The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.12742366

PUBLIC HEALTH INVESTMENT, PUBLIC EDUCATION INVESTMENT AND INDUSTRIAL OUTPUT GROWTH IN NIGERIA

OJO RUFUS OLAWUMI [1], OLUWAGBENLE SOLA [2], OLUFAYO MARY BOSEDE [3] and OLUFEMI OLUFUNKE BOSEDE [4]

[1,2] (PhD), Department of Economics, School of Social Sciences, Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti, Ekiti State, Nigeria.
[3,4] Department of Economics, School of Social Sciences, Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti, Ekiti State, Nigeria.
Email: [1]olawumi.ojo@bouesti.edu.ng, [2]oluwagbenle.sola@bouesti.edu.ng, [3]olufayo.mary@bouesti.edu.ng, [4]olufemi.olufunke@bouesti.edu.ng

Abstract

Investment in public health and public education is expected to have positive effects on the nation's industrial output. Nigeria economy seemed to have recorded deficit in this area in terms of inadequate allocation to health and education, with the resultant effect on low productivity in the Nigeria industrial sector. Hence, study examined the relationship between public health investment, public education investment and industrial output growth in Nigeria. Secondary data were collected from the Central Bank of Nigeria 2022. The study due to the strong evidence of long run relationship among the variables, conducted ARDL model to be able to determine the nature of the relationship between the variables. Selected variables are integrated of order I (1) and I(0). Cointegration test was carried out using ARDL Bounds Test approach to cointegration. The finding revealed that, in the long run, public education investment have significant effect on industrial output in Nigeria as well as longrun negative relationships exist between public health expenditure on the performance of industrial output in Nigeria and that long run relationship exist between Gross Capital Formation and industrial output in Nigeria. In the long-run the level of inflation rate, gross capital formation, exchange rate and interest rate affects industrial sector output growth positively and negatively in Nigeria. Based on the findings, the study recommended among others that; government should grow the industrial sector through its budgetary allocation on education which contribute positively to industrial growth in the long run in Nigeria. Government should increase and restructure its expenditure on health sector in order to provide more funds to the sector.

Keywords: Public Health Investment, Public Health Education, Industrial Output Growth.

INTRODUCTION

It is an essential economic asset to healthy workforce world over. Improved health is an important impetus to labour productivity, increasing life expectancy, and boosting workers' productivity. Unproductivity is always traced to sick people and the number of workforce declines abysmally with increased number of sick people. To finance health, it involves the basic functions of revenue collection, pooling of resources, and purchase of health interventions. Various sources through which health can be financed in Nigeria include budgetary allocations from three levels of government. Government at the Federal level is restricted to coordinating the affairs of the University Teaching Hospitals, the government at the state level manages the various General Hospitals while the Local Government focuses on primary health centers and dispensaries (Vogel, 1993). Investment in health involves the expenditure on health facilities, provision of drugs, safeguard and maintain people's mental

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.12742366

and physical health in a given period. Broadly speaking, investment in health care also includes the expenditure for the purpose of entertainment, job training etc. It is suffix to say that investment in health care is a productive investment (Xiaoqing, 2005).

Over the years, the need to develop the health and education of individuals towards enhancing sustainable growth has been taken into cognizance. The importance of human capital in promoting the growth of the developing countries have been thoroughly discussed in theories. Human capital has been referred to as a stock of knowledge, ability, time, physical and managerial skills in producing final goods and services (United Nation, 2010). Natural resources and capital formation used to be the measurement of socio-economic development across nation until recently when the stock of skills in health, knowledge and the character of the population are considered more in the process, because it determines the productivity and standard of living of a Country (Schultz, 1961).

To enhance the growth of any Country, expectually Nigeria, expenditure must be focused on the manufacturing sector. To this end, the output of the manufacturing sector should be improved and encouraged by government (Ishola, 2012). Investment in human capital, the skills, knowledge and productivity of labour must be increased, in order to achieve economic development. The impact of human capital investment on industrial productivity in Nigeria has not yielded expected result due largely to political instability (Olayemi, 2012).

Education is expected to record improved outcome due to improve government spending while the manufacturing sector has impacted significantly. The manufacturing sector is known for its positive impacts on the nation's economic development. Some of the impacts are increasing government revenue through tax; improved standard of living; reduction in infrastructural gap, growth of Gross National Products (GNP); generation of employment; manpower development, to mention but a few (Aderibigbe, 2004).

