THE IMPACT OF PRIVATE HEALTHCARE INVESTMENT ON EMPLOYEE PRODUCTIVITY IN NIGERIA

NUHU MOHAMMED
University of Benin, Benin City, Nigeria
nuhu.mohammed@uniben.edu
JUDITH O. OMOBUDE
University of Benin, Benin City, Nigeria

Abstract

This research analyzed the influence of private health spending, malaria death rate, literacy levels, and GDP per capita on labor productivity in Nigeria between 1992 and 2024. The dependent variable was Labour Productivity Rate (LPR), with Private Health Expenditure (PHE), Malaria Mortality Rate (MMR), Literacy Rate (LTR), and GDP per capita serving as explanatory variables. Yearly time-series data were examined employing descriptive statistics, Augmented Dickey-Fuller (ADF) unit root tests, Phillips-Ouliaris and Johansen-Fisher cointegration assessments, along with an Error Correction Model (ECM). ADF results indicated that all variables were stationary at the first difference, I(1). Cointegration tests validated a long-term equilibrium association between the variables. ECM findings revealed that the literacy rate positively and significantly influenced labor productivity, whereas the malaria mortality rate negatively and significantly affected it. Private health spending exhibited a positive but trivial impact, while GDP per capita showed a negative and inconsequential short-term effect. The error correction term was both negative and significant, indicating a stable long-term relationship and a gradual return to equilibrium following short-term disturbances. The research indicates that enhancing literacy rates and lowering malaria death rates are crucial for boosting labor productivity

Keywords: Labour Productivity Rate, Private Health Expenditure, Malaria Mortality Rate, Literacy Rate, Gross Domestic Product per Capita,

JEL classification: I15, I18, J24, O15, O47

1. INTRODUCTION

Investment in healthcare has become increasingly acknowledged as a vital factor in the development of human capital, enhancement of labor productivity, and promotion of sustainable economic growth. In contemporary economies, workers represent one of the most important resources for organizations, and their health condition greatly impacts job performance, productivity, and the competitiveness of the organization. Healthy employees tend to be more productive, have reduced

absenteeism rates, showed greater motivation, and contributed more successfully to organizational goals. As a result, funding in healthcare has emerged as a crucial approach for boosting workforce effectiveness and promoting economic development results (Bloom, Kuhn, & Prettner, 2018).

Private healthcare investment involves spending by private individuals, employers, healthcare organizations, health maintenance organizations (HMOs), insurers, and other private entities aimed at enhancing healthcare delivery, healthcare infrastructure, medical technologies, and employee health services. In both developed and developing nations, the private sector is playing an increasingly vital role in supporting public healthcare systems by broadening access to quality healthcare services and alleviating pressure on government-funded healthcare facilities (World Health Organization [WHO], 2023). These investments are especially crucial in nations where public healthcare funding is insufficient to address increasing healthcare needs.

Nigeria's healthcare industry offers a distinct setting for exploring the link between private healthcare funding and worker productivity. Although Nigeria is among Africa's largest economies, it still grapples with considerable healthcare issues, such as insufficient healthcare funding, substandard healthcare infrastructure, a lack of qualified healthcare workers, and unequal access to quality healthcare services. As stated by the World Bank (2024), Nigeria's healthcare spending is still quite low in comparison to global standards, leading to a significant dependence on private healthcare services and personal healthcare expenses. Consequently, private healthcare institutions have emerged as significant players in the provision of healthcare services, particularly in urban areas and for formal sector workers.

2. THEORETICAL LITERATURE

2.1. GROSSMAN DEMAND FOR HEALTH MODEL (1972)

The Grossman (1972) framework views health as a type of enduring human capital that generates healthy time for people. Within this framework, people act as both consumers and creators of health. Health is regarded as a capital stock that diminishes over time but can be enhanced through investments like medical care, nutrition, and preventive health services.

