International Journal of Economics, Business and Management Research

Vol. 8, No.07; 2024

ISSN: 2456-7760

Impact of Human Capital Development and Manufacturing Sector Productivity in Nigeria

Kadir, Muleru Ganiyu[1] Lawal Esther Ph.D[2]
[12]Department of Economics, Babcock University, Ogun State

doi.org/10.51505/IJEBMR.2024.8714 URL: https://doi.org/10.51505/IJEBMR.2024.8714

Received: Feb 16, 2024 Accepted: Feb 21, 2024 Online Published: July 22, 2024

Abstract
Manufacturing, the process of creating goods through tools, machinery, labour, and formulations, historically drove economic progress in the nineteenth century. While recognised for its pivotal role in economic growth and development, Nigeria's manufacturing sector struggles to significantly influence employment and GDP, despite augmented human capital. This study explores the correlation between human capital development and manufacturing productivity in Nigeria, spanning 2000 to 2022, using an ex post facto research design rooted in the Solow Swan growth model. Data sourced from the World Bank's World Development Indicators underwent analysis through Ordinary Least Square (OLS) and causality tests, with conclusions drawn at a 5% significance level. Findings indicate that primary school enrolment, industrial labour force, and physical capital lack substantial impact on manufacturing productivity, unlike gross secondary school enrolment which positively influences productivity, while tertiary enrolment has a notable negative effect. The study underscores poor human capital development, particularly in primary school enrolment and the labour force, as key factors impeding manufacturing productivity in Nigeria, emphasising the imperative of enhancing the sector's labour force quality to unleash its full potential.

Keywords: School enrolment, Labour force manufacturing sector, Output.
JEL Classification: C01, C13, L6

1. Introduction

Transitioning from a developing country to a prosperous one historically necessitates more than reliance on exporting agricultural produce and raw materials; a robust manufacturing sector is pivotal. Not only does the manufacturing sector address critical policy concerns such as GDP growth, unemployment, and balance of payment issues, but it also plays a significant role in driving economic progress and sustainable development in developing nations like Nigeria. Despite Nigeria's vast population and labour force, the manufacturing sector's potential to fuel growth, generate wealth, and bridge wealth disparities has not been fully leveraged (Ogundipe & Olarewaju, 2020).

Notably, it is posited that advancements in human capital and enhanced labour productivity within the manufacturing sector promote sectorial output by facilitating greater economies of scale production and technical progress (Thirlwall, 2013). However, Nigeria's recent economic growth shows limited evidence of structural change, with the manufacturing sector contributing

Vol. 8, No.07; 2024

ISSN: 2456-7760

relatively minimally to the GDP compared to other nations. Over the years, the manufacturing sector's value added to the GDP has dwindled consistently, illustrating a decline from 18.4% in 1989 to 6.6% in 2010, as reported by World Development Indicators in 2022. This decline is further compounded by Nigeria's lack of skilled labor, largely due to factors like illiteracy, unskilled labor, and inadequate technical training as highlighted by Anyanwu (2018) and Adeleye et al. (2020).

Moreover, Nigeria's education standards fall short internationally, with low enrolment rates from primary to tertiary levels compared to regions such as East Asia or the OECD during the 1960s as noted by the National Bureau of Economic Research (NBER) in 2020. Lacking educational proficiency leads to a "learning crisis" in Africa, with a significant number of children unable to attain the necessary educational standards. Dropout rates are alarmingly high, with millions of children leaving school prematurely, particularly in Northern Nigeria. The historical context of Nigeria's manufacturing sector development, including strategies from the First National Development Plan to the Structural Adjustment Programme, highlights the challenges faced in enhancing manufacturing productivity amidst economic shifts and policy alterations. In light of these complexities, the interconnectedness between human capital development and manufacturing sector productivity emerges as a central concern for Nigeria's economic growth trajectory. Hence, aim of this study is to examine the influence of human capital development in manufacturing sector output in Nigeria. The rest of the section include literature review, methodoly, analysis and discussion and conclusion.

2.0 Literature Review

Industrial output encompasses the collective output of all entities engaged in producing goods within a nation, with manufacturing output representing the production from all factories, a subset within industrial output. Manufacturing, occurring within factories or plants over specified time frames, is pivotal for economic development (Dinh, Palmade, Chandra, & Cossar, 2012). Particularly significant in developing nations like Nigeria, manufacturing aids in meeting increasing demands for goods, addressing balance of payment challenges, fostering employment, boosting the agricultural sector, diversifying the economy, and potentially enhancing foreign exchange earnings from exports. It also reduces dependency on foreign trade, optimally utilizing available resources. Effectiveness in the manufacturing sector is gauged by maximizing industrial components, reflecting the industrial services and goods' volume produced, with income derived from sales, after deductions for trade discounts and relevant taxes (Felipe, Mehta, & Rhee, 2014).

Human capital development, the stock of productive skills and knowledge in labor, encompasses education, training, and health investments to enhance individuals' productive capacity. In Nigeria, human capital primarily advances through education and healthcare, funded by public allocations for educational supplies and human capital development components. This accumulation of technical knowledge and skills in a country's workforce from formal education and on-the-job training propels national development across various sectors (Odumade, 2011; Harbison, 1973). Human capital's influence on the manufacturing sector underscores its importance in boosting productivity and, by extension, economic growth. This interdisciplinary process includes investments in education and skills for the populace's capacity building, vital for

socio-economic advancement (Odo, Eze, & Onyeisi, 2016).

The relationship between human capital development and manufacturing sector output signifies a crucial facet for countries aiming for industrialization and economic transformation. Notably, improvements in human capital, acquired through education and skills, have been deemed essential for long-term sustainable growth. Improved labor productivity, facilitated by well-educated individuals, demonstrates the positive correlation between human capital enhancement and technology adaptation, leading to consistent demand for skills. Developed countries exemplify progress in economic and human capital development post-World War II, with enhanced labor forces boosting productivity and driving industrial expansion, underscoring the pivotal role that education plays in fostering economic growth and bolstering manufacturing output (Acemoglu, Gallego, & Robinson, 2014). The quality of human capital development aligns with the manufacturing sector's growth rate, underscoring the vital role of knowledge and skill enhancement in economic progress and manufacturing sector productivity.