There is a strong correlation between education and the output of the manufacturing sector. The developed nations of the World paid more attention to their education sector, the evidence of which could be seen in term of improved manufacturing output. Education is a tool that drives the well- being of individuals and by extension, the society (Idrees & Siddiqi, 2013). The education spending as a percentage of Gross Domestic Product in developing Countries like Nigeria is far lower than the statistics in the developed World (Idrees and Siddiqi (2013). Expenditure on education enhances human capital formation which translates to economic growth. Social spending in terms of education expenditure determines the growth of the manufacturing output and improved economic performance in terms of economic growth (Idrees and Siddiqi (2013).

The positive impacts of education on the economy had been adjudged to be significant hence there is need to continue to invest in education for the economy to be able to attain the desired level of productivity and to enhance economic growth (Olayemi, 2012).

Lots of problems have been solved in the Nigerian manufacturing sector. Economic recession surfaced which almost collapse the global oil market from early 1980. Overdependence on imports for consumption and capital goods, infrastructural deficit and neglect of the agricultural

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.12742366

sector are part of the problems confronted by the Nigerian economy. Nigeria has been rated as the poverty capital of the World. There is the need to allow growth and development to navigate through productive performance in the manufacturing sector. To what extent human capital development affect productivity in the industrial sector formed the focal point of this study. Investment in education has improved tremendously in Nigeria in the recent past. Several efforts have been put in place by government to improve education standard in Nigeria. However, the efforts have not yielded the desired change. Inadequate statutory allocation to education, poor political environment, lack of dedicated teachers, poor implementation of policies and several others are some of the problems bedelviling education in Nigeria. This is evident through the increase in the number of people that have showed interest in private schools at various levels. Nigerians no longer believe in the ability of government to provide quality education. Only those who can afford the private educational institutions have since increased their patronage. So many Nigerians cannot afford the fees charged by the private investors, hence, there is need for government to pay attention and priotize investment in education.

On the other hand, public health investment is another area of concern in this study. There is a strong positive correlation between individuals' health and their productivity. Health is very key factor in human capital development. The health status of labour has a direct effect on labour productivity. In an attempt to improve health care delivery, government has made several attempts at improving health services by ensuring that more Doctors are available to patients, provision of more hospitals, increasing health facilities and ensuring additional health workers are engaged. Though, lots improvements are still required. Government seemed to have priotized the urban areas while the rural sector had been neglected. There is need to further reduce the population per Doctor, employ more health workers and embark on drastic measures to improve labour productivity. Nigeria is still confronted with poor services in the hospitals due to inadequate facilities, inadequate drugs, and deficit health infrastructures particularly in the rural areas. The extreme poverty in Nigeria is the reason for poor health and decline productivity of labour.

Government is lacking in the provision of productive investment in the health sector. Some governments, where they do at all, considers health allocation as costs rather than investment. This they do without cognizance to the long run effect on productivity and economic growth (Atun and Fitzpatrick, 2005).

Below are some research questions to guide the study; (i) does public health investment has impact on industrial output growth in Nigeria? (ii) What is the impact of public education investment on industrial output growth in Nigeria? To this end, the broad objective of the study is to determine the relationship between public health investment, public education investment and industrial output growth in Nigeria. However, the specific objectives are to; examine the impact of public health investment on the industrial output growth in Nigeria and to determine the impact of public education investment on industrial output growth in Nigeria.

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.12742366

Review of Empirical Studies

Several works had been carried out on the nexus between public health investment, public education investment and industrial output growth both within and outside Nigeria. For instance, Olayemi (2012) examined the relationship between human capital investment and industrial productivity in Nigeria from 1978 to 2008 using Co-integration and Error Correction Mechanism (ECM) techniques and found that government expenditure on education had a positive long run relationship with index of industrial production while government expenditure on health and Gross Capital Formation exhibited long run negative relationship with the endogenous variable.

In the same vein, Elijah and Uchechi (2012) investigated the linkage between financial development sector and industrial production in Nigeria using the Auto-regressive Distributed Lag from the period 1970 to 2009. Their result revealed that a co-integrating relationship exist between financial sector development and industrial production. Both the long run and short run dynamic coefficients of financial sector development variables have negative and statistically significant on industrial production.

Adejumo,Olomola and Adejumo(2013) examined the role of Human capital on industrial development in Nigeria using a time series data analysis within the period 1980 to 2010. The study found out that human capital has significantly influenced industry value-added in terms of output generated industrially. However, the effect of human capital is low in Nigeria. Falade and Olagbaju (2015) examined the impact of government capital expenditure on manufacturing sector output in Nigeria within the period of 1970 and 2013.

They employed co-integration and error correction techniques of analysis. The study showed a long-run relationship among the variables of interest in the study while the error correction model showed that government capital expenditure has positive relationship with manufacturing sector output in Nigeria and recurrent expenditure showed negative effect on manufacturing sector output.