Concerning this study, private healthcare investment increases the health capital of employees, cutting down on illness days and enhancing their available working hours. When healthier employees dedicate more time effectively to their work tasks, productivity rises. Therefore, the model offers a solid theoretical rationale for how investment in private healthcare leads to enhanced labor results in Nigeria.

2.2. EFFICIENCY WAGE THEORY

In 1984, Joseph E. Stiglitz presented the efficiency wage theory for unemployment and wage rigidity in his NBER work titled "Theories of Wage Rigidity." The Efficiency Wage Theory suggests that companies could raise salaries

or offer benefits (like healthcare) to enhance employee productivity. The theory indicates that employees who are healthier and receive better support are more driven, less prone to neglect their duties, and more efficient. Within the scope of this research, private healthcare investment serves as a non-salary efficiency motivating factor. When companies offer or facilitate access to private healthcare, employees tend to be healthier, more dedicated, and more productive. This minimizes turnover, boosts morale, and increases organizational effectiveness. In Nigeria, where access to healthcare is frequently restricted, employer-funded private healthcare serves as a strategic means to boost productivity.

Multiple empirical investigations have analyzed the connection between healthcare spending, worker productivity, and economic outcomes in various nations and areas. These studies supply proof that health investments notably affect labor productivity, workforce efficiency, and organizational performance.

Okunade, Olayiwola, and Joseph (2025) examined how health investment affects productivity growth in Sub-Saharan Africa in their research named "Does Health Investment Matter for Productivity Growth in Sub-Saharan Africa? "Experiential Understanding from Income and Geographical Economic Classification Viewpoints." The authors utilized data from 28 Sub-Saharan African nations and applied the Dumitrescu–Hurlin heterogeneous panel non-Granger causality test along with a dynamic panel threshold model to examine the connection between health investment and productivity growth. The results showed a two-way causal link between health investment and productivity growth, suggesting that higher health investment greatly boosts productivity throughout the region. The research determined that ongoing health investments are crucial for enhancing labor productivity and economic outcomes.

In a similar vein, Okereke, Eluwa, Akinola, Suleiman, and Unumeri (2021) studied the impact of financial incentives within primary healthcare environments in Nigeria. The research utilized a cross-sectional survey approach with healthcare staff from chosen primary healthcare centers. Their research indicated that healthcare-related rewards and funding greatly enhanced employee motivation, job satisfaction, and the efficiency of service delivery. The research found that investments in healthcare positively impact workforce productivity by improving employee engagement and performance.

In their study "Health and Economic Growth," Bloom, Kuhn, and Prettner (2018) performed a thorough empirical evaluation of the connection between health and economic growth. Through cross-country data and econometric analyses, the authors discovered that enhancements in health outcomes markedly boost labor productivity and workforce involvement. The research determined that investing in healthcare boosts the quality of human capital, which in turn increases productivity and aids in sustainable economic growth.

Yahaya and Bello (2025) examined how employee welfare practices influence organizational performance in emerging economies. Using panel data analysis on firm-level information, the research revealed that companies that

invested in employee welfare initiatives, such as healthcare services and health insurance plans, achieved greater levels of employee productivity and organizational performance. The writers determined that welfare initiatives related to healthcare are vital tools for improving workforce productivity and lowering employee attrition.

In Nigeria, Kolawole and Anagun (2024) investigated the link between public health spending and economic output. By utilizing time-series data and employing Ordinary Least Squares (OLS) estimation alongside cointegration methods, the research revealed a positive and statistically significant association between healthcare spending and labor productivity. The writers contended that investing in healthcare enhances workers' health, which in turn boosts their productivity and supports economic growth.

Egwutu (2025) examined the influence of healthcare financing on Nigeria's economic performance utilizing an Autoregressive Distributed Lag (ARDL) model. The research employed secondary data sourced from national economic and health databases. The results indicated that healthcare funding has a beneficial effect on economic performance by enhancing health outcomes and boosting labor productivity. The research suggested enhancing investment in healthcare infrastructure and funding systems to maintain productivity growth.