In recent times, global studies on the impact of human capital development on manufacturing variables have garnered significant attention. Evidence from past research in developed economies reveals notable findings. For instance, studies in Canada by Ghali and El-Sakka (2004) and Australia by Zahnd and Kimber (2009) showcased the significant relationships between human capital, industrial energy consumption, and human development index, respectively. The impacts of human capital development and government expenditure on industrial growth were also explored in Australia in research by Oluwatobi (2011).

Okumoko, Omeje, and Udoh (2018) researched on the dynamics of human capital development and industrial growth in Nigeria. The study used time series data spanning 1976-2016 periods on relevant variables which were analyzed using both descriptive and econometric techniques and the objective was to provide empirical evidence on the impact of human capital development on industrial growth in Nigeria. ADF procedures were used to test for stationarity of the variables. The results showed that the variables moved towards equilibrium in the long-run. The results also showed that recurrent expenditure on education and health has a negative impact on industrial growth. Following the result, the study asserted 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. Mačiulytė-Šniukienė1 and Matuzevičiūtė (2018) investigated the impact of human capital on labour productivity in European Union member states using panel data analysis. Results of the paper were estimated using the Pooled ordinary least squares (OLS) and fixed effects model (FEM). The results showed that human capital is positively significant in improving the growth of labour productivity in the EU and the estimates also asserted that the impact occurs after three times lags in case of education expenditure.

Vol. 8, No.07; 2024

ISSN: 2456-7760

An analysis of the relationships between human capital and GDP growth in Croatia by Škare and Lacmanović (2015) highlighted human capital as a vital driver of economic progress, influencing productivity and technological advancements. Moreover, studies on job mobility during the pandemic in Australia by Black and Chow (2022) and the implications of the labor market on economic growth by Lim et al. (2021) shed light on the dynamic nature of industrial sectors amidst crises.

In developing economies, notable economic theories like Kaldor's growth model and Lewis' theory of unlimited labor supplies have influenced the discourse on human capital's role in driving economic growth. Furthermore, investigations into the impact of human capital on economic performance in countries like Malaysia by Jairi and Ismail (2012) and Iran by Akbari, Moayedfar, and Jouzaryan (2012) have emphasised the positive correlation between human capital investments and economic productivity.

Research specific to the Nigerian economy has delved into the effects of human capital development on manufacturing output. Studies by researchers like Favour et al. (2020), Sankay, Ismail, and Shaari (2010) have explored this relationship, highlighting the significant roles of education, training, and research in influencing industrial performance. Findings from various studies underscore the critical nature of human capital investments in enhancing economic growth, industrial productivity, and organizational resilience across different sectors and regions.

Ihensekhien,(2023) evaluated the influence of human capital on industrial sector growth in Nigeria from 1986 to 2020. The Autoregressive Distributed Lag co-integration method of estimation was applied in the empirical analyses to determine the influence of human capital variables on industrial sector growth. The empirical observations revealed that government's recurrent investment in education had significantly negative short-run impact on industrial sector growth while in the long run, there was a significant positive influence.

These empirical studies collectively accentuate the intricate connections between human capital development initiatives and their impact on economic and industrial outcomes. The results emphasis the necessity of tailored strategies that focus on enhancing human capital through education, training, and research to drive sustainable economic growth, bolster productivity, and foster resilience in organizations and economies.

2.1 Trend Analysis of Gross primary enrolment (GPE), gross secondary enrolment (GSE), gross tertiary enrolment (GTE), industrial labour force participation (LFPRINDUSTRY) and physical capital (Pcapital) on manufacturing sector productivity (MSP) in Nigeria (1989-2022)

This section reveals the trend of Gross primary enrolment (GPE), gross secondary enrolment (GSE), gross tertiary enrolment (GTE), industrial labour force participation (LFPRINDUSTRY) and physical capital (Pcapital) on manufacturing sector productivity (MSP) in Nigeria. Below are the series plot of the explanatory variables and the explained variable.

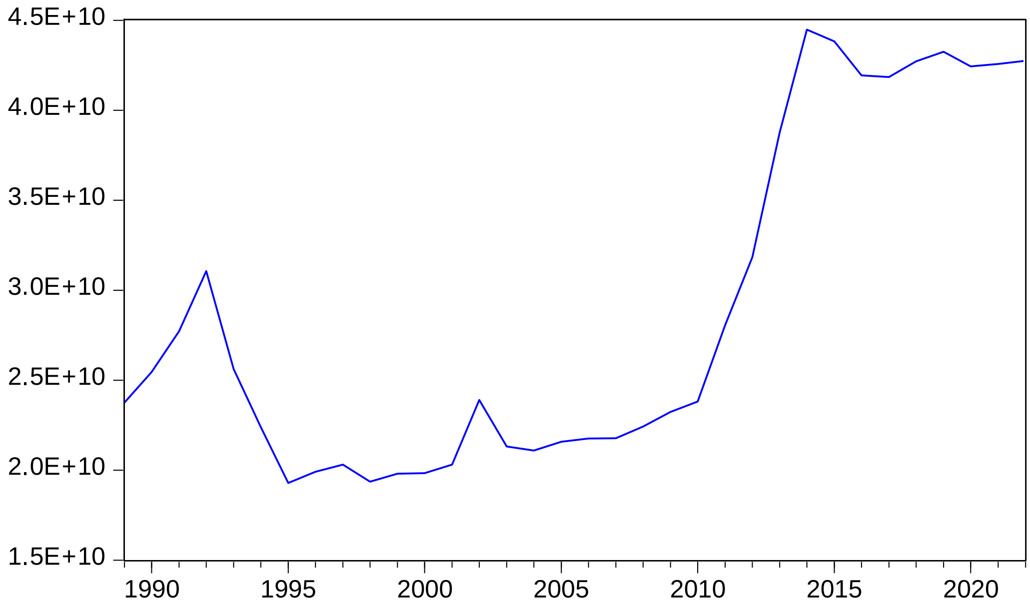

Figure 4.1: Trend analysis on Manufacturing Sector Productivity

The trend analysis shown in figure 4.1 shows that there has been a continuous fluctuation on the movement of manufacturing sector productivity. However, towards the periods of 2011 to 2022 Nigeria witnessed consistent increase on the rate of unemployment.