Ekesiobi, Dimnwobi, Ifebi, and Ibekilo (2016) examined the impact of public sector education investment on manufacturing output in Nigeria using the Ordinary Least Squares (OLS) technique to analyse the relationship. The study revealed that that public education spending has a positive but insignificant effect on manufacturing output growth in Nigeria.

Chukwunonso, Ekesiobi, Dimnwobi,and Ifebi, (2017), examined public sector education investment and manufacturing output in Nigeria. The study employed the Ordinary Least Square (OLS) technique to analyse the relationship between public educational spending, primary school enrolment rate, per capita income, exchange rate, foreign direct investment and manufacturing output growth. The study showed that that public education spending has a positive but insignificant effect on manufacturing output growth in Nigeria.

Adisu, (2019), examined the effect of some macro-economic variables on the industry output growth in Ethiopia. The study made use of a time series data ranging from 1991 to 2018 from Ministry of Finance and Economic Cooperation of Ethiopia. The study employed the

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.12742366

Augmented Dickey-Fuller (ADF) and the Phillip-Perron (PP) unit root tests of stationary, Auto Regressive Distributed Lag (ARDL) bound test to co-integration and error correction model. The study revealed the existence of a long-run relationship between industrial output growth and macroeconomic variables. Macroeconomic variables such as, lending rate, inflation rate and trade balance found to have negative effects on industrial output.

Ughulu, (2021) examined the importance of the human capital investment in industrial sector output in enhancing sustainable economic growth in Nigeria for the period 1981 to 2019. The study relied on descriptive statistics, unit root and co-integration tests as the well as the error correction model (ECM).

The study revealed that there existed a positive relationship between industrial sector output and economic growth. Capital expenditure on education and health investment exhibited negative relationships on industrial output which accounted for the current decline in the level of industrial activities in Nigeria.

Ojo and Ojo (2022) examined health expenditure, education and economic growth in Nigeria. The study made use of the error correction model as the estimation technique. The study revealed that government disbursement on education and health has a positive and considerable impact on economic growth in Nigeria.

Charles and Musa (2023) investigated the effects of education and health infrastructure on industrial sector performance in Nigeria. The study employed. The study employed Autoregressive Distribution Lag model to analyse the parameters. The study revealed that there is positive but statistical significant relationship between education infrastructure and industrial sector performance and negative but statistically insignificant relationship between health infrastructure and industrial sector performance was established in Nigeria.

Several studies have been carried out within and outside Nigeria on the relationship among public health investment, public education investment and industrial output growth. Previous studies made use of data period below 2022. A study with data period extended to 2022 is believed to have the ability to produce reliable outcomes.

Also, there is divergencies in the outcome of the previous studies by their failure to reach consensus in their findings. In term of methodology, this study has adopted a more robust and sophisticated estimation technique in an attempt to fill the observed gap in the examination of the relationship among the variables.

METHODS AND MATERIALS

Model Specification

Following the neo-classical model of growth which was based on the Cobb-Douglas production function;

$Y = f(A, K, L)$ ---------- (1)

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.12742366

Romer and Weil (1992) considering the role of human capital on economic growth incorporated human capital in the framework and the model was written as:

$Y(t) = K(t)\, \alpha H(t)\, \beta \{A(t)\, L(t)\} 1-\alpha-\beta$ ---------- (2)

Where;

Y is output;

K = Physical capital and

H = the Human Capital Stock;

L = Labour force;

A is level of technology and

α, β, < 1, implying decreasing returns to capital.

Olayemi (2012) adopted the model by incorporating public expenditure on health and education as a proxy for human capital and replace output (Y) proxy for economic growth as industrial index production output. The model was written as;

$IIP = f(TED, THE, GCF)$ ---------- (3)

Where,

IIP- industrial index production,

TED- total expenditure on education,

THE- total health expenditure, and

GCF- gross capital formation proxy for K- capital.

Following the work of Olayemi (2012) the empirical model adopted for this study is written as; $Y = f(PHI\ PEDI, GCF, EXR, INTR)$ ---------- (4)

Econometrically, we have;

$Y = \beta_0 + \beta_1 PHI + \beta_2 PEDI + \beta_3 GCF + \beta_4 EXR + \beta_5 INTR + \mu$ ……..….(5)

Where;

Y – Industrial output as percentage share of gross domestic product (GDP)

PHI – public health Investment in Nigeria

PEDI – public education Investment in Nigeria

GCF- Gross Capital Formation as a proxy for domestic investment.