Globally, the World Health Organization (2023), in its Global Health Expenditure Report 2023, examined health spending trends among member nations. The report showed that nations investing more in healthcare typically face reduced productivity declines linked to illness and greater workforce participation rates. The report highlighted that healthcare spending ought to be perceived as an investment in human capital instead of simply a social cost.

Similarly, the International Labour Organization (2023), in its worldwide report Employment and Social Outlook Report analyzed the link between employee well-being and labor market results. Utilizing labor market information from various nations, the report revealed that companies that emphasize employee health and wellness initiatives attain greater workforce productivity, reduce absenteeism, and enhanced employee retention.

The Federal Ministry of Health and Social Welfare (2024) emphasized the significance of private-sector involvement in funding and providing healthcare services in Nigeria via the National Health Sector Strategic Development Plan 2024–2028. The sectoral analysis in the report revealed that greater private healthcare investment could enhance workforce health outcomes and productivity by broadening access to quality healthcare services.

Moreover, the African Development Bank (2024) analyzed the role of human capital investments in economic transformation within Africa in its African Economic Outlook 2024. Through macroeconomic and sectoral evaluations in African nations, the report identified that investments in healthcare greatly enhance labor productivity and foster sustainable economic growth. The report highlighted that nations with more robust healthcare systems generally achieve enhanced productivity results and greater economic competitiveness.

The preceding empirical analysis clearly shows that investment in healthcare is crucial for improving labor productivity, employee performance, and economic growth. Nonetheless, the majority of current research has focused on overall health spending, public healthcare funding, or macroeconomic productivity results. Not many studies have focused on the direct effect of private healthcare investment on worker productivity in Nigeria. This results in an empirical gap that demands additional exploration, thus validating the current research.

3. METHODOLOGY

3.1. THEORETICAL FRAMEWORK

The theoretical framework for this study is built on Grossman's health demand theory (1972) which considers health demand to be a demand for capital goods. This can be expressed as Health Stock (H-1) – decline in value + expenditure on Health (I). An individual comes into the world with a baseline endowment of H (health), which they enhance through investment. The efficiency of investment in H (health) will determine the rate of H (health) production. The Grossman health demand model illustrates the optimal expenditure point (demand) for health (health spending), as shown below;

Marginal benefit = return rate = (W*G)/C where W represents the wage rate, G indicates the marginal product (rate of return) from health investment, which experiences diminishing marginal returns, and C denotes the direct cost associated with health investment. This concept is referred to as the 'marginal efficiency of capital' (MEC). The expenditure on health demand comprises two components: (i) Consumption impacts: Health provides immediate satisfaction, meaning you experience enhanced well-being when in good health. (ii) Investment impacts: Health boosts the days you can engage in both market and non-market activities - a unique aspect of the model.

3.2 MODEL SPECIFICATION

The functional form of the model is as follows:

LPR=f(PHE, MMR, LTR, GDP)

The econometric form of the model is:

$LPR=\beta_0+\beta_1PHE+\beta_2MMR+\beta_3LTR+\beta_4GDP+\varepsilon$

Where;

LPR = Labor Productivity Rate, PHE = Private Health Expenditure, MMR = Malaria Mortality Rate, LTR = Literacy Rate, GDP = Gross Domestic Product per capita income, β_0, β_1, β_2, β_3, β_4 are parameters of the regression equation and ε is the disturbance term.

3.3 TECHNIQUES OF ANALYSIS

For this study, the Ordinary Least Squares (OLS) Estimator was utilized, as it provides the best linear unbiased estimates (BLUE). The R2 outcome indicates the

overall fit quality of the regression line, the Augmented Dickey-Fuller outcome tests for (unit root) to determine if the time series data is stationary, while the Philip Ouliaris co-integration result examines the long-term relationship between the variables and assesses whether the variables are co-integrated over the long term.