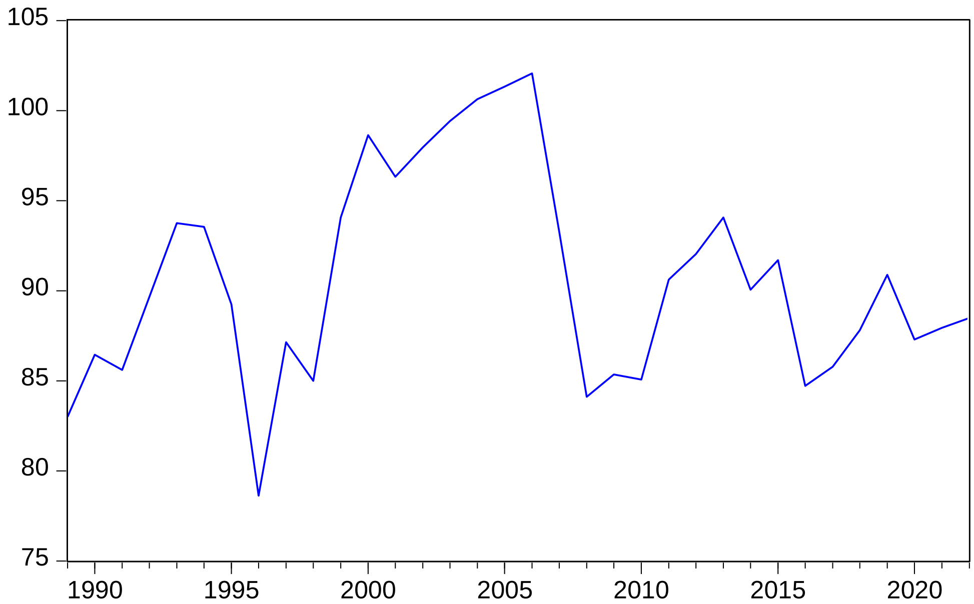

Figure 4.2: Trend analysis on Gross Primary School Enrolment

ISSN: 2456-7760

Figure 4.2 shows the trend in gross primary enrolment, which by indication shows that there has been a lot of fluctuations on the rate of gross primary enrolment in Nigeria. The country witnessed the highest gross primary enrolment rate within the periods of 2000 to 2005. It declined drastically from 102.1% in 2006 to 88% in 2022, though not without fluctuation within the periods.

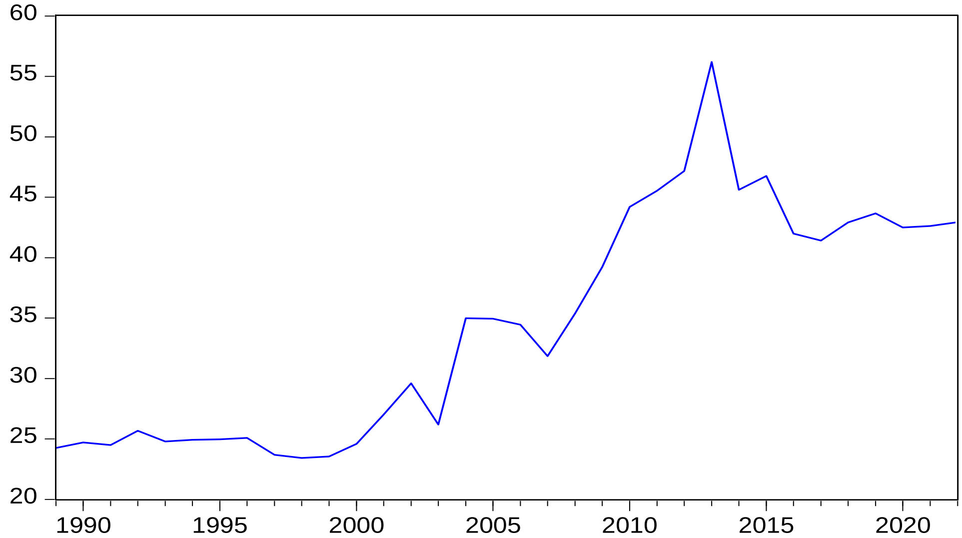

Figure 4.3: Trend analysis on Gross Secondary School Enrolment

Figure 4.3 shows the trend in gross secondary enrolment, which by indication shows that there has been also a lot of fluctuations on the rate of gross primary enrolment in Nigeria. The country witnessed the highest secondary school enrolment within the periods of 2010 to 2015. It declined drastically subsequently till 2022.