EXR- Exchange rate in Nigeria

INTR – Interest Rate in Nigeria

A priori Expectation

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.12742366

Table 1 below showed the a priori expectations for the variables in the model earlier specified.

Table 1: A priori Expectations

Regressand	Regressor	Relationship	
Y	HI	+	Government health investment is the spending of the government as part of the total health spending. Positive, i.e. as government health expenditure increases, health outcomes will also increase.
Y	EDI	+	Government education investment is the spending of the government as part of the total education spending. Positive, i.e. as government education expenditure increases, education outcomes will also increase.
Y	GCF	+	Positive relationship is expected between gross capital formation and industrial output in Nigeria
Y	EXR	-	Negative relationship is expected between exchange rate and industrial output in Nigeria.
Y	INTR	-	Negative relationship is expected between interest rate and industrial output in Nigeria.

Estimation Techniques

The methods of estimation employed for this study are based on Autoregressive Distributed Lag (ARDL) approach to cointegration and Granger causality test. The study analyzes time series properties of the research variables using the Augmented Dickey Fuller (ADF). The advantage of the ARDL method is that, it can be applied to the model whether the independent variables are stationary at I (0) or I (1). The dependent variable must be stationary in I (1).

Statistical Tools

Testing for Unit Roots

A unit root test is vital in observing the stationary of time series data. It is main to estimate about the variables observed have a tendency to return to the long term trend follow a shock (stationary) or the variables follow a random walk which containing a unit root. If the variables follow a random walk after a temporary or permanent shock, the regression between variables is spurious (Amiruddin, nor and Ismail 2007). According to the Grauss-Markov's theorem, in such cases, the series do not have a finite variance. Hence the OLS will not produce consistent parameter estimates.

A stationary series is one whose basic properties, for example it mean and its variance, do not change it over time. In contrast, a non-stationary series has one or more basic properties that do change over time. If the time series variable is stationery,

i) The mean of is constant over time

ii) The variance of is constant over time

iii) The simple correlation coefficient between variable depends on the length of the lag (k) but on no other variable (for all k).

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.12742366

The unit root test can be separated into 2 tests that is Augmented Dickey Fuller (ADF) test and Phillips Perron (PP) test. This will test for level (original series), first differences and second differences (changes). If stationary at level, then the series are integrated of order zero, I(0) and if stationary at first differences and second differences, the series are integrated of order one and two, I(1) and I(2) respectively. The Augmented Dickey-Fuller test statistic and Phillips-Perron test statistic to estimate the stationary for the variables. For the purpose of this study, the researcher choose to use The Augmented Dickey-Fuller test statistic. The results are and the hypothesis will indicate as below:

Hypothesis:

Ho: No stationary

Ha: Stationary

Hence, if p-value is smaller than 0.05, then rejected Ho, that is stationary, if failure to reject Ho, that means no stationary.

Dickey-Fuller and the Augmented Dickey-Fuller Tests

Dickey and Fuller (1979) consider three different regression equations that can be used to test the presence of a unit root. Basically, the three regressions differ due to the presence of the deterministic elements α_1 and $\alpha_2 t$ and they are given as follows:

$\Delta Yt = \alpha Yt_{-1} + \mu t$..... (1)

$\Delta Yt = \alpha 1 + \alpha_1 Yt_{-1} + \mu t$..... (2)

$\Delta Yt = \alpha 1 + \alpha_2 t + Yt_{-1} - \mu t$..... (3.3)

Where Y_t is the required time series, Δ is the difference operator, t is the time trend and μ_t is the pure white noise error term which should satisfy the following assumptions: normality, constant variance and independent error terms. Equation (3.1) is a pure random walk, equation (3.2) adds an interceptor drift term and equation (3.3) includes both a drift and linear time trend. The test involves estimating the equations using the OLS in order to obtain the estimated value of α, and the associated standard error and compare the resulting t-statistic with appropriate value reported in the Dickey-Fuller (DF) tables. The weakness of the DF test is that it does not take account of possible autocorrelation in the error process or term (μ_t). To cater for the above mentioned problem associated with DF test, the Augmented Dickey-Fuller (ADF) can be used.

Cointegration Test

Regression of one non-stationary variable on another is very likely to yield impressive-seemingly results which are wholly spurious (Mukherjee *et al*., 1998). In general, if two time series variables are both non-stationary in levels but stationary in first-differences, they are integrated of order 1, I (1), then there could be a linear relationship between them which is stationary, I (1) and as such all the series of interest should be integrated of the same order, preferably I (1).The two time series variables that satisfy this requirement are considered to be

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.12742366

cointegrated. Variables are cointergrated with one another if the residuals from the levels regression are stationary.