3.4 SOURCES OF DATA

This research used time-series data spanning from 1992 to 2024. Information was sourced from the International Labor Organization (ILO) database, World Development Indicators (WDI), and the World Health Organization World Bank. The information gathered from these sources was modified as needed and examined with econometric methods.

4. EMPIRICAL ANALYSES AND PRESENTATION OF RESULT

Table 1: *Descriptive Statistics*

	LPR	LTR	PHE	MMR	GDP
Mean	-0.05514	4.02897	4.21126	-0.04223	8.28620
Median	0.00047	4.01548	4.21730	-0.01626	8.12622
Maximum	0.34427	4.27667	4.32783	0.72231	8.79785
Minimum	-2.25153	3.89183	4.09634	-1.50657	7.97247
Std. Dev.	0.41278	0.09947	0.07029	0.43628	0.26889
Skewness	-4.70746	1.04159	-0.16614	-1.91264	0.64394
Kurtosis	25.89550	3.59754	1.83280	8.74841	1.84590
Jarque-Bera	842.66100	6.45800	2.02506	65.55580	4.11204
Probability	0.00000	0.03960	0.36330	0.00000	0.12796
Sum	-1.81965	132.95610	138.97170	-1.39355	273.445
Sum Sq. Dev.	5.45226	0.31664	0.15810	6.09087	2.31367
Observations	33	33	33	33	33

Source: Author's computation (2026), using EViews 12.0

Table 1 displays the descriptive statistics for Labor Productivity Rate (LPR), Literacy Rate (LTR), Private Health Expenditure (PHE), Malaria Mortality Rate (MMR), and Gross Domestic Product per capita (GDP) during the examined period. The findings indicate that LPR had an average of -0.0551 and a standard deviation of 0.4128, suggesting moderate variability in labor productivity during the study timeframe. The mean values for Literacy Rate (LTR) and Private Health Expenditure (PHE) were 4.0290 and 4.2113, respectively, with standard deviations of 0.0995 and 0.0703, indicating higher stability in these variables. The average GDP per capita showed the peak value of 8.2862, whereas the Malaria Mortality Rate (MMR) had a mean value of -0.0422.

The skewness statistics indicate that LPR (-4.7075), PHE (-0.1661), and MMR (-1.9126) exhibit negative skewness, signifying that their distributions feature longer tails on the left side. On the other hand, LTR (1.0416) and GDP (0.6439) exhibit positive skewness, indicating longer right tails. The kurtosis values also show that LPR (25.8955) and MMR (8.7484) exhibit strong leptokurtosis, suggesting the

existence of extreme values and a distribution that is more peaked compared to the normal distribution. Conversely, PHE (1.8328) and GDP (1.8459) are platykurtic, signifying distributions that are comparatively flatter.

The Jarque-Bera normality test indicates that LPR (842.6610; p = 0.0000), LTR (6.4580; p = 0.0396), and MMR (65.5558; p = 0.0000) are not normally distributed at the 5 percent significance level. Nonetheless, PHE (2.0251; p = 0.3633) and GDP (4.1120; p = 0.1280) follow a normal distribution as their probability values are greater than 0.05. In general, the descriptive statistics show adequate variability among the variables and offer initial support for the appropriateness of the data for additional econometric analysis.

Table 2: *Augmented Dickey Fuller Test for the used variables*

Variables	***ADF Test Statistic***	***ADF lag length***	***ADF Critical values***		***Remark***	***Order of Integration***
			1% level	***5% level***		
D(LNLTR_)	*-6.34747*	*0*	*-3.67017*	*-2.96397*	*Stationary*	***I(1)***
D(LNLPR)	*-4.12221*	*0*	*-3.67017*	*-3.67017*	*Stationary*	***I(1)***
D(LNMMR)	*-14.45108*	*0*	*-3.65373*	*-2.95711*	*Stationary*	***I(1)***
D(LNPHE)	*-7.55106*	*0*	*-3.65373*	*-2.95711*	*Stationary*	***I(1)***
D(GDP)	*-4.63063*	*0*	*-3.64634*	*-2.95402*	*Stationary*	***I(1)***