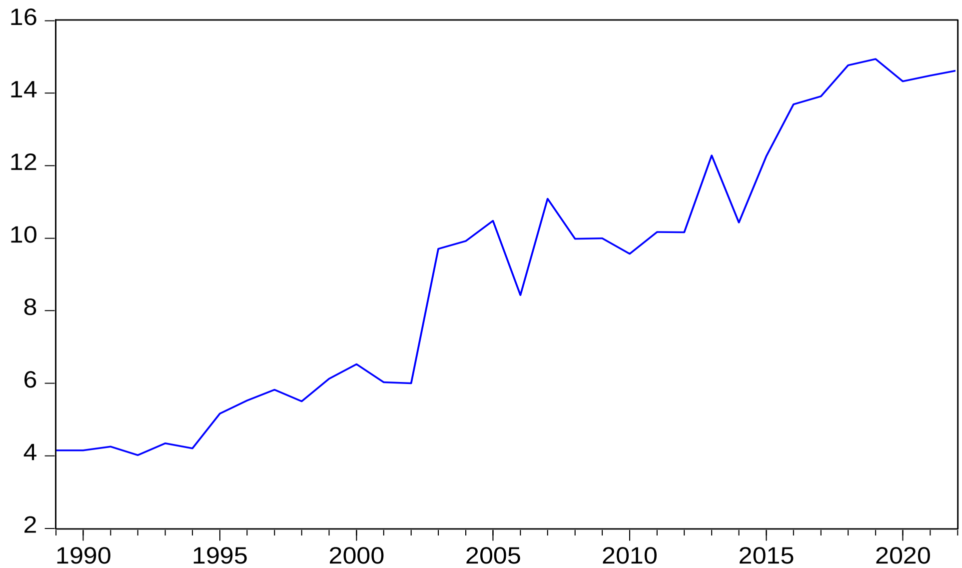

Figure 4.4: Trend analysis on Gross Tertiary School Enrolment

Vol. 8, No.07; 2024

ISSN: 2456-7760

Figure 4.4 shows the trend in gross tertiary enrolment, revealed an inconsistent growth indicating the rate of fluctuations in the trend.

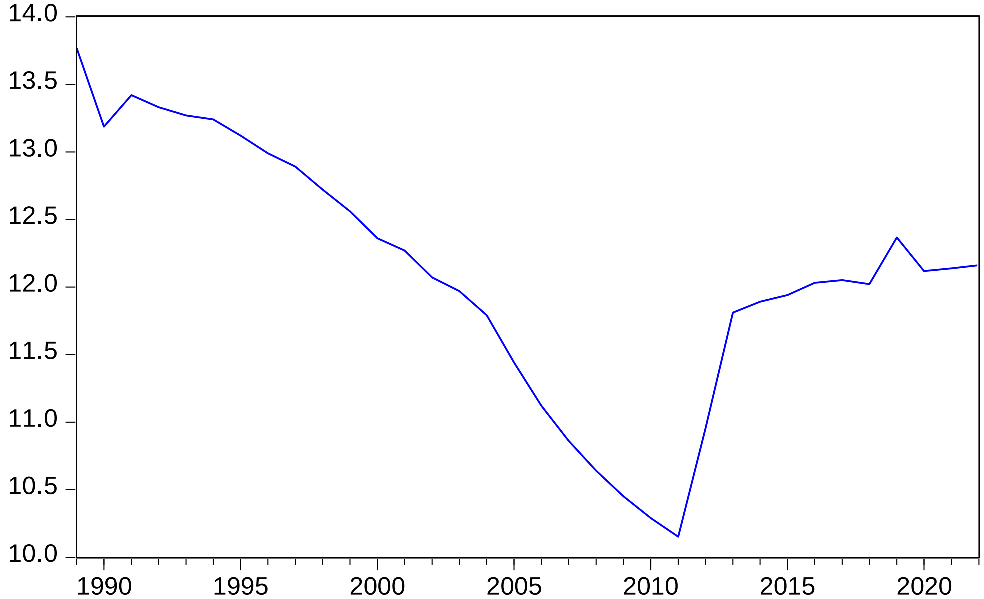

Figure 4.5: Trend analysis on Industrial Labour Force Participation

Figure 4.5 shows the trend in industrial labour force participation, which by indication shows that there is also a lot of fluctuations on the rate of industrial labour force participation in Nigeria. The country witnessed continuous fall from 1990 to 2010. However, it start increasing 2011 to 2022 at a fluctuating rates.

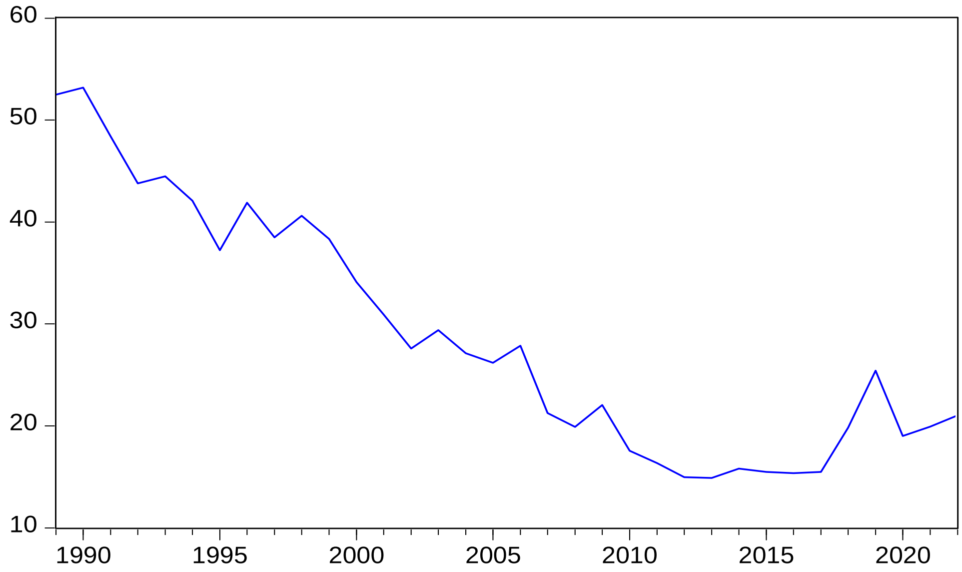

Figure 4.6: Trend analysis on Physiscal Capital

Figure 4.6 shows the trend in physical capital proxied gross fixed capital formation shows that there is also a lot of fluctuations on the rate of gross fixed capital formation in Nigeria. The country also witnessed continuous fall from 1990 to 2015. However, it started increasing 2016 to 2022 at a fluctuating rate.

