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THE DYNAMICS OF HUMAN CAPITAL DEVELOPMENT AND INDUSTRIAL GROWTH IN NIGERIA

Okumoko, Tubo Pearce[1], Omeje, Danjuma[1], and Udoh, Fond M.[3]

[1]Department of Economics, Niger Delta University, Wilberforce Island, Bayelsa State Nigeria.

[3]Department of Economics, University of Calabar, Cross River State, Nigeria.

ABSTRACT: *This article is aimed at providing empirical evidence on the impact of human capital development on industrial growth in Nigeria. Time series data spanning 1976-2016 period on relevant variables were analyzed using both descriptive and econometric techniques. ADF procedures were used to test for stationarity of the variables. The results show that the variables moved towards equilibrium in the long-run. The results also show that recurrent expenditure on education and health has a negative impact on industrial growth. The goodness of fit was encouraging. This article asserts that rigorous pursuance of graduate skill acquisition programmes as well as adherence to the 26 per cent minimum budgetary allocation demanded by UNESCO for education which will spur improvement in human capital development will impact industrial growth positively. More-so, incentives such as tax holidays, pioneer reliefs and exemptions that aids increased investment in industrial growth be vigorously pursued by governments at all levels in Nigeria.*

KEYWORDS: Human capital development, industrial growth, expenditure on education, expenditure on health, gross capital formation, exchange rate, Nigeria

JEL Classification: E62, H51, H52, O47

INTRODUCTION

Human capital development (HCD) has been described as an end of development. It is a means of fulfilling the potentials of people by enlarging their capabilities and this necessarily implies empowerment of people, enabling them to participate actively in their own development (Sankay, Ismail and Shaari 2010). The concept of human capital refers to the abilities and skills of human resources of a country, while human capital formation refers to the process of acquiring and increasing the number of persons who have the skills, education and experience that are critical for economic growth and development of a country. Glyfason (2001) aver that education and health are essential in human capital development. Education enhances economic development and improves people's lives in many ways: increase efficiency, foster democracy and therefore create good conditions for quality governance, enhance quality of services provided and improve the health care system. Other findings show that there is a strong link between educational levels and individual earnings, output levels and productivity (Ramey and Ramey, 2004). To this end effective investment in human capital is a key component of long run economic growth and improved productivity.

In support of this fact the United Nations Development Programme (UNDP) argued that development should focus on investment in human capital which should be seen in the light of how the economy is managed and wealth is distributed for the benefit of people. Thus, it is recommended that at least 26% of the annual government budget should be allocated to

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education and health sector in order to enhance human capital development. However a glossary look at the indices of HCD for Nigeria does not reflect a substantial expenditure on education and health (Olayemi 2012).

Furthermore, a considerable body of research has concentrated on the role of human capital investment in explaining the level and variation in production and earnings in the industrial sector. Empirical investigations from various researchers have revealed that adequate investment in human capital serves as a catalyst for improved productivity and economic growth. In addition, evidence has also shown that across countries, government expenditures in education and health which are prime indicators of 'healthy' human capital investment as a fraction of GDP and school enrolments are both negatively related to the level of natural resources. In an attempt to verify the relationship between natural resources, human capital and economic growth Brunnshweiler (2008) observed that countries that do not invest in enough human capital tend to rely on one sector to grow, that is, tend to be monocultural. In addition, Brunnshweiler (2008) stated that lack of effective and efficient human capital prevents entrepreneurship, innovation and creativity which consequently prevent diversification. More so, overreliance on natural resource based industries does not inspire the society to invest in education and training; spirally under-development of human capital has effects on different sectors of the nation's economy such as industrial that require higher skills.

The objective of this study is to empirically determine the relationship between human capital development and industrial growth in Nigeria between 1976 and 2016. The basic concern of this article is to ascertain whether the relationship between human capital development and industrial growth is country specific or it is same across developing countries as well as to find an explanation to the reason (s) behind the poor state of industrial growth in Nigeria against the backdrop of government's expenditure on human capital development in Nigeria.