Source: Author's computation (2026), using EViews 12.0

To prevent misleading regression outcomes and ascertain the integration order of the variables, the Augmented Dickey-Fuller (ADF) unit root test was performed. The findings presented in Table 2 show that every variable became stationary following the first differencing. The ADF statistics for D(LNLTR), D(LNLPR), D(LNMMR), D(LNPHE), and D(GDP) are -6.3475, -4.1222, -14.4511, -7.5511, and -4.6306, respectively. These values are less than their relevant critical values at the 5 percent significance level.

As a result, the null hypothesis indicating the existence of a unit root is rejected for all variables after applying first differencing. This indicates that Labor Productivity Rate (LPR), Literacy Rate (LTR), Private Health Expenditure (PHE), Malaria Mortality Rate (MMR), and GDP per capita are all integrated of order one,

I(1). The discovery that every variable has the identical order of integration meets the essential requirement for cointegration analysis and indicates the potential for a stable long-term relationship among the variables.

Table 3: *Philip Oulairis Cointergration Test*

Variables	***Tau-statistic***	***Prob.****	***z-statistic***	***Prob.****
GDP	*-2.00494*	*0.94200*	*-6.99145*	*0.96220*
PHE	*-3.55243*	*0.36780*	*-16.2324*	*0.49370*
MMR	*-16.3045*	*0.00010*	*-39.22550*	*0.00050*
LPR	*-2.74592*	*0.73130*	*-32.80286*	*0.00790*

*LTR_*	*-5.02439*	*0.03730*	*-22.27410*	*0.17340*

Source: Author's computation (2026), using EViews 12.0

After confirming that all variables are integrated of order one, the Phillips-Ouliaris cointegration test was used to determine if a long-term equilibrium relationship exists among Labor Productivity Rate, Private Health Expenditure, Malaria Mortality Rate, Literacy Rate, and GDP per capita.

The findings show varied evidence among the individual statistics. Nonetheless, the tau-statistics for MMR (-16.3045; p = 0.0001) and LTR (-5.0244; p = 0.0373) show statistical significance, whereas the z-statistics for MMR (-39.2255; p = 0.0005) and LPR (-32.8029; p = 0.0079) are likewise significant at the standard levels. The importance of these figures offers adequate proof to dismiss the null hypothesis of nonexistent cointegration.

This result suggests that Labor Productivity Rate, Private Health Expenditure, Malaria Mortality Rate, Literacy Rate, and GDP per capita exhibit a shared stochastic trend and sustain a long-term equilibrium relationship even with short-term variations. Consequently, departures from equilibrium are short-lived and are anticipated to be rectified eventually.

Table 4: *Johansen-Fisher Cointegration Test Results.*

Series: GDP PHE MMR LPR LTR				
			5% Critical	
No of CE(S)	*Eigenvalue*	*Trace Statistic*	*Value*	*1% Critical*
*None **	*0.86292*	*111.08100*	*68.50*	*76.10*
*At most 1 **	*0.61057*	*49.47721*	*47.20*	*54.50*
At most 2	*0.33782*	*20.24224*	*29.70*	*35.70*
At most 3	*0.13031*	*7.46360*	*15.40*	*20.04*
At most 4	*0.09620*	*3.13553*	*3.80*	*6.70*
Trace test indicates 2 cointegrating equations(s) at the 5% level				
Trace test indicates 1 cointegrating equation(s) at the 1% level				
**(**) denotes rejection of the hypothesis at the 5%(1%) level*				
*None **	*0.86292*	*61.60373*	*33.50*	*38.80*
*At most 1 **	*0.61057*	*29.23500*	*27.10*	*32.20*
At most 2	*0.33782*	*12.77863*	*21.00*	*25.50*
At most 3	*0.13031*	*4.328063*	*14.10*	*18.60*
At most 4	*0.09620*	*3.13553*	*3.80*	*6.70*
Max-eigenvalue test indicates 2 cointegrating equations(s) at the 5% level				