3. Methodology

The study employs an ex- post facto research to examine the effect of unemployment and inflation on the Nigeria economy. Ex-post facto research design is considered appropriate for this study because, it tests hypotheses about cause and effect relationships and examines how an independent variable, prior to the study, affects a dependent variable. This category of research design can be related to the quantitative approach and allows taking a critical look at prior variables use in the study.

3.1 Theoretical Framework

The study adopted the Solow swan model of growth which is adapted by Guerrini (2006). Solow's model takes the rate of saving, population growth and technical progress as exogenous. There are two inputs capital and labor which are paid their marginal products. Assuming a Cobb -Douglas production functions the production function at time t is given by:

$y(t) = k(t)^{\propto} A(t) L(t)^{1-\propto} \qquad 0 < \propto < 1$ (1)

Where: Y is output, K is capital, L is labor and A is the level of technology.

The initial levels of capital, labor and level of technology are taken as given. Labor and level of technology grow at constant rates:

$\dot{}(t) = nL(t)$ (2)

$\dot{}(t) = gA(t)$ (3)

Where n and g are exogenous parameters and where a dot over a variable denotes a derivative with respect to time.

Applying the result that a variables growth rate equals the rate of change of its log to equation (4) and (3) tells us that the rates of change of the logs of *L* and *A* are constant and that they equal n and g respectively. Thus,

$\ln L(t) = \{\ln L(0)\} + nt$ (5)

$\ln A(t) = \{\ln A(0)\} + gt$ (6)

Where *L*(0) and *A*(0) are the values of L and A at time 0. Exponentiating both sides of these equations gives us:

$L(t) = L(0)e^{nt}$ (7)

$A(t) = A(0)e^{nt}$ (8)

The number of effective units of labor, A (t) L (t), grows at rate *n*+*g*.

The model assumes that a constant fraction of output *s* is invested. Defining *k* as the stock of capital per effective unit of labor, *k* = *K/AL*, and *y* as the level of output per effective unit of labor, y=*Y/AL*, the evolution of k is governed by

$k(t) = sY(t) - (n + g - \partial)k(t) = sK(t)^{\alpha} - (n + g + \partial)k(t)$ (9)

Where ∂ is the rate of depreciation? Equation 3.8 implies that K converges to a steady state value which is defined by

$sK^{\propto} = (n + g + \partial)Kor$

$$K = \left[\left(\frac{s}{n} + g + \partial\right)\right] 1/(1-\alpha \quad (10)$$

The steady state capital labor ratio is related positively to the rate of saving and negatively to the rate of population growth. The central prediction of the Solow model concerns the impact of saving and population growth on real income. Substituting (9) into the production function (10) and taking logs we find the steady state income per capita is:

$$\ln\left[\frac{y(t)}{L(t)}\right] = \ln A(0) + g(t) + \propto/1-\propto \ln(s) - \propto/1-\propto \ln(n+g+\partial) \quad (11)$$

Because the model assumes factors of marginal products, it then predicts not only the signs but also the magnitudes of the coefficients on saving and population growth.

Relating the oretical model to the study, an extract from equation (11) can be expressed as:

RMGDP = f(PSE, SSE, TSE, LF, AYS) ------------ (12)

3. 2 Measurement and Data Sources

The data used for the empirical analysis in this study are majorly sourced from World Development Indicators (WDI), 2023. The period for this study is span across a period of thirty-three (2000-2022).

Table 1: Variables Measurement and Data sources

Variable	Description	Source	Measurement
Manufacturing sector output (MSO)	Proxied as manufacturing sector contribution to GDP	World Development Indicators (WDI) of the world bank	Dollars
Gross Primary school enrollment (GPE)	Used to proxy human capital development	World Development Indicators (WDI) of the world bank	Percent
Gross secondary school enrollment (GSE)	Used to proxy human capital development	World Development Indicators (WDI) of the world bank	Percent
Gross Tertiary school enrollment (GTE)	Used to proxy human capital development	World Development Indicators (WDI) of the world bank	Percent
Labour force participation rate (LFPR)	Measured labour factor input	International Labour Organization (ILOSTAT)	Percent
Average years of schooling (AYS	Captured the time spent on human capital accumulation.	World Development Indicators (WDI) of the world bank	Percent

Source: Author's Compilation 2024

3.3 Model Specification

In the light of the theoretical framework, the model of this study is adapted from the work of Okoh, Oyeranmi, Adamu, and Agbadua, (2023).. This authors examined the effect of human

Vol. 8, No.07; 2024

ISSN: 2456-7760

capital development on the manufacturing sector in Nigeria for the period 1981-2021. The author's model is specified as:

$$MANQt = \beta 0 + \beta 1\text{HUMANCAP} + \beta 2\text{EXCH}t + \beta 3CPIt + \beta 4POPGRt + \beta 5\,INTRt + \varepsilon t \ldots\ldots\ldots.(13)$$

where MANQ= Manufacturing value added (As a proxy for manufacturing sector growth) HUMANCAP = Human capital development (primary, secondary and tertiary school enrolments) EXCH = Exchange rate ; CPI = Consumer price index; POPGR = Population growth rate INTR = The policy variable (interest rate) The above equation is extended to incorporate the present variables for the study. The variables for the study is specified as:

$$\text{RMGDP} = \text{f(PSE, SSE, TSE, LF, AYS)} \;-------------(14)$$

Where MGDP is the manufacturing sector contribution to the GDP, PSEprimary school enrolment, SSE is secondary school enrolment, TSE is the Tertiary school enrolment, LF is labour force from the industry and AYS is average year of school is interest rate and EXCHR Linearly, the model is estimated as:

$$MGDP = \beta 1 + \beta 2PSE + \beta 3SSE + + \beta 4TSE + + \beta 5LF + \beta 6AYS + \mu --(15)$$

. β_1, β_2, β_3, β_4 , β_5 and β_6 are the Parameters, while μ is the Error term (white noise).

3.4 Apriori Expectation

It is expected that: $\beta_1>0$; $\beta_2>0$; $\beta_3>0$;$\beta_4> 0$ and $\beta_5>0$;.

