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HEALTH CARE SPENDING AND ITS IMPACT ON LABOUR PRODUCTIVITY IN NIGERIA: 2000-2023

[1]Magbuin Maryam, [1]Akpan Michael Simpson and [1]Oniore Jonathan Ojarikre

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Abstract

Health is an important determinant of economic growth and will likely increase health care spending. Similarly, investments in health care can also increase labour productivity, thus an increase in economic growth and subsequent increase in the wellbeing of the population. As a result, understanding the determinants of healthcare spending and its impact on labour productivity is crucial for designing targeted interventions to improve health care access, quality, and equity in high-populated country like Nigeria. Thus, this paper examines the impact of health spending on labour productivity in Nigeria from 2000 to 2023 using time series data. The Autoregressive Distributed Lagged (ARDL) model was used as the main analytical technique. The short-run result revealed that health expenditure per capita, recurrent health expenditure, and out-of-pocket health spending have a negative influence on labour productivity, whereas capital health expenditure has positive influence on labour productivity. However, the long run result revealed that that health expenditure per capita is positively correlated with labour productivity. In other words, health expenditure per capita increases labour productivity. On the other hand, the findings indicated that recurrent health expenditure appears to affect labour productivity negatively over the long-run and an indication that bad managed recurrent health expenditure can negatively impact productivity. Similarly, the estimated impact of capital health expenditure on labour productivity is negative and insignificant eventually. This implies that capital health expenditure stimulates labour productivity negatively. The results indicate that out-of-pocket health spending affects labour productivity positively eventually. Therefore, this paper recommends that the Federal Ministry of Health intensify its investments in health care infrastructure in order to increase health expenditure per capita. Further, a thorough audit of recurrent health care spending by the Federal Ministry of Finance, which will likely enhance the efficiency and accountability of these expenditures, is recommended. In addition, the Federal Ministry of Health should actively promote the development of the health care industry and increase fixed asset investments in the health care sector.

[1] Department of Economics, Faculty of Social Sciences, Bingham University, Karu, Nigeria

I. Introduction

A healthy workforce is a key economic resource. Good health plays a vital role in boosting an individual's work efficiency. Better health enhances labor productivity by extending life expectancy and improving physical and mental performance. Illness reduces productivity, and the workforce shrinks as more people become sick. Health expenditure encompasses key processes such as gathering funds, consolidating resources, and financing health care measures (Abdulwahab & Isiaka, 2021).

Global health care remains a persistent challenge for nations worldwide, as rising economic and environmental pressures threaten healthcare systems (Onofrei *et al*., 2021). These risks contribute to widespread health issues, including child and maternal mortality, infectious and non-communicable diseases, and inadequate health care access (WHO, 2022). Health spending serves multiple purposes—not just providing funding but also establishing proper financial incentives for providers and guaranteeing universal access to essential public and personal health care services. To guarantee access to health care services, three key financing functions must work together: revenue collection, resource pooling, and strategic intervention purchasing. Health investment encompasses spending on medical facilities, medications, and services aimed at treating illnesses and preserving both physical and mental well-being over time. Broadly speaking, it also includes expenditures on wellness-related activities, such as recreation and occupational training. As such, health care investment represents a productive form of economic expenditure (Xiaoqing, 2015).

Governments seek to enhance population health and boost labor market productivity. Investments in health care can improve workforce efficiency, thereby stimulating economic growth and elevating overall societal welfare. As Bloom and Canning (2000; 2003) argued, healthier individuals contribute more effectively to the economy by: enhancing workplace output and earning higher wages, dedicating more time to labor market participation, and pursuing further education and skill development to maximize economic productivity. Improved national health enables a country to achieve greater output with its existing resources—physical capital, human capital, and technological advancements (Nurudeen *et al*., 2023).

Nigeria's health care system faces persistent challenges, including chronic underfunding, inefficient resource distribution, and suboptimal health outcomes—all of which negatively impact workforce productivity. While robust health care systems are widely recognized as catalysts for economic growth, Nigeria's health expenditure remains disproportionately low relative to global benchmarks, hindering its developmental potential. Despite possessing abundant human resources that should position it as a model of productivity-led growth, Nigeria struggles with chronic underemployment, inadequate healthcare infrastructure, and depressed labor productivity, all of which constrain its economic development. The World Bank's (2020) Human Capital Index ranked Nigeria at 168th globally, placing it among the seven bottom nations for human capital development. This assessment underscores severe deficiencies in healthcare delivery and workforce efficiency (Ayaga *et al*., 2023).