Source: Author's computation (2026), using EViews 12.0

To further confirm the presence of a long-term relationship between the variables, the Johansen-Fisher cointegration test was performed. The trace statistic shows that the null hypothesis of no cointegration is dismissed since the trace statistic of 111.0810 surpasses the 5 percent critical value of 68.50. In the same vein, the null hypothesis of a maximum of one cointegrating equation is rejected, as the trace statistic of 49.4772 surpasses the critical value of 47.20. Nevertheless, the null

hypothesis stating a maximum of two cointegrating equations cannot be dismissed, as the trace statistic of 20.2422 falls short of the critical value of 29.70. The trace test reveals the presence of two cointegrating equations at the 5 percent significance level.

The maximum eigenvalue test yields comparable outcomes. The maximum eigenvalue statistic of 61.6037 surpasses the critical value of 33.50 for the null hypothesis of no cointegration, whereas the statistic of 29.2350 exceeds the critical value of 27.10 for the null hypothesis of at most one cointegrating equation. Nonetheless, the value of 12.7786 is below the critical threshold of 21.00 when considering the null hypothesis of no more than two cointegrating equations. Therefore, the maximum eigenvalue test further verifies the existence of two cointegrating equations at the 5 percent significance level.

The Johansen-Fisher cointegration findings thus offer robust evidence of a consistent long-term equilibrium connection between labor productivity, private health expenditures, malaria mortality rate, literacy rate, and GDP per capita. This discovery indicates that health expenditure, disease load, education levels, and economic outcomes are interrelated and collectively affect labor productivity in the long term. As a result, any temporary imbalance among these variables will be rectified via an adjustment process that reinstates long-term equilibrium.

Table 5: *Parsimonious Error Correction Estimates (Dependent Variable: D(LPR,1).*

Variable	***Coefficient***	***Std. Error***	***t-Statistic***	***Prob.***
C	*-0.01581*	*0.00865*	*-1.82853*	*0.08050*
D(LTR,1)	*0.15542*	*0.02029*	*-7.65990*	*0.00000*
D(MMR,1)	*-0.02432*	*0.00157*	*15.52949*	*0.00000*
D(PHE,1)	*0.05099*	*0.10341*	*0.49312*	*0.62660*
D(GDP,1)	*-0.38239*	*0.25873*	*-1.47792*	*0.15300*
ECM(-1)	*-0.04086*	*0.005340*	*-260.87540*	*0.00000*
AR(1)	*-0.088189*	*0.09133*	*-0.96565*	*0.34430*
MA(11)	*-2.21726*	*0.10649*	*-20.82202*	*0.00000*
R-squared	*0.77230*	*Mean dependent var*		*-0.07273*
Adjusted R-squared	*0.70301*	*S.D. dependent var*		*0.44028*
S.E. of regression	*0.23994*	*Akaike info criterion*		*0.20078*
Sum squared resid	*1.32414*	*Schwarz criterion*		*0.57084*
Log likelihood	*4.88790*	*Hannan-Quinn criter.*		*0.32141*
F-statistic	*11.14453*	*Durbin-Watson stat*		*1.85491*
Prob(F-statistic)	*0.00004*			

Source: Author's computation (2026), using EViews 12.0

Table 5 shows the concise Error Correction Model (ECM) estimates for the factors influencing Labor Productivity Rate (LPR). The ECM framework encompasses the short-term dynamics and the rate at which imbalances from the long-term equilibrium are addressed.

The coefficient for Literacy Rate [D(LTR,1)] is positive and statistically significant at the 1 percent level ($\beta = 0.1554$; $p = 0.00000$). This outcome suggests that increases in literacy rates considerably boost labor productivity in the short term.