Human Capital Development in Nigeria

In Nigeria, the human development indicators have performed poorly over the years. The 2016 UN Human Development Report ranked Nigeria 153rd out of 193 countries. In 2010, Nigeria was 142nd out of 169 countries. Government introduced the Universal Basic Education programme as well as increased the share of education in budgetary spending from 4 per cent in 2010 to 8.44 per cent in 2016, among other measures taken at the level of States and the Local Government Councils. The literacy rate for the 15-24 age group was 85.5 per cent in 2010, up from 64.1 per cent in 2000, but education quality has remained generally low across the country. The government has also sought to improve the health care system; health spending in the federal budget increased from 4 per cent in 2010 to 6 per cent in 2011 and later went down to 4.23 per cent in 2016, and several policy initiatives were adopted to strengthen the health system, including a National Strategic Health Development (HSHD) plan, intensification of the immunization programmes, and scaling up coverage of the National Health Insurance Scheme. Despite these efforts, health outcomes remain poor. According to the United Nations' 2010 MDG Report, the infant mortality rate was 75 deaths per 1 000 live births, the under-five mortality rate was 157 per 1 000, the maternal mortality rate was 545 deaths per 100 000 live births and the proportion of births attended by skilled personnel was 39 per cent., and the national prevalence of HIV is estimated at 3.6 per cent (World Economic Outlook, 2012). Figure 1 shows the ratio of expenditure on education and health to total expenditure.

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In 2012, 67.1 per cent of the population lived on less than USD 1 per day, up from 61 per cent in 2010. The Gini coefficient, an indicator for measuring income inequality increased from 0.43 in 2004 to 0.49 in 2013. Mechanisms to help the poor were not properly targeted, and pro-poor spending lacked transparency and accountability. Gender disparity remains a major issue, with the female population accounting for more than 56 per cent of Nigerians who cannot read. Female school enrolment was also relatively lower than that of male.

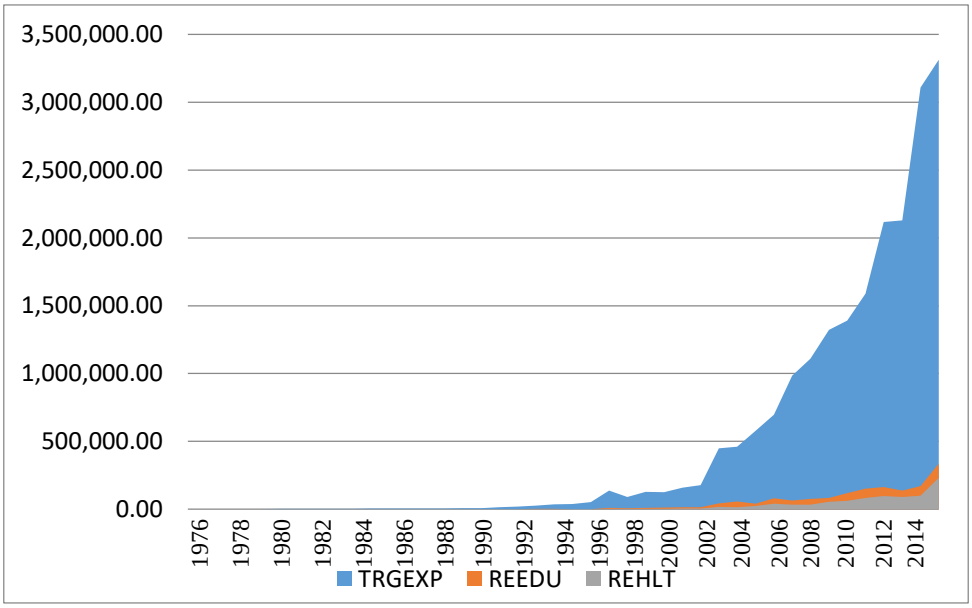

Figure 1: Share of Recurrent Expenditure on Education and Health to Total Recurrent Expenditure from 1976-2016

Source: Central Bank of Nigeria Statistical Bulletin, 2017

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Literature Review

A lot of empirical evidence abounds on the relationship between human capital development and growth in developing countries over the past four decades. Ding and Field (2005) find a negative association between human capital and export dependence and argue that low growth in the economy may be due to a high level of resource dependence that is due to poor development of human capital.

Lederman and Maloney (2003) find that resource abundance measured by resource exports per worker and in proportion of GDP positively affect growth, but resource concentration has a negative effect, which is due to reduced accumulation of physical and human capital and deterioration of the terms of trade. However, they do not control for institutions in their estimations. Manufacturing imports substitute for the development of domestic production, so openness to trade correlates with lower growth in mineral dependent economies.