RESULTS AND DISCUSSION

Presentation of Results

Unit Root Tests

In time series analysis with econometrics results, before running any test it is important to distinguish between correlation that arises from a share trend and one associated with an underlying causal relationship. Regression of non-stationary time series will lead to spurious estimates. Unit Root tests deal with the situation where estimation result claim statistical significance of the long run relation between variables in a given regression analysis just because of trending relations among these variables than presence of true momentous casual relations.

The Augmented Dickey-Fuller (ADF) unit root test results for the time series variables are presented in Table 2 below.

The use of ARDL models does not impose pre-testing of variables for unit root problems. However, unit root tests was conducted in this study to find out if there are mixtures in the order of integration of our variables. The order of integration of the time series was investigated by applying the Augmented Dickey and Fuller (1979) test with maximum lag of five (5) as suggested by the AIC criteria.

Table 2: Unit Root Test Results

Variable	ADF Test Statistic	95% Critical ADF Value	Order of Integration	Remark
D(Y)	2.258**	1.952	*I* (1)	Stationary
D(PHI)	3.595**	1.952	*I* (1)	Stationary
D(PEDI)	4.307**	3.552	*I* (1)	Stationary
D(INTR)	2.996**	1.952	*I* (1)	Stationary
GCF	5.703**	2.963	*I* (0)	Stationary
D(EXR)	4.505**	3.536	*I* (1)	Stationary

Source: Authors' Computations, 2024.

Note: ** = 5 percent significance.

From table 2, the ADF test statistic for each of the variables are greater than the respective critical values. Thus, we accept the hypothesis of unit roots in each of the time series. In the final evaluation, all the variables became stationary after first difference except gross capital formation that was stationary at level. Hence, they are integrated of order *I* (1) and *I*(0). Thus co-integration tests can be applied for all variables.

ARDL Bounds Test Approach to Cointegration

In line with the result of the unit root test, cointegration test will be carried out using ARDL Bounds Test approach to cointegration. The choice of this approach is premised on the fact that

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.12742366

our variables are integrated of different orders [(I(0) and I(1)], thus negating the use of Engle-granger and Johansen Cointegration test approach. Pesaran and Shin (1999) and Pesaran et al (2001) developed the ARDL cointegration approach which has three major advantages over other traditional cointegration approaches. Firstly, the ARDL framework does not require that all the variables under study be of the same order of integration; it accommodates series which are I(0) or I(1) or both. Secondly, it is relatively more efficient using small sample sizes. Thirdly, the ARDL framework obtains unbiased estimates of the long-run model. The rule of ARDL Bounds test of cointegration states that the null hypothesis should be rejected if the value of the computed F-statistic is greater than the upper bounds value and accepted if the F-statistic is less than the lower bounds value. The ARDL cointegration test will be said to be inconclusive should the computed F-statistic fall within the lower and upper bound.

Table 3: ARDL Bounds Test Result

Significance Level	Critical Value		Computed F-Statistics
	Lower (I0) Bound	Upper (I0) Bound	
10%	2.08	3	
5%	2.39	3.38	11.27087
2.50%	2.7	3.73	
1%	3.06	4.15	

The Bounds critical values for k=5

Source: Author's Computation, 2024.

Accordingly, Table 3 showed that the computed F-statistic (11.27) falls above the upper bound critical value at 10, 5, 2.5 and 1 percent level of significance. This implies that there is a long-run relationship among Industrial output as percentage share of gross domestic product, public health Investment in Nigeria, public education Investment in Nigeria, Gross Capital Formation as a proxy for domestic investment, Exchange rate and Interest Rate.

Table 4: Auto-Regressive Distributed Lag (ARDL) Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
EXR	-11.62719	5.642570	-2.060620	0.0733
GCF	0.903003	0.152812	5.909228	0.0004
INTR	5.367227	8.369679	0.641270	0.5393
PEDI	49.99816	20.63479	2.423003	0.0417
PHI	-46.25208	36.13823	-1.279866	0.2365
C	22.26743	155.5398	0.143162	0.8897
R-squared	0.999960	Mean dependent var		8338.695
Adjusted R-squared	0.999830	S.D. dependent var		10588.16
S.E. of regression	137.9053	Akaike info criterion		12.75796
Sum squared resid	152143.0	Schwarz criterion		13.95780
Log likelihood	-196.2643	Hannan-Quinn criter.		13.17215
F-statistic	7708.449	Durbin-Watson stat		2.106870
Prob(F-statistic)	0.000000			
*Note: p-values and any subsequent tests do not account for model selection.				

Source: Author's Computation, 2024.