A one percent rise in the literacy rate results in about a 0.155 percent boost in labor productivity, all else being equal. The discovery reinforces the human capital theory, which asserts that investing in education enhances workers' abilities, effectiveness, and output.

The Malaria Mortality Rate [D(MMR,1)] shows a negative and statistically significant coefficient (β = -0.02432; p = 0.00000). This suggests that rises in malaria-related deaths negatively impact work productivity. A one percent rise in malaria deaths decreases labor productivity by about 0.024 percent in the short term. The outcome highlights the negative effects of disease burden on workforce involvement, employee productivity, and general economic output.

The coefficient for Private Health Expenditure [D(PHE,1)] is positive (β = 0.0510) yet statistically insignificant (p = 0.6266). This indicates that while greater private health spending generally enhances labor productivity, its immediate impact is minor and statistically indistinguishable from zero. The suggestion is that the productivity improvements linked to health investments might take a longer time to become evident.

Similarly, Gross Domestic Product per capita [D(GDP,1)] shows a negative coefficient (β = -0.38239) but is still statistically insignificant at conventional significance levels (p = 0.1530). This indicates that variations in GDP per capita do not significantly affect labor productivity in the short term over the study period. The error correction term, ECM(-1), is significantly negative (β = -0.0409; p = 0.0000), aligning with the expected outcome for cointegrated variables. The negative sign indicates a long-run equilibrium relationship between labor productivity, private health expenditure, malaria mortality rate, literacy rate, and GDP per capita. The coefficient of -0.0409 indicates that roughly 4.09 percent of any short-term imbalance in labor productivity is adjusted each year towards the long-term equilibrium trajectory. While the adjustment process is somewhat gradual, the importance of the coefficient suggests that discrepancies from equilibrium are progressively resolved over time.

Concerning the model diagnostics, the coefficient of determination (R^2) stands at 0.7723, suggesting that around 77.23 percent of the fluctuations in labor productivity are accounted for by alterations in literacy rate, malaria mortality rate, private health spending, GDP per capita, and the error correction mechanism. The adjusted R^2 value of 0.7030 indicates that approximately 70.30 percent of the fluctuations in labor productivity are explained by the independent variables after considering the degrees of freedom.

The model's overall importance is validated by an F-statistic of 11.1445 and a probability value of 0.000004, suggesting that the explanatory variables collectively have a substantial impact on labor productivity. Additionally, the Durbin-Watson statistic of 1.8549 is near the reference value of 2.0, indicating a lack of significant autocorrelation in the residuals.

5. CONCLUSION

This research explored the impacts of Private Health Expenditure (PHE), Malaria Mortality Rate (MMR), Literacy Rate (LTR), and Gross Domestic Product per capita (GDP) on Labor Productivity Rate (LPR). The descriptive statistics showed moderate differences among the variables, and the unit root test verified that all variables were integrated of order one, I(1). The Phillips-Ouliaris and Johansen-Fisher cointegration tests confirmed a stable long-run equilibrium relationship among the variables, suggesting that health, education, and economic factors collectively affect labor productivity over time.

The results of the Error Correction Model (ECM) indicated that the literacy rate has a positive and statistically significant impact on labor productivity, implying that advancements in educational attainment improve workers' skills, efficiency, and productivity potential. In contrast, the malaria mortality rate was observed to exert a negative and significant influence on labor productivity, emphasizing the harmful effect of disease burden on workforce efficiency and economic performance. Despite a positive correlation between private health spending and labor productivity, its short-term impact was statistically insignificant, suggesting that the advantages of health investments might require time to become evident. Likewise, GDP per capita had little effect on labor productivity throughout the study period. The substantial and negatively marked error correction term further validated the presence of long-run equilibrium and the system's inclination to revert to equilibrium after experiencing short-run disturbances.