Gylfason (2001) and Bravo-Ortega and De Gregorio (2005) concentrate on human capital. The first study shows that the negative growth effects of natural resources stem from lower

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education spending and less schooling in resource-rich countries; the latter find that the negative effects can in fact be offset by higher education levels (Brunnshweiler, 2008).

In a research conducted by Behbudi, Mamipour and Karami (2010) the relationships between natural resource, human capital and economic growth by two methods of panel data and cross section has been investigated. First the relationship of natural resource abundance, human capital and economic growth is studied by cross section method and then they estimate the main empirical implications of the model using panel data for the period 1970-2004. The results seem to indicate that natural resources are damaging for economic growth in countries (first group) with low levels of human capital, and countries with rich natural resource neglect human capital. While, in the second group of countries that have high level of human capital, this high level of human capital can offset the negative effect of natural resource on economic growth.

Empirical results from Gylfason (2001) shows that public spending on education relative to national income, expected years of schooling for girls and gross secondary-school enrolment are all negatively related to the share of natural capital in national wealth across countries. Birdsall, Pinckney and Sabot highlights the same results. According to them, in resource-rich countries, natural resources break the virtuous cycle between reduced inequalities, human capital accumulation and economic growth. Empirical results from Stijns (2006) shows that there is not a curse of natural resources for human capital. He proves that resource rents per capita and subsoil wealth are associated with better indicators of human capital accumulation. His study corroborates the results of Davis (1995) who shows that resource-rich developing countries do better in terms of social performances than resource-poor ones.

Theoretical Framework

Generally, growth models attempt to explain the causes of vast growth in the global economy overtime and cross-country income differences. The Solow growth model is the basis for understanding most growth theories. In the light of the shortcomings of Solow's growth model, the amplified version of the model was specified by Mankiw, Romer and Weil (1992). In this augmented version of the model, a Cobb-Douglas production function is assumed. This started off by adding human capital accumulation to the Solow model. According to Mankiw, Romer and Weil (1992), the aggregate output of the economy can be written as:

$$Y_t = K_t^{\alpha} H_t^{\beta} (A_t L_t)^{1-\alpha-\beta}, \alpha > 0, \beta > 0, \alpha + \beta < 1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where *A* is index of technical change that varies overtime but for the moment held constant, *K* denotes the capital stock, *L* shows labour supply and *H* is stock of human capital. Equation implies that there are constant returns to all *K, H,* and *L*. Assuming *sk* to be the fraction of income invested in physical capital and *sh* the fraction invested in human capital, the evolution of the economy is determined by:

$$k_t = s_k y_t - (n + g) k_t \quad - \quad - \quad - \quad - \quad (2)$$

$$h_t = s_k y_t - (n + g) h_t \quad - \quad - \quad - \quad - \quad (3)$$

where $y = Y/AL$, $k = K/AL$, and $h = H/AL$ are quantities per effective unit of labour. It is assumed that the same production function applies to human capital, physical capital, and consumption. In other words, one unit of consumption can be transformed at no cost into either one unit of physical capital or one unit of human capital. Human capital (*H*) is the knowledge acquired by workers, often as the result of specific investment in education. Since human

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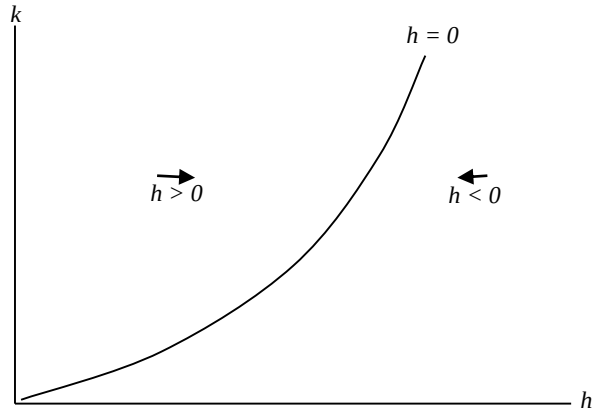
capital involves investment just as physical capital, it also depreciates. The human capital model shows that economic growth depends on population growth and accumulation of physical and human capital.