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.12742366

Table 4 presents the ARDL result using industrial output (Y) as the dependent variable. The Durbin-Watson statistics value is 2 which implies that there is no autocorrelation problem in the model which is good for the study. The F-statistics measure the joint significance of the variables. The F-statistics value is 7708.449 with the probability value of 0.000000; this indicates that the independent variables jointly explained the dependent variable at a 5% significance level. The R-squared measures the determination of coefficient, measuring the fit of the model. The value of the R-squared is 0.999960, this shows that about 99% variation in the dependent variable is been explained by the variations in the independent variables. Hence, there is a good fit in the model. Likewise, the adjusted R squared measure the goodness of fit with putting the degree of freedom into consideration. The value is 0.999830, showing that the model has a good fit at 99%.

The long run estimation coefficient of public Education investment in Nigeria (*PEDI*) carries positive sign (49.99816) implying that there is positive relationship between education expenditure and industrial output in Nigeria and its t-value is (2.423003) with the p.value of 0.0417 which is statistically significant at 5% level. This implies that public education expenditure has influence industrial output productivity significantly in the long-run in Nigeria. Theoretically, this is to say that, education expenditure contribute to the growth of industrial output in Nigeria since the long run coefficient conform to the apriori expectation of the study. It is estimated from the result that 1% increase in (PEDI), on the average, will lead to 24% increase in industrial output (Y) in the Nigerian economy in the long run.

The statistical findings shows that the quality of health expenditure in Nigeria do not contribute significantly to industrial output. The long run regression coefficient of (PHI) carries negative sign of -46.25208 and its p-value 0.2365 which is greater than 0.05% level of significance implies that theoretically, the coefficient is not significant and statistically not significant, the health expenditure is not significant to industrial output in Nigeria as confirmed by the greater value of the p.value. This result did not conform to our a priori expectation, the expectation was that, positive relationship should exist between health expenditure and industrial output productivity in Nigeria. In this case, Expenditure on health has a negative effect on labour productivity thereby reducing the growth of industrial productivity by 46%. This is due to the fact that, although government undertakes capital projects like health care expenditure, they do not provide sufficient finance for the maintenance and continuity of these projects. Since the government expenditure on health is negatively related to industrial output in Nigeria. This may be due to the wrong channeling of funds and corrupt practices of the leaders coupled with the problem of brain drain and frequent strikes by health officials. It therefore follows that if government can intensify its commitment to education and health, productivity growth output in the industrial sector will be achieved through healthy labour force.

The long run estimation coefficient of Gross Capita Formation in Nigeria (*GCF*) carries positive sign (0.903003) implies that there is positive relationship between gross capital formation and industrial output in Nigeria and its t-value is (5.909228) with the p.value of 0.0004 which is statistically significant at 5% level. Therefore, Gross Capital formation as expected has a positive and significant effect on industrial output growth in Nigeria. This

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.12742366

implies that, the government of Nigeria gives special attention for the development of this sector; hence transferring of productive resources toward industry is beneficial for the sector.

In the long run, Exchange rate had a negative (-11.62719) and significant effect at 5% level of significance on industrial output in Nigeria as a control variable. This implies that, the rate of exchange of the country currency has not favoured the value of the industrial output. This could be as a result of inappropriate policy implementation towards increasing the value of the sector output.

Interest rate exhibited a positive (5.367227) relationship with industrial output in Nigeria though statistically not significant. This means that interest rate has the potential of increasing industrial output growth in Nigeria. At a lower lending rate firms tend to be pushed to lending money and investing on industry sector.

Table 5: ARDL Short-run Relationship Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CointEq(-1)*	-0.242436	0.020632	-11.75024	0.0000
R-squared	0.999105	Mean dependent var		1138.031
Adjusted R-squared	0.997826	S.D. dependent var		2235.922
S.E. of regression	104.2466	Akaike info criterion		12.41510
Sum squared resid	152143.0	Schwarz criterion		13.34831
Log likelihood	-196.2643	Hannan-Quinn criter.		12.73725
Durbin-Watson stat	2.106870			
* p-value incompatible with t-Bounds distribution.				

Source: Author's Computation, 2024.