6. RECOMMENDATIONS

Based on the study's results, the subsequent recommendations are suggested:

i. The government ought to boost funding for educational and literacy initiatives. Given that the literacy rate positively influences labor productivity, it is essential to bolster policies that improve access to quality education, adult literacy programs, vocational training, and skill development initiatives to boost workforce efficiency.

ii. More focus should be directed towards malaria prevention and control initiatives. Due to the severe and substantial effects of malaria deaths on workforce efficiency, government bodies and health organizations must enhance initiatives in malaria monitoring, supply of insecticide-treated nets, sanitation improvements, indoor residual spraying, and availability of effective treatments.

iii. Public and private health spending ought to be promoted and used effectively. Even though private health spending did not show statistical significance in the short term, investments in health continue to be crucial for enhancing workforce well-being and long-term productivity. Policies that enhance access to affordable healthcare services, expand health insurance coverage, and boost healthcare financing ought to be prioritized.

iv. Reforms in the health sector need to prioritize preventive care. Preventive health measures can lessen disease impact, decrease absenteeism, boost employees' physical health, and ultimately improve work productivity.

v. Economic growth strategies need to be more inclusive and focused on productivity. Although GDP per capita had little immediate impact on labor productivity, long-term policies focused on generating job opportunities, enhancing infrastructure, backing productive industries, and elevating living standards can bolster the productivity-boosting benefits of economic growth.

vi. Comprehensive human capital development strategies should be implemented. Policymakers ought to concurrently invest in education and health since both areas enhance each other in boosting the quality, efficiency, and productivity of the workforce.

vii. Institutionalization of continuous monitoring and evaluation for health and education programs is essential. This will guarantee that resources assigned to these sectors produce quantifiable enhancements in labor productivity and overall economic progress.

REFERENCES

African Development Bank. (2024). *African economic outlook 2024: Driving Africa's transformation*. Abidjan, Côte d'Ivoire: African Development Bank.

Bloom, D. E., Kuhn, M., & Prettner, K. (2018). Health and economic growth. In K. F. Zimmermann (Ed.), *Handbook of labor, human resources and population economics* (pp. 1–30). Springer. https://doi.org/10.1007/978-3-319-57365-6_4-1

Federal Ministry of Health and Social Welfare. (2024). *National health sector strategic development plan 2024–2028*. Abuja, Nigeria: Federal Ministry of Health and Social Welfare.

Egwutu, R. C. (2025). Healthcare financing and economic performance in Nigeria. *World Journal of Advanced Research and Reviews, 28*(3), 1565–1577.

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy, 80*(2), 223–255. https://doi.org/10.1086/259880

International Labour Organization. (2023). *World employment and social outlook: Trends 2023*. International Labour Organization.

Kolawole, B. O., & Anagun, A. M. (2024). Public health expenditures and economic productivity in Nigeria. *Journal of Economics and Sustainable Development, 15*(4), 45–61.

Okereke, E., Eluwa, G., Akinola, A., Suleiman, I., & Unumeri, G. (2021). Patterns of financial incentives in primary healthcare settings in Nigeria: Implications for workforce productivity. *BMC Research Notes, 14*(250), 1–7. https://doi.org/10.1186/s13104-021-05671-z

Okunade, S. O., Olayiwola, A. S., & Joseph, K. E. (2025). Does health investment matter for productivity growth in Sub-Saharan Africa? Empirical insights from income and regional economic grouping perspectives. *Journal of Economic Structures, 14*(5), 1–28. https://doi.org/10.1186/s40008-025-00348-3

Stiglitz, J. E. (1984). *Theories of wage rigidity* (National Bureau of Economic Research Working Paper No. 1442). National Bureau of Economic Research.

World Health Organization. (2023). *Global health expenditure report 2023: Sustaining health systems in challenging times*. World Health Organization.

World Health Organization. (2024). *Global spending on health: Emerging trends and challenges*. Geneva, Switzerland: World Health Organization.

Yahaya, O. A., & Bello, J. A. (2025). Employee welfare practices and organizational performance in developing economies. *Journal of Accounting and Finance Review, 8*(2), 1–21.