Nigeria has faced persistent challenges in labor productivity growth over recent decades. Following the Structural Adjustment Program era, productivity trends have shown significant volatility while making limited contributions to economic expansion. Empirical data reveal fluctuating contributions to GDP growth: from 2.15% in 1992 to 12.85% in 2002, before declining to 5.86% (2012), -2.56% (2018), and -0.61% (2023). This study examines the impact of health care expenditure on labor productivity in Nigeria, aiming to identify the optimal investment levels needed to enhance workforce efficiency and drive sustainable economic development.

2. Literature Review

Ayaga *et al.* (2024) studied the links among health expenditure, labor productivity, and economic growth in Nigeria using the structural vector autoregressive (SVAR) Model. The study found long-term correlations

between Nigeria's economic growth, labor productivity, and health spending. Additional findings showed that, in the short term, health spending has a positive but negligible link with labor productivity, and that, in the near term, labor productivity has a positive but statistically negligible relationship with Nigeria's economic growth.

Osim *et al*. (2024) used multiple regression, mediation, and correlation analysis to examine the effects of public health spending and government efficacy on labor productivity in West Africa between 1980 and 2022. Furthermore, the Engel-Granger residual-based and Johansen co-integration tests were applied. In the short term, spending on public health and government effectiveness had some positive but negligible effects on labor productivity. At the same time, public health spending showed a long-term, negative, and substantial effect on labor productivity in Senegal, Guinea, Togo, Nigeria, and Mali.

Using the Autoregressive Distributed Lag (ARDL) methodology, Ugbaka and Chijioke (2024) examined the relationship between industrial productivity and health outcomes in Nigeria from 1990 to 2022. The study discovered that variations in Nigeria's mortality, morbidity, infant mortality, literacy, and life expectancy rates have a substantial impact on the country's industrial productivity over both the short and long term. However, in the long run, while economic development and labour productivity significantly increase industrial productivity, their impact on the dependent variable were abysmal. This study shows that health outcomes considerably affect industrial productivity in Nigeria.

Adekunle *et al.* (2023) used the Two-Stage Least Squares (2SLS) approach to ascertain the effect of public health financing on health outcomes as well as the impact of health outcomes on labor productivity and economic growth from 1981 to 2021. According to the study, increasing public health spending has a considerable positive impact on health outcomes, such as baby, neonatal, and under-five mortality; these improvements also boost labor productivity, but the neonatal death rate has the highest labor productivity elasticity. This shows that a consistent drop in infant fatalities would contribute to the production of healthy individuals who would grow up to become healthy and productive workforce.

Agbai *et al*. (2023) examined how labor productivity is impacted by health, a human capital that directly influences productivity. To determine the order of integration of the time series data, the Dickey-Fuller Generalized Least Squares (DF-GLS) test was employed. The empirical findings demonstrated that the factors are long-term in association with one another. The results also showed a short-term, negligible negative impact of maternal death rate on production. Therefore, the report suggests that in order to boost Nigerian productivity, the government should improve maternal health care facilities and raise public health spending.

Olabiyi *et al*. (2023) investigated the relationship between Nigerian production, health outcomes, and health spending. In order to analyze the study, the vector auto-regression (VAR) technique was used. According to the study, effectively allocating health expenditures could result in positive health outcomes and, in turn, higher labor productivity—both of which are critical for raising national wealth. According to the report, government health spending should be allocated with accountability and transparency in order to promote citizen health and increase labor productivity, which will raise national wealth.

Joshua *et al.* (2023) empirically analyzed the impact of public health expenditure on productivity in Nigeria. This study employs econometric techniques to verify the time series properties and the relationship among HIV/AIDS prevalence rate, life expectancy rate, and productivity in Nigeria. The findings revealed that maternal mortality and HIV/AIDS prevalence rates have a negative significant impact on productivity eventually. The life expectancy rate was found to have a significant positive effect on productivity. In the short run, the multiple regression results indicate that public health expenditure has a positive, insignificant impact on productivity in Nigeria. The findings also revealed that the maternal mortality rate had a negative, insignificant effect on productivity in the short run.

Therefore, the study proposes that the government should enhance public health spending and strengthen maternity health care facilities to boost productivity.

Evbayiro-Osagie and Obasogie (2022) examined the impact of public health expenditure on labour productivity in Nigeria. Using data from 1981 to 2017, the study employs both the residual based test–the Engel-Granger approach—and the Johansen multivariate co-integration test. The error correction model (ECM) was used to establish the short-run dynamics of the regression model. The findings of this study show that public health expenditure has a positive and insignificant impact on productivity in the short run. However, it also revealed that public health expenditure has a long run significant adverse impact on labour productivity in Nigeria. The study recommends that the government reconsider the proportion of its annual budget set aside for public health expenditure to improve its effect on human productivity in Nigeria.