Table 5, showed the result of the short-run relationship between public health investment, public education investment and industrial output growth in Nigeria. To investigate the existence of a short relationship among the variables of interest, restricted error correction model regressions was estimated. The most important thing in ECM (CointEq(-1)*) model is the sign and significance status of the error term. It measures the speed by which the short term deviations in the model can converge back to, or diverge from its long run equilibrium. In this case, it is negative and highly significant implying that any short term distortions in the model could be corrected; and the short term deviations could converge towards the long run equilibrium at the annual speed rate of -0.242436. The equilibrium adjustment level reported that about 24% of disequilibrium will be adjusted periodically. It revealed that the model will revert to its equilibrium path whenever shocks occurs. The coefficient of error term is 24% indicating that Nigeria industrial output corrects its disequilibrium at a speed of 29% yearly. The error correction term is significant at 0.05% level since the p-value is less than 0.05%. it thus means that our short run is given validity that public health investment, public education investment and industrial output growth have long run relationship under the period of study. We can accept this model because the value of R^2 is smaller (0.93) than the value of Durbin-Watson statistic (1.98) which means that the model is not a spurious model hence can be accepted.

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.12742366

DISCUSSION OF FINDINGS

This study examined the relationship between public health investment, public education investment and industrial output growth in Nigeria between 1981 and 2021 at short and long run levels.

From the regression analysis, the long run estimation coefficient of public Education investment in Nigeria had a positive relationship with industrial output in Nigeria as confirmed by both t-value of (2.423003) and the p.value of 0.0417 and it is statistically significant at 5% level. This implies that public education expenditure has a significant influence on industrial output growth in the long-run in Nigeria. This outcome conforms with the work Ekesiobi, Dimnwobi, Ifebi, and Ibekilo (2016) that concluded that public education spending has a positive effect on industrial output growth in Nigeria. Corroborated with this findings if the work of Olayemi (2012) whose outcome found that government expenditure on education maintained a positive long run relationship with index of industrial production.

The statistical findings of health expenditure in Nigeria do not contribute significantly to industrial output. Expenditure on health has a negative effect on labour productivity thereby reducing the growth of industrial productivity by 46%. This is due to the fact that, although government undertakes capital projects like health care expenditure, they do not provide sufficient finance for the maintenance and continuity of these projects. This outcome support the work Olayemi (2012) who concluded that government expenditure on health exhibited long run negative relationship with industrial output growth.

The long run estimation coefficient of Gross Capita Formation in Nigeria (*GCF*) carries positive sign (0.903003) implies that there is positive relationship between gross capital formation and industrial output in Nigeria and its t-value is (5.909228) with the p.value of 0.0004 which is statistically significant at 5% level. Therefore, Gross Capital formation as expected has a positive and significant effect on industrial output growth in Nigeria. This implies that, the government of Nigeria gives special attention for the development of this sector; hence transferring of productive resources toward industry is beneficial for the sector.

In the long run, Exchange rate posed negative and significant effect on industrial output in Nigeria as a control variable. This implies that, the rate of exchange of the country currency has not favoured the value of the industrial output. This could be as a result of inappropriate policy implementation towards increasing the value of output in the sector.

In the same vein, Okoye, Nwakoby and Okorie (2016), their findings revealed that the rate of change in exchange rate exert significant negative impact on industrial output. Supporting this findings is the work of Johngbo (2014) who investigated the impact of real exchange rate fluctuations on industrial output in Nigeria using Ordinary Least Squares regression technique to analyse the data used. He founds that real exchange rate play a significant role in determining the industrial output. Negating this outcome is the work of Otalu and Keji (2015) who showed that exchange rate had a positive and significant impact to the growth of the industrial sector in Nigeria.

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.12742366

Interest rate exhibited a positive relationship with industrial output in Nigeria though statistically not significant. This means that interest rate has the potential of increasing industrial output growth in Nigeria. At a lower lending rate firms tend to be pushed to lending money and investing on industry sector.

Negating this outcome is the work of Elijah and Uchechi (2012), who found that a co-integrating relationship exist between financial sector development through interest rate and industrial production. Both the long run and short run dynamic coefficients of financial sector development variables have negative and statistically significant impact on industrial production. Finally, the findings from the study shows that the F-statistics value indicates that the independent variables jointly explained the dependent variable at a 5% significance level.

CONCLUSION AND POLICY RECOMMENDATIONS

The study examined the relationship between public health investment, public education investment and industrial output growth in Nigeria.

In the long-run the level of inflation rate, gross capital formation, exchange rate and interest rate affects industrial sector output growth positively and negatively in Nigeria. However, the effect of public education investment on industrial output growth is positive and significant, meaning in the long run this variable has significant effect on industrial sector output growth in Nigeria.

The interest rate was found to be having a positive and not significant effect on industrial output growth which is opposite to our priori expectation. Showing that, any increase in interest rate would decrease the output of the industrial sector in Nigeria. Exchange rate had a negative (- and significant effect on industrial output in Nigeria as a control variable. The rate of exchange of the country currency has not favoured the value of the industrial output.