Empirical Results and Interpretations

The preliminary analyses included descriptive statistics, correlation matrix, and unit root test, which was carried out to analyze the properties of the data, and avoid spurious results by factoring in the unit root test. Thereafter, the Ordinary Least Square analysis was estimated.

4. Results and Discusion

4.1 Preliminary Analysis

The time series data employed for the estimation of the empirical model specified to investigate Gross primary enrolment (GPE), gross secondary enrolment (GSE), gross tertiary enrolment (GTE), industrial labour force participation (LFPRINDUSTRY) and physical capital (Pcapital) on manufacturing sector productivity (MSP) in Nigeria is presented below:

Vol. 8, No.07; 2024

ISSN: 2456-7760

Table 2: Descriptive Analysis

	Mean	Median	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability	Observations
MSP	3.15E+10	2.96E+10	1.01E+10	0.063260	1.180720	2.494341	0.287317	18
GPE	91.08489	90.13306	5.517331	0.462463	2.148701	1.185148	0.552902	18
GSE	37.26310	41.69517	9.306094	-0.06585	2.168159	0.531979	0.766447	18
GTE	10.61737	10.78757	3.828709	-0.45315	1.829766	1.643114	0.439746	18
LFPRINDUSTRY	11.97246	12.08320	0.895331	-0.31494	2.352257	0.390617	0.822581	18
PCAPITAL	25.50485	21.14453	10.68107	1.160458	2.464627	4.201898	0.122340	18

Source: Authors computation, 2023

The descriptive statistics in table 2 shows the statistical properties of the variables. The result showed that on the average, the contribution of the manufacturing sector to the Nigeria GDP is very low below contributing approximately #30billion between the periods of 1989 to 2022. The gross primary school enrolment averaged 91.1%. It was further revealed that the gross secondary enrolment averaged 37.3%, the gross tertiary enrolment stands at 10.6%. the average labour force is 12% while the average physical capital, measured by fixed capital formation stands at 25.5%. This shows that the education level in Nigeria recorded a very low state within the periods understand, compared to other developed or developing regions.

The skewness of all the variables showed that almost all the variables have positive skewness. The kurtosis statistics which is a measure of the relative peakedness of a distribution showed that all the variables are platykurtic in nature since their kurtosis statistics are less than 3. This means that their distribution is flatter than a normal distribution with shorter tails. Also, the Jarque-Bera statistics showed that all the variables have probability values of Jarque-Bera greater than 0.05. this means that their Jarque-Bera statistics are not significant at 5%level, which indicates that these variables are normally distributed.

Table 3: Correlation Matrix

	MSP	GPE	GSE	GTE	LFPRINDUSTRY	PCAPITAL
MSP	1.000000					
GPE	-0.567531	1.000000				
GSE	0.385670	-0.272973	1.000000			
GTE	0.295055	-0.251316	0.237580	1.000000		
LFPRINDUSTRY	0.122937	-0.141965	-0.502484	-0.341562	1.000000	
PCAPITAL	-0.519600	0.110852	-0.145334	-0.124248	0.120661	1.000000

Source: Authors computation, 2023

ISSN: 2456-7760

Furthermore, the correlation test for the variables and the results are presented in table 3. The correlation matrix table clearly shows that the lowest degree of association exists between all the variables and manufacturing sector output (MSP). This implies that all the variables have little influence on the manufacturing sector output (MSP). Although higher levels of influence are expected, which is inevitable to boost manufacturing sector output, human capital development components are primarily essential to drive the manufacturing sector, which is endogenously determined. Following the correlation criteria of Kim (2019), it could be deduced that there is no evidence of multicollinearity among the exogenous variables.

4.2 Stationarity Test Result

This section explained the application of the unit root test which was carried out to determine the stationarity level of the variables. This test is necessary to avoid unauthentic results.

Table 4: Unit Root Test: Augmented Dickey-Fuller Test (ADF) and Phillips-Perron Test

	Augmented Dickey-Fuller Test (ADF)			**Phillips-Perron test statistic**		
Variables	Level	1st Diff	Order of Integration	Level	1st Diff	Order of Integration
MSP	0.750805	-3.509484**	I(1)	0.946996	-3.473009*	I(1)
GPE	-2.580186	-5.576758*	I(1)	0.188104	-6.230298*	I(1)
GSE	-1.122344	-7.258443*	I(1)	0.796719	-7.020290*	I(1)
GTE	2.001890	-7.614715*	I(1)	2.877876	-7.583153*	I(1)
LFPRINDUSTRY	-0.392710	-4.052003*	I(1)	-0.884173	-4.105837*	I(1)
Pcapital	-2.475598**	-	I(0)	-3.097206*	-	I(0)

Source: Source: Authors computation using E-views 2021Where *1%, **5%, and ***10%

The study employs Augmented Dickey-Fuller and Phillips-Perron test to ascertain the order of integration of the variables. Using the Augmented Dickey-Fuller test, it is observed that MSP, GPE, GSE, GTE and LFPRINDUSTRY variables are stationary at first difference I (1), while Pcapital is stationary are at level I (0) at 5% significance level. Phillips-Perron tests results also the same results This implies that the test results for the two stationary tests, Augmented Dickey-Fuller and Phillips-Perron, are consistent. As a result of the nature of the data variables, this study adopts the use of Autoregressive Distributive Lag (ARDL)

Table 5: Optimal Lag Length Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-712.0994	NA	8.31e+18	46.39351	46.71731	46.49906
1	-699.5848	18.57000	3.97e+18	45.65063	46.02069	45.77126
2	-695.9927	5.098491*	3.37e+18*	45.48340*	45.89972*	45.61911*
3	-695.9927	4.57e-05	3.62e+18	45.54791	46.01049	45.69870

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 5 shows the optimal lag length selection criteria. It displays diverse lag criterions and the respective lag length chosen. All the criterions selected lag length 2, so the lag length that would be chosen is 2, especially based on the Akaike information Criterion. The AIC is superior to other criteria in their ability to minimize under estimation while maximizing the chance of recovering the true length.