$$ln\left[\frac{Y^t}{L^t}\right] = lnA_0 + gt - \frac{\alpha+\beta}{1-\alpha-\beta}\ln(n+g+\delta) - \frac{\alpha}{1-\alpha-\beta}\ln(s_k) + \frac{\beta}{1-\alpha-\beta}\ln(s_h) \ldots\ldots\ldots (4)$$



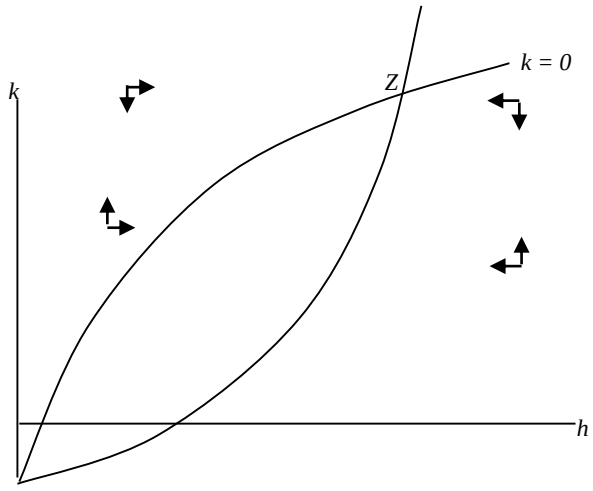


Figure 1a: The dynamics of human capital per unit of labour

Point "Z" in figure 1b is the steady state of growth or otherwise known as the balanced path. In the steady state, k, h and y are constant, total physical capital, human capital and output (K, H and Y) are growing at rate $n + g$ and physical capital per worker, human capital per worker and output per worker are growing at rate g. Thus, the long-run growth rate of output per worker is determined by the exogenous rate of technological progress (Romer, 1996).

DATA AND METHODOLOGY

Data for this study were collected from various issues of the Central Bank of Nigeria Statistical Bulletin, Statement of Accounts and Annual Reports, the World Bank, African Development Bank as well as various reports of the International Monetary Fund. Annual data collected covered between 1976 and 2016. Industrial growth, nominal exchange rate, inflation rate, petroleum imports and exports, oil revenue, capacity utilization, recurrent expenditures on health and education, total labour force participation rate, gross capital formation, oil price, oil reserve, world oil production, domestic oil production, human development index and literacy rate comprised the set of data used for the analysis.

Time series properties of the variables were examined. The augmented Dickey-Fuller (ADF) test was employed to determine the existence of unit root. We test if the variables trend together towards a long-run equilibrium by using the Johansen's cointegration test. This determines the cointegration rank. The error correction mechanism describes how human capital and its various components and growth would adjust towards their equilibrium state in each time period.

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Model specification

The model represents in a simple form the relationship between each explanatory variable and the explained variable. Thus the model is specified as:

$$indgr = \alpha_0 + \alpha_1 oilprices + \alpha_2 gcf + \alpha_3 cu + \alpha_4 reedu + \alpha_5 rehlt + \alpha_6 inf + \alpha_7 exch + \varepsilon_t \dots\dots(5)$$

a priori = $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_7 > 0$ $\alpha_6 < 0$

where, *reedu* is recurrent expenditures on education, *rehlt* is recurrent expenditures on health, *oilprices* is oil prices, *cu* is capacity utilization, *gcf* is gross capital formation, *inf* is inflation rate, *exch* is exchange rate, ε_t denotes error term and α_i are parameters to be estimated. If there is evidence of conintegration, equation (5) converges to the error correction model.

$$\Delta^{k_0} indgr_t = \propto_0 + \propto_1 (\Delta^{k_1} oilprices_{t-i}) + \propto_2 (\Delta^{k_2} gcf_{t-i}) + \propto_3 (\Delta^{k_2} cu_{t-i}) + \propto_4 (\Delta^{k_4} reedu_{t-i}) + \propto_5 (\Delta^{k_5} rehlt_{t-i}) + \propto_6 (\Delta^{k_6} inf_{t-i}) + \propto_7 (\Delta^{k_7} exch_{t-i}) + \propto_8 (ecm_{t-i}) + \varepsilon_t \dots\dots\dots(6)$$

where α_8 is speed of adjustment coefficient and ecm_{t-1} is the residual or error correction mechanism of the previous year. However, to ensure the parsimonious nature of the model, equation (6) above translates into an autoregressive distributed lag (ARDL) model as shown in equation (7).

$$\Delta^{k_0} indgr_t = \propto_0 + \theta_1 (\Delta^{k_0} indgr_{t-i}) + \propto_1 \sum \Delta^{k_1} z_{t-q} + \propto_8 (ecm_{t-i}) + \varepsilon_t \dots\dots(7)$$

where z_{t-q} denotes vector of macroeconomic controls that includes all other explanatory variables in the model.