Recommendations

Based on the findings and conclusion, the following recommendations were made;

Government should develop the industrial sector through its budgetary allocation on education which will translate to industrial growth in the long run in Nigeria. Government should increase and restructure its expenditure on health in order to provide more health facilities, drugs, laboratories, equipment, amongst other things. This can be achieved via the right channeling of funds to the health sector in Nigeria. Government authorities should make sure that the volume and value of trade openness with other countries of the world should be scaled-up, but with great caution, to elicit greater industrial sector output in Nigeria through exchange rate regulation.

Government should regulate interest rate currently in operation in Nigeria. The high interest rate in the Nigeria investment space is capable of discouraging investors from borrowing to scale-up industrial productivity in Nigeria.

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.12742366

References

1) Adejumo, A. V., Olomola, P. A., &Adejumo, O. O. (2013). The Role of Human Capital in Industrial Development: The Nigerian Case (1980-2010). *Modern Economy Scientific Research*, 4, 639-651.

2) Aderibigbe, J. O. (2004). An Overview of the Nigerian Financial System, *CBN Bullion*, 28(1).

3) Amiruddin, R., Nor, A. H. S. M. & Ismail, I. (2007). The Dynamic Causal between Financial Development and Economic Growth: Empirical Evidence from Malaysia Based on Vector Error Correction Modeling Approach. *Labuan Bulletin of International Business & Finance* 5, 23-29.

4) Atun, R. A., and Fitzpatrick, S. (2005). Advancing Economic Growth: Investing In Health. A Summary of The Issues discussed at a Chatham House conference held on 22–23, 2005.

5) Central Bank of Nigeria (CBN) (2015). The changing structure of the Nigerian economy and implications for development. Realm communication, Lagos.

6) Charles, A. & Musa, B. (2023). Effects of Education and Health Infrastructure on Industrial Sector Performance: Evidence from Nigerian Economy. ABUAD Journal of Social and Management Science (AJSMS), 4(1), 130-147.

7) Chukwunonso, S., Ekesiobi, S. K., Dimnwobi,O. E., and Ifebi, B. N. I. (2017). Public Sector Education Investment and Manufacturing Output in Nigeria: Empirics and Policy Options. *Public Policy and Administration Research*, 6(7), 95-105.

8) Ekesiobi, C. S., Dimnwobi, S. K., Ifebi, O. E., &Ibekilo, B. N. (2016). Public Sector Education Investment and Manufacturing Output in Nigeria: Empirics and Policy Options. *Public Policy and Administration Research*, 6(7), 95-106.

9) Elijah, U., &Uchechi, R.O., (2012). Financial Sector Development and Industrial Production in Nigeria (1970-2009): An ARDL Co integration Approach. *Journal of Applied Finance & Banking*, 2(4), 49-68.

10) Falade, O. E. &Olagbaju, I. O. (2015). Effect of government capital expenditure on manufacturing sector output in Nigeria. *Business and Economic Research, 5(2),* 136-152.

11) Idrees, A. S., & Siddiqi, M. W. (2013). Does public education expenditure cause economic growth? Comparison of developed and developing countries. *Pakistan Journal of Commerce and Social Sciences*, 7 (1), 174-183.

12) Kannegiesser L. (2011). National Health Insurance Scheme to boost generics market in Nigeria. http://www.frost.com/prod/servlet/market-insight.

13) Ojo,T.J. and Ojo, S.I. (2022). Health Expenditure, Education and Economic Growth in Nigeria.Open Journal of Social Science and Humanities, 3(1), 01-17.

14) Okoye, L. U., Nwakoby, C. I. N. and Okorie, E. U. (2016). Economic Openness and Industrial Development in Nigeria. *Journal of Policy and Development Studies,* 10(1), 12-26.

15) Olayemi, S. O. (2012). Human Capital Investment and Industrial Productivity in Nigeria. *International Journal of Humanities and Social Science*, 2(16), 298-307.

16) Ughulu, S. E. (2021). Industrial Output and Economic Growth in Emerging Economies: Evidence from Nigeria. *Applied Finance and Accounting* 7(1). 32-43.

17) Vogel R. J. (1993). Financing Health Care in Sub-Saharan Africa. *Greenwood Press*, 1993.

18) World Bank, (2016). *World Development Indicator, Washington D.C.*

19) World Health Organization (2000). The World Health Report 2000: Health Systems: Improving performance. Geneva 2000: World Health Organization.

20) Xiaoqing, X. (2005). Investment in Physical Capital, Investment in Health and Economic Growth in China. *Investment Management and Financial Innovations*. 2(5), 23-29.