Abdulwahab and Isiaka (2021) empirically examined government expenditure on health and workforce productivity. The vector autoregressive (VAR) model was estimated using the Nigerian annual time series data from 1980 to 2018. Results from the VAR estimate and Granger causality revealed that; government capital expenditure on healthcare in Nigeria had a negative effect on workforce productivity during the study period. Government recurrent expenditure on healthcare in Nigeria positively impacted workforce productivity during the study period. Government capital expenditure and government recurrent expenditure on health care caused workforce productivity over the study period, meaning that changes in this form of expenditure could also account for changes in workforce productivity. It is recommended that better attention should be given to health personnel remuneration to motivate them to give their best in production, which will have a positive multiplier effect on the economy.

Opeloyeru *et al.* (2021) investigated the role of institutional quality in the relationship between health expenditure and labour force participation (LFP) in Africa, taking into consideration two forms of health expenditures (government health expenditure (GHE) and out-of-pocket health expenditure (OOPHE)) and gender labour force participation dichotomy. The study employed data from 39 African countries for the period between 2000 and 2018 using Panel Fixed Effects with Driscoll and Kraay standard errors and a two-stage System Generalized Method of Moments (GMM). The results revealed that government health expenditure yields an increasing effect on total, female, and male LFP. OOPHE, in most cases, leads to a decline in LFP. Institutional quality was found to be harmful to LFP. The magnitude of the positive effect of government health expenditure on LFP is reduced by the interaction between institutional quality and government expenditure.

Ugwu *et al.* (2021) evaluates health outcome on labour productivity in Nigeria using time series data from 1970 to 2018. Employing Auto Regressive Distributed Lag (ARDL) bound co-integration test procedures for estimation. The life expectancy variable (HEALTH) indicates a positive sign and is statistically significant, implying that a unit change in the life expectancy of workers will lead to an increased labour productivity in Nigeria. The literacy rate variable (LIT) indicates a positive sign and is statistically insignificant. The gross domestic investment variable (GFCF) shows a positive sign and is statistically significant, implying that domestic investment exerts a significant effect on labour productivity in Nigerian. This study recommends policies that increases productivity of labour, in order to raise the standard of living of the people in Nigeria.

Iseghohi (2021) examined the effects of health status on labour productivity for the period 2000Ql to 2018Q4. Vector autoregression and Granger causality were used for the analysis. The empirical results showed that output per man has self-cumulative effect. Malaria cases constituted drag to labour productivity during the study period. Secondary school enrollment rate, the proportion of malnourished Nigerians and life expectancy rate at birth had no significant effect on output per worker.

Olawumi (2020) examined the impact of government education expenditure, and health expenditure on labour productivity in Nigeria between 1981 and 2018. Due to the strong evidence of a long-run relationship among the variables, the study employed ARDL approach to the cointegration test. Findings show that there is a negative relationship between real gross capital formation and labour productivity eventually in Nigeria, as well as the existence of long run negative relationship between health expenditure. In the long run, there is a positive relationship between government expenditure on education and labour force productivity and economic growth in Nigeria.

Onyema and Nyenke (2019) examined healthcare, health status and productivity of labour in Nigeria in order to determine the direction of causality between them. The Ordinary Least Squares (OLS) method was used to estimate the model. The analysis indicates that government expenditure on health (GXH) and life expectancy (LXP) does not conform to theoretical expectations. On the other hand, prevalence of HIV and AIDS (HAD) and risk of catastrophic expenditure on surgical care (RCES) are consistent with the theoretical expectations. The analysis also reveals that prevalence of HIV/AIDS was statistically significant. However, GXH, RCES, and LXP were not statistically significant. The pairwise Granger causality test indicates that government expenditure on health (GXH) and life expectancy (LXP) does not granger cause labour productivity (LPD). However, the prevalence of HIV/AIDS (HAD) and poor expenditure on surgical care (RCES) granger cause labour productivity (LPD), implying that poor healthcare delivery and the health status of people adversely affect labour productivity in Nigeria.

Hassan *et al.* (2016) examined the impact of healthcare expenditure per capita and infectious diseases on labour productivity performance in Africa using System GMM Estimation methods for 50 panels from African countries from 2002 to 2011. The results indicate that healthcare expenditure per capita is positive but insignificant to labour productivity performance in the region. The results also confirm the negative impact of infectious diseases on labour productivity performance in the region. Government effectiveness and corruption control are positive and significant to the improvement of healthcare expenditure in Africa. Thus, the study recommends that African governments and health-related development partners should increase the financial amount allocated to the health sector.

3. Data and Methodology

In this paper, the selected research design is an ex-post facto design. The ex-post facto design is particularly suitable for studies aiming to decipher statistical associations between dependent and independent variables, primarily to establish cause-and-effect relationships. It is a design that not only allows for the testing of hypotheses about these relationships and effectively integrates theoretical review with empirical findings (Kerlinger & Howard, 2013).

The theoretical framework adopted for this paper is the endogenous growth model (