4.3 Bounds Co-Integration Test Result

The Autoregressive Distributive Lag (ARDL) bound testing model is employed in this study. This is because the variables used in this study, were not integrated in the same order.

Table 6: ARDL Bounds Test Null Hypothesis: No long-run relationship exists

Test Statistic	Value	k
F-statistic	1.561124	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Source: Authors computation, 2024

The above bound testing result reveals that long-run equilibrium relationship does not exist between the variable, since the F-Statistic is less than I (0) and I (1) bound. In this case the study cannot proceed to estimate the short-run and long-run significance but can only estimate the short. Hence the study employed Ordinary Least Square analysis

4.4 Model Estimation

Table 7 Ordinary Least Square estimation

Dependent Variable: LNMSP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGPE	0.058444	0.277864	0.210333	0.8350
LNGSE	0.568498	0.186997	3.040147	0.0052
LNGTE	-0.282024	0.110985	-2.541097	0.0171
LNLFPRINDUSTRY	0.177624	0.666083	0.266670	0.7917
LNPCAPITAL	0.064887	0.135367	0.479342	0.6356
C	15.16086	1.634768	9.274013	0.0000

Source: Author's computation, 2024

Table 7 shows that gross primary school enrolment a positive insignificant impact on the manufacturing sector productivity (β= 0.058, P> 0.05), the gross secondary enrolment has a significant positive impact on the manufacturing sector output (β= 0.568, P < 0.05). this implies that a 1% increase in the secondary school enrolment level will bring about a corresponding increase on the manufacturing sector output by about 56.8%. while tertiary enrolment has a significant negative impact on the manufacturing sector productivity (β= -0.282, P> 0.05). showing that a 1% increase in the tertiary enrolment will bring about a corresponding decrease of the manufacturing sector productivity by about 28.2%. The industrial labour force has a positive insignificant impact on the the manufacturing sector productivity (β= 0.178, P> 0.05), in the same vein the physical capital has a positive insignificant impact on the manufacturing sector productivity.

4.5 Post Estimation Tests

This is also referred to as the second order test. For the purpose of the study, we would be testing for: autocorrelation, normality, serial correlation, heteroscedasticity, and stability using Jarque-Bera test, Breusch-Godfrey tests and Breusch-Pagan-Godfrey test

Table 8. Results of Diagnostic Tests

Test	H0	P-Value	Decision	Conclusion
Jarque- Bera	Residuals are normally distributed	0.374	Fail to reject H0	Residuals are normally distributed
LM Test	No Serial Correlation	0.849	Fail to reject H0	There is no serial correlation
White (CT)	No Hetersced asticy	0.374	Fail to reject H0	There is no heteroscedasticity

Source: Authors' compilations, 2024

The residuals exhibit a normal distribution as determined by the Jarque-Bera test, with the p-value exceeding the 5% significance level. The Breusch-Godfrey test is utilized to examine the presence of serial or autocorrelations in the model, wherein the null hypothesis states the absence of autocorrelation. The obtained p-value, surpassing the 5% significance threshold, indicates the model's lack of autocorrelation. Similarly, regarding heteroskedasticity, the null hypothesis asserts no presence of such when the p-value is not significant and surpasses the 5% level of significance. Consequently, Table 5 confirms the acceptance of the null hypothesis, signifying the absence of heteroskedasticity given the p-value is greater than the 5% significance level.

4.6 Pairwise Granger Causality Tests

Table 9: Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.	Remark
LNGPE does not Granger Cause LNMSP	32	0.74470	0.4844	No Direction
LNMSP does not Granger Cause LNGPE		1.46317	0.2493	
LNGSE does not Granger Cause LNMSP	32	3.87315	0.0332	Unidirectional
LNMSP does not Granger Cause LNGSE		2.36829	0.1128	
LNGTE does not Granger Cause LNMSP	32	2.51384	0.0997	No Direction
LNMSP does not Granger Cause LNGTE		0.08250	0.9210	
LNLFPRINDUSTRY does not Granger Cause LNMSP	32	5.02146	0.0140	Unidirectional
LNMSP does not Granger Cause LNLFPRINDUSTRY		1.53359	0.2340	
LNPCAPITAL does not Granger Cause LNMSP	32	2.98267	0.0676	No Direction
LNMSP does not Granger Cause LNPCAPITAL		0.87154	0.4297	

The granger causality test in Table 4.2.2.6 revealed that no causality exists between gross primary enrolment, tertiary enrolment and physical capital on the manufacturing sector productivity. While there exists unidirectional causality with gross secondary enrolment and productivity, then labour force also has unidirectional causality to productivity. Meaning, only gross secondary enrolment and labour force can cause effect on the manufacturing sector productivity, though the manufacturing productivity has now effect on them.

Vol. 8, No.07; 2024

ISSN: 2456-7760

Conclusion and Recommendations

The analysis unveiled the statistically significant model depicting the relationship between human capital development and manufacturing sector output in Nigeria. Major explanatory variables encompassed measures of human capital development such as gross primary, secondary, and tertiary school enrolments alongside the industrial labour force, with physical capital serving as a control variable to gauge manufacturing sector growth. Positive yet insignificant relationships were noted between gross primary enrolment, industrial labour force, and physical capital with manufacturing sector productivity, suggesting their impact on productivity is limited despite direct correlations. Conversely, gross secondary school enrolment exhibited a significant positive association with sector productivity, indicating a notable increase with rising enrolments. In contrast, a significant negative relationship transpired between gross tertiary enrolment and sector productivity, hinting at a productivity decline as tertiary enrolment levels escalate in Nigeria. Notably, only gross secondary school enrolment aligned with anticipated outcomes from the model, hinting at reasons behind Nigeria's subdued sector productivity and GDP contribution. Shifting focus to objective two, causal tests revealed no causality between gross primary school enrolment, tertiary school enrolment, physical capital, and productivity in Nigeria. However, secondary school enrolment and labour force participation displayed a unidirectional causality with manufacturing sector productivity, suggesting their potential to enhance productivity levels while remaining unaffected by sector influences. These outcomes align with Olusola's (2016) observations regarding physical capital and primary enrolment's insignificant impact on productivity, although differing regarding secondary school enrolment. Furthermore, the findings affirm the negligible effect of tertiary enrolment on productivity in developing economies like Nigeria, consistent with Altiner and Toktas's (2017) conclusions linking productivity decrement to increasing education levels, particularly evidenced by the adverse relationship between tertiary school enrolment and productivity. Nonetheless, disparities arose concerning the labour force's impact on productivity in the sector.

Based on the aforementioned findings, a set of comprehensive recommendations can be devised. Firstly, a crucial review of Nigerian policies is advised to bolster primary school enrolment levels, given its foundational role in human capital development. Secondly, it is imperative for the government to allocate funds judiciously towards education, focusing on enhancing teaching quality, infrastructure, and prioritising basic education to mitigate dropout rates. Thirdly, a curriculum overhaul via the Ministry of Education is paramount to align educational offerings with the manufacturing sector's demands, addressing the prevailing mismatch between skilled labour force and sector requirements, thereby enhancing productivity. Additionally, urgent augmentation of expenditure in tertiary institutions is necessary to foster research and development, nurturing advanced skills crucial for the manufacturing sector. Lastly, there is a pressing need to enhance vocational studies within secondary schools to augment their contribution towards bolstering manufacturing sector productivity.

References

Acemoglu, D., Gallego, F., & Robinson, J. (2014). Institutions, Human Capital and Development. *National Bureau of Research Working Paper*, *No*. 19933.

Adeleye, N., Osabuohien, E., & Asongu, S. (2020). Agro-Industrialisation and Financial Intermediation in Nigeria. African *Journal of Economic and Management Studies*. doi.org/10.1108/AJEMS-02-2019-0078.

Akbari, M., Moayedfar, R., & Jouzaryan, F. (2012). Analysis of Short Run and Long Run Effects of Human Capital on the Economic Growth in Iran. *Economics and Finance Review*, 1(11), 01–09.

Anyanwu, J. C. (2018). Does human capital matter in manufacturing value added development in Africa? *Asian Journal of Economic Modelling*, 6(3), 294-316.

Black, S., & Chow, E. (2022). Job Mobility in Australia during the COVID-19 Pandemic. Bulletin – June 2022 Australian Economy. Reserve Bank of Australia.

Dinh, H. T., Palmade, V., Chandra, V., & Cossar, F. (2012). *Light Manufacturing in Africa: Targeted Policies to Enhance Private Investment and Create Jobs.* Washington, DC: The World Bank.

Favour, O., Adeyemi, O. M., Paul, A., & Ngosi, A. (2020). Human capital and manufacturing output in Nigeria: A micro–data survey. *Research in World Economy* 12(2):132

Felipe, J., Mehta, A., & Rhee, C. (2014). Manufacturing Matters… but It's the Jobs That Count. *Asian Development Bank working paper series*, No. 420.

Ghali, K. H., & El–Sakka, M. I. (2004). Energy use and output growth in Canada: A multivariate cointegration analysis. *Energy Economics*, 26(2), 225-238.

Harbison, F. H. (1973). *Human Resources as the Wealth of Nations*. New York: Oxford University Press.

Ihensekhien, O. A. (2023). Human capital development and industrial sector growth in nigeria. *Nigerian Journal of Management Sciences*, *24*(2b).

Jajri, I., & Ismail, R. (2012). An Analysis of Relationship Between Human Capital and Economic Growth. *Life Science Journal*, 9(4), 3735-3742.

Mačiulytė-Šniukienė1, A. and Matuzevičiūtė, K. (2018). Impact of Human Capital Development on Productivity Growth in EU Member States. Business, Management and Education. 16(1), 1-12.

National Bureau of Economic Research. (2020). The Economic Decline in Africa. Retrieved from https://www.nber.org/digest/jan04/w9865.html.

Odo, S. I., Eze, O. R., & Onyeisi, S. O. (2016). Analysis of the relationship between human capital development and economic growth in Nigeria. European Journal of Accounting, Auditing and Finance Research, 4(3), 56-71. http://eprints.gouni.edu.ng/id/eprint/1582.

Odumade, A. (2011). Human capital development and national economic growth: Nigerian experience. In T. A. Aladejana & B. O. Olanisimi (Eds.), *Human capital development in Africa: A book of readings*. Ibadan: Codat Publications Ltd.

Ogundipe, A. A., & Olarewaju, F. O. (2020). Manufacturing Output and Labour Productivity: Evidence from ECOWAS. *Academic Journal of Interdisciplinary Studies*, 9(5), 102-111.

Okumoko, T.P., Omeje, D., and Udoh, F.M. (2018). The Dynamics of Human Capital Development and Industrial Growth in Nigeria. International Journal of Developing and Economic Sustainability. 6(2), 41-51

Oluwatobi, A. (2011). Energy consumption and economic growth – The case of Australia. *Journal of Electrical Power and Energy Systems*, 55(2013), 222–307.

Sankay, O. J., Ismail, R., & Shaari, A. H. (2010). The impact of Human Capital Development on the Economic Growth of Nigeria. *Prosiding Perkem V, Jalid*, 1, 63–72.

Škare, M., & Lacmanović, S. (2015). Human capital and economic growth: a review essay. *Amfiteatru Economic*, 17(39), 735-760.

Thirlwall, A. P. (2013). Commentary on Kaldor's 1970 regional growth model. *Scottish Journal of Political Economy*, 60(5), 492-494. https://doi.org/10.1111/sjpe.12027.

Zahnd, A., & Kimber, H. M. (2009). Benefits from a renewable energy village electrification system. *Renewable Energy*, 34, 362-368.