RESULTS AND DISCUSSION

The augmented Dickey Fuller (ADF) test was used to determine the order of integration of the variables in the study. Table 1 shows that ADF stationarity test results at levels.

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Table 1: Test of Stationarity at Levels

	ADF		Order of Integration
	Intercept with no trend	Intercept with trend	
indgr	-6.205740**	-6.083833**	1(0)
cu	-1.833469	-0.017412	NS
exch	2.344054	0.127162	NS
inf	-3.353691**	-3.893910**	1(0)
oilprices	-1.596703	-1.842451	NS
reedu	0.745797	-1.043177	NS
rehlt	-0.560546	1.683348	NS
gcf	-0.666457	0.112701	NS
ect	-3.504307*	-2.960411*	1(0)

Note: ** and * indicate significance at 5% and 10% levels respectively.

NS = Not Stationary; 1(0) = stationary at levels; 1(1) = stationary after first differencing

Table 2: Test of Stationarity at First Difference

	ADF		Order of Integration
	Intercept with no trend	Intercept with trend	
indgr	-7.827164**	-7.885637**	1(1)
cu	-3.976520**	-4.136213**	1(1)
exch	-2.364874**	-2.927832**	1(2)
inf	-6.907167**	-6.856325**	1(1)
oilprices	-5.984878**	-5.950681**	1(1)
reedu	-5.974528**	-1.828559	1(1)
rehlt	-3.509575**	-3.782465**	1(1)
gcf	-3.851010**	-3.961908**	1(1)

Note: ** and * indicate significance at 5% and 10% levels respectively.

NS = Not Stationary; 1(0) = stationary at levels; 1(1) = stationary after first differencing

From table 1 the ADF stationarity test results show that only *inf* and *indgr* are stationary at levels. *reedu, cu, rehlt, oilprices* and *gcf* were integrated at order 1 (see Table 2). However, at first difference all the variables were stationary. Therefore, the null hypothesis is rejected and the alternative accepted for each of the variables. The residual of the ordinary least square estimate (ect) is stationary at level as expected.

Johansen Cointegration

To establish the existence of long run relationship among the variables, a cointegration test is performed using the Johansen's cointegration test. From table 3 the Johansen-Juselius (JJ) procedure utilizes two test statistics to determine the number of cointegrating vectors. These are trace and maximum eigenvalue test statistics. Both tests indicates the existence of 3

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cointegrating relationships. The implication is that there is a stable long-run relationship among the variables under observation. With these results, the short run dynamic equation was specified as an error correction model (ECM), incorporating the one period lagged residual from the static regression. The autoregressive distributed lag technique is used with a maximum lag of 2 to obtain an overparameterized equation and parsimonious results were obtained.

Table 3: Johanson-Juselius Cointegration Tests

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.847940	176.1346	95.75366	0.0000
At most 1 *	0.563785	91.37802	69.81889	0.0004
At most 2 *	0.489149	54.04517	47.85613	0.0117
At most 3	0.264128	23.81971	29.79707	0.2082
At most 4	0.192421	10.01825	15.49471	0.2793
At most 5	0.008874	0.401116	3.841466	0.5265

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.847940	84.75654	40.07757	0.0000
At most 1 *	0.563785	37.33285	33.87687	0.0186
At most 2 *	0.489149	30.22546	27.58434	0.0224
At most 3	0.264128	13.80145	21.13162	0.3816
At most 4	0.192421	9.617136	14.26460	0.2383
At most 5	0.008874	0.401116	3.841466	0.5265

Max-eigenvalue 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

Source: Authors' computation

Error Correction Model

The parsimonious error correction results show that *gcf had* a negative impact on the industrial sector. The low level of capital formation consequently affects growth in the industrial sector negatively. The GDP per capita for Nigeria after rebasing her economy is less than $3,000. Hence, low disposable income means low savings and translates into low investment in the

