuring efficiency of Decision Making Unit (DMU) in the public and private sectors. It is a tool for estimating a multi-product technology functions and to assess the managerial performance of selected decision-making units that utilizes multiple resources in turning out multiple products. Data Envelopment Analysis is an alternative non-parametric technique for efficiency measurement which uses mathematical programming rather regression (Ray, 2004). It constructs a piece-wise-linear production function based on observed best practice. It is based on the radial measure of efficiency developed by Farrell (1957) which corresponds to the coefficient of resource utilization defined by Debrea (1951). From the above theories, this study intends to adopt the theory of unbalanced growth. This is because, it depicts the growth pattern of the Nigerian economy, with reference to social infrastructure and maternal mortality.

Empirical Literature

Isaac and Michael (2015) investigated the impact of health expenditure on economic growth in Nigeria, using time series data spanning from 1981 to 2013. Ordinary least square regression analysis, Auto-regressive Distributed Lag (ARDL) Model approach and Error Correction Mechanism (ECM) were employed as the estimating techniques to test the existence of long-run relationship among the variables. The result shows that gross capital formation, and total health expenditure determines the level of economic growth in Nigeria, while life

expectancy rate indicates statistical negative impact on the growth contrary to theoretical economic expectation for the period covered by the study. As a result, the following policy measures are suggested among others that government should encourage savings and investments in the economy, increase expenditures on health provisions, induce the level of labour productivity and place priority on the issues of security to lives and properties so as to pave way for growth and development of the Nigerian economy.

Ogunjimi, and Adebayo, (2018) investigated the relationship among health expenditure, health outcomes and economic growth in Nigeria for the period between 1981 and 2017, using the Toda-Yamamoto causality framework to examine these relationships. The results of the Toda-Yamamoto causality tests showed a unidirectional causality running from health expenditure to infant mortality, while there is no causality between real GDP and infant mortality; a unidirectional causal relationship running from health expenditure and real GDP to life expectancy and maternal mortality; and a unidirectional causal relationship running from real GDP to health expenditure. This study recommended that the Nigerian government should make a conscious efforts towards increasing the health expenditure to meet up with the WHO"s recommendation, that all countries should allocate at least 13 per cent of their annual budget to the health sector for effective funding as this would bring desired health outcomes and employ the use of modern technology and the services of professional health personnel should be sought to combat the high incidence of maternal and infant mortality in the health sector in Nigeria.

Ogungbenle, *etal* (2013) analyze the relationship existing among life expectancy, public health spending and economic growth in Nigeria. A vector Autoregressive (VAR) model approach was employed in analyzing the data. The results of the study revealed that there is no bi-directional causality between life expectancy and public health spending in Nigeria. In the same vein, the study also revealed that there is no bi-directional causality between life expectancy and economic growth in Nigeria over the years. However, the study confirmed that there is bi-directional causality between public health spending and economic growth in Nigeria. Based on the findings of the study, it was recommended that for Nigeria to experience a sustainable economic growth, it has become imperative for her to put in place measures that would boost the life expectancy of her citizenry by increasing her public health spending as this will serve as a panacea for her economic backwardness.

Oladele and Adeniji (2015) investigate the effect of health on economic growth in Nigeria using secondary data from the period 1980 to 2013. Time series properties of the data was tested with ADF and PP unit root test which was followed by a test of the long run relationship among the variables using Johansen-Juselius cointegration test, VECM and granger causality test. The result of the unit root

test revealed that all the variables were stationary at first difference i.e I(1) while Schwarz Information Criterion (SC) confirmed the appropriateness of two lag length and the trace statistic and the max-Eigen statistic Johansen cointegration test both revealed the existence of five cointegrating equation. The VECM result showed that all the explanatory variables were in line with the a priori expectation and the model satisfied the stability condition while the granger causality result depicts a uni-directional relationship between health indicators and economic growth in Nigeria. Therefore, it was suggested that government should increase the allocation of fund to the health sector and develop strategies for the monitoring of the disbursement of such fund as well as increase the awareness of the availability of various health services to the society.

Adeyemo (2018) examine the effects of public health spending on maternal mortality in Nigeria. It is informed by the escalating nature of maternal mortality outcomes in Nigeria. A panel data regression analysis was employed from the years 2003 to 2015 from selected 25 States in Nigeria. The study adopted instrumental variables strategy as a solution for possible endogeneity for its econometric analysis. After controlling for other relevant covariates like female per capita income, female literacy rate, and urbanization, we realized that public health expenditure is a vital factor in reducing incidences of maternal mortality in Nigeria

Methodology

Model Specification

The model of this study is based on the modification of

RGDP=f (LEXP, SENR, PCIN)

The mathematical form of this model is stated as:

$$RGDP=f(\beta_o+\beta_1 LEXP + \beta_2, SENR + \beta_3, PCIN)$$

Therefore, the econometric form of the model is stated as follows

$$RGDP=f(\beta_o+\beta_1 LEXP + \beta_2, SENR + \beta_3, PCIN +\mu)$$

Where:

RGDP =Real Gross Domestic Product
LEXP = Life Expectancy (represents mortality rate)
SENR = School Enrollment (represents social infrastructure)
PCIN = Per Capita Income (represents exogenous variable which explains other variables in the model)

Result

Table 4.1: Real Gross Domestic Product (RGDP), Life Expectancy (LEXP), SCHOOL Enrollment (SENR) and Per Capita Income (PCIN), spanning from 1980 to 2019.

YEAR	RGDP	LEXP	SENR	PCIN
1980	158.44	45.33	9484	874
1981	144.83	45.64	10307	2180

1982	154.98	45.87	11276	1844
1983	163.00	46.02	11308	1223
1984	170.38	46.11	11184	902
1985	192.27	46.13	10628	883
1986	202.44	46.10	9349	639
1987	249.44	46.05	8974	598
1988	320.33	45.99	8974	549
1989	419.20	45.95	8305	474
1990	499.68	45.90	8649	568
1991	596.04	45.88	8565	503
1992	909.80	45.86	8970	477
1993	1259.04	45.84	9382	270
1994	1762.81	45.84	9361	321
1995	2895.20	45.84	8930	408
1996	3779.13	45.88	7866	462
1997	4111.64	45.92	7866	480
1998	4588.99	45.99	7866	469
1999	5307.36	46.10	9411	498
2000	6897.48	46.27	649	568
2001	8134.14	46.51	9638	590
2002	11332.25	46.84	9811	742
2003	13301.56	47.24	9811	795
2004	17321.30	47.72	661	1008
2005	22269.98	48.25	666	1268
2006	28662.47	48.81	671	1656
2007	38995.38	49.37	701	1883
2008	39157.88	49.91	631	2243
2009	44285.56	50.42	640	2328
2010	54612.56	50.90	638	1927
2011	62980.46	51.35	9067	2544
2012	71713.94	51.79	9209	2756

2013	89043.62	52.23	9412	2998
2014	94144.96	53.67	9412	2323
2015	101489.49	53.11	9412	2179
2016	101489.49	53.54	8473	2176
2017	113711.63	53.95	8473	1969
2018	127736.83	54.33	683	2033
2019	144210.49	54.49	683	2033

Source: Central Bank of Nigeria (CBN) statistical Bulletin and World Bank data 2019

Table 4.1, presents the raw data collected from the field. These are data associated with real gross domestic product, life expectancy, school enrollment and per capita income spanning 1980 to 2019.

Table 4.2: Descriptive statistics

	RGDP	**LEXP**	**SENR**	**PCIN**
MEAN	30484.41	48.22350	7149.900	1266.025
MEDIAN	6102.420	46.20000	8972.000	892.5000
MAXIMUM	144210.5	54.49000	11308.00	2998.000
MINIMUM	144.8300	45.33000	631.0000	270.0000
STD. DEV.	42215.33	3.053295	3876.937	820.4031
SKEWNESS	1.286739	0.911173	-1.003363	0.470822
KURTOSIS	3.341444	2.262637	2.241144	1.741511
JARQUE-BERA	11.23229	6.441086	7.671350	4.117481
PROBABILITY	0.403639	0.239933	0.021587	0.127615
SUM	1219376.	1928.940	285996.0	50641.00
SUM SQ. DEV.	6.95E+10	363.5817	5.86E+08	26249389
OBSERVATION	**40**	**40**	**40**	**40**

Source: E-View 10

Table 4.2 presents descriptive statistics of the variables in the study. The total observations considered in this study were 40 with four variables (one dependent and three independent variables). Life expectancy (LEXP), revealed a mean value of 48.22350 with a minimum of 45.33000 and maximum of 54.49000 while the standard deviation is. 0.911173 In the same table, School enrollment (SENR), reported a mean value of 7149.900 while minimum and maximum reported a value of 631.0000, 11308.00 with a standard deviation of 3876.937. Equally Per capita income (PCIN), showed a mean value of 1266.025 while both minimum and

maximum reported a value of 270.0000 and 2998.000 with standard deviation of 820.4031

In general, the standard deviation for each variable indicate the value by which a given variable deviates from its mean. Among the variables under study, life expectancy (LEXP), has the least standard deviation, an indication that it does not deviate much from its mean. Per capita income (PCIN), has the larger deviation, an indication that it deviates much from its mean. As regards the variables in the study,

Table 4.3: Unit Root Test

VARIABLES	LEVEL		1ST DIFFERENCE		ORDER OF INTEGRATION	PROB
	T-stat	Critical Value	T-stat	Critical Value		
RGDP	7.474583	-2.938987	-4.757399	-3.198312	I(1)	0.0025
LEXP	2.618419	-2.938987	-6.484542	-3.198312	I(1)	0.0000
SENR	-2.478342	-2.938987	-7.553388	-3.198312	I(1)	0.0000
PCIN	-1.095396	-2.938987	-7.821130	-3.198312	I(1)	0.0000

Source: E-view 10 Table 4.3, present the summary of stationary test performed with a unit root procedure Augmented by Dickey Fuller (ADF). The result indicates that all the series in the distribution are integrated of order one. This implies that the series became stationary after first differencing in line with box and Jenkins (1987). Therefore, we move to test for long-run association using Johensen Co-integration

Johensen Co-Integration Output

Unrestricted Cointegration Rank Test (Trace)

HYPOTHESIZED		TRACE	0.05	
NO. OF CE(S)	Eigenvalue	Statistic	Critical Value	Prob.**
NONE *	0.748109	97.90222	47.85613	0.0000
AT MOST 1 *	0.475380	46.88820	29.79707	0.0002
AT MOST 2 *	0.442161	23.02023	15.49471	0.0031
AT MOST 3	0.037753	1.423906	3.841466	0.2328

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

HYPOTHESIZED		MAX-EIGEN	0.05	
NO. OF CE(S)	Eigenvalue	Statistic	Critical Value	Prob.**
NONE *	0.748109	51.01402	27.58434	0.0000
AT MOST 1 *	0.475380	23.86797	21.13162	0.0201
AT MOST 2 *	0.442161	21.59633	14.26460	0.0029
AT MOST 3	0.037753	1.423906	3.841466	0.2328

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
Table 4. The result showed that there is the presence of co-integration in the model. This is evident by the fact that the critical value or p-value of at most three is greater than 0.05 implying that a long-run relationship exists among the variables. Therefore, it is pertinent to consider error correction.

Table 4.4: Parsimonious Error Correction Model (ECM)

VARIABLE	COEFFICIENT	STD. ERROR	T-STATISTIC	PROB.
C	2191.650	999.3048	2.193175	0.0357
D(LEXP)	7124.388	2662.334	2.675993	0.0116
D(SENR)	-0.124954	0.246606	-0.506696	0.6158
D(PCIN)	4.590662	3.249076	1.412913	0.1673
ECM(-1)	-5.020917	3.647383	-1.376581	0.0182

R-SQUARED	0.216877	MEAN DEPENDENT VAR	3893.392
ADJUSTED R-SQUARED	0.118986	S.D. dependent var	5071.762
S.E. OF REGRESSION	4760.473	Akaike info criterion	19.89917
SUM SQUARED RESID	7.25E+08	Schwarz criterion	20.11686
LOG LIKELIHOOD	-363.1346	Hannan-Quinn criter.	19.97592
F-STATISTIC	2.215507	Durbin-Watson stat	1.570379
PROB(F-STATISTIC)	0.009452		

Source: E-view 10

The Error correction model (ECM) output in Table 4.4, shows that LEXP, PCIN have positive impact on RGDP, while SENR have negative effect, putting all other variables aside, a unit rise in LEXP and PCIN brings about 7124.388 and 4.590662 unit rise in RGDP, respectively, while a unit rise in SENR leads to 0.1249540 unit fall in RGDP. Except LEXP, all other explanatory variables are not significant. The variables however give about 23% explanation for the fluctuation in RGDP and the model is fit considering the low probability value of F-statistics. The result also showed that a long-run causality exists between the variables running from LEXP, SENR, PCIN to RGDP. The negative value of -5.020917 indicate the adjustment to equate the short run distortion to the long run equilibrium; therefore, to attain the short run relationship in the long run, an annual 50% alignment is desired.

Findings, Conclusion and Recommendation

From the ECM result, Life Expectancy (**LEXP)** has a positive and significant relation with Real Gross Domestic Product (RGDP). This result is in conformity

with economic theory, and the implication is that, as the people's lifespan increases, the labor force in the country will equally increase. This, will in-turn lead to increase in the productive capacity that will generate wealth for the country viz-a viz-increase economic growth of the country. It was also reported that a negative and insignificant relationship exist between school enrollment and gross domestic product in Nigeria. The implication of this result is that, as school enrollment rate continues to increase, the more maternal mortality will increase, this situation if not controlled will adversely affect the economy in the long-run. This can be attributed to lack of social infrastructure in the country. Thus, the study recommends that, in other to reduce the high rate of maternal mortality which affects economic growth and development in Nigeria, social infrastructure, specifically, quality health facilities should be provided to the citizens, particularly primary and secondary schools to encourage school enrollment in the country. Further study on the topic is recommended.

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