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manufacturing sector. Government expenditure on education has a negative effect on industrial growth. This result is peculiar to the Nigerian economy. a priori expectation from economic theory suggests a positive relationship with the industrial sector. In Nigeria, the expenditure on education is far less than the universal threshold. Poor educational infrastructure and manpower development has led to the negative impact of *reedu* on *indgr*. The findings from the result revealed that investment in human capital, in the form of education and capacity building through training and orientation impacts negatively on human capital development after the first year; this confirmed the study by Adenuga and Out, (2006). The reason for this relationship can possibly be traceable to the much reported corruption and misappropriation of public funds (Transparency International, 2011) allocated for projects such as the installation of educational and health infrastructure in Nigeria. As at 2016, Nigeria scored 28 out of 100 in terms of transparency and the country made a position of 136 out of 176 (Transparency International, 2016). On the other hand, *oilprices* had a positive relationship with industrial growth. A naira change in oil prices leads to 3.01 percent change in industrial growth in the Nigerian economy covering the period of the study. The model explains approximately 78 percent of the industrial growth. The ECM took the correct sign implying that short term errors were corrected. Therefore, the model is fit for prediction and forecasting. The Durbin-Watson statistic indicates that there is no auto-correlation in the model. In addition, the probability of the F-Statistic suggests that the overall model is statistically significant at the chosen 5 percent level of significance.

Table 4. Estimated Regression Results for the Industrial Growth Model

Dependent Variable: D(INDGR)

Included observations: 44 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.152555	0.867445	-0.175866	0.8621
@TREND	0.016952	0.028076	0.603790	0.5525
DLOG(REEDU)	-0.368646	0.850788	-0.433300	0.6692
DLOG(CU(-2))	12.08187	4.974736	2.428646	0.0242
DLOG(OIL_PRICES)	3.010494	1.107597	2.718041	0.0129
DLOG(REHLT)	-0.047542	0.867430	-0.054808	0.9568
DLOG(GCF)	-3.392096	1.998043	-1.697709	0.1043
DLOG(GCF(-1))	-2.490466	1.888675	-1.318632	0.2015
ECM(-1)	-0.476710	0.421777	-3.501163	0.0021

R-squared	0.783545	Mean dependent var	-0.111364
Adjusted R-squared	0.556783	S.D. dependent var	2.576478
S.E. of regression	1.715279	Akaike info criterion	4.222816
Sum squared resid	61.78583	Schwarz criterion	5.155461
Log likelihood	-69.90195	F-statistic	3.455358
Durbin-Watson stat	1.888301	Prob(F-statistic)	0.003050

Source: Authors' computation

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CONCLUSION AND RECOMMENDATIONS

This article is aimed at providing empirical evidence on the impact of human capital development on industrial growth in Nigeria. The results suggest that the strategies of human capital development such as expenditure on education and health care have negative effect on industrial growth. This does not support a priori expectation. However, this may be because of the peculiar nature of Nigeria and other developing economies. In Nigeria, education and healthcare is under-funded since independence. The incessant strike actions by labour organizations in these sectors are clear indications of inadequate budgetary provisions for these sectors. This article asserts that skill acquisition centres be opened up and operated like the university system in order to train graduates on specific skills and entrepreneurship; this would reduce the rate of unemployment whilst improving the labour participation rate of educated Nigerians which enhance industrial growth. The government should adhere to the minimum education budgetary allocation of 26 per cent demanded by UNESCO. Gross capital formation constitutes savings and is a very key factor for economic growth and development.

Since savings is largely dependent on disposable income, governments should pursue policies to create jobs and business opportunities for households to enhance their income base. Savings can also be encouraged by effectively managing savings rates in money deposit banks. It is also important for the authorities to make conscious efforts to increase investment in the industrial sector through tax reliefs such as tax holidays, pioneer reliefs and exemptions. A proper management of the level of inflation in the economy is very important. The results show a negative impact. A more scientific and reliable inflation modeling is recommended for the Nigerian industrial sector to grow. Government subsidy on the importation of capital goods into the industrial sector might bring about the desired growth in the sector. The recent government bailout policy directed at the industrial sector in Nigeria is a welcomed development. This, if properly managed would stimulate growth in the sector. The positive impact of oil revenue should be sustained by total liberalization of the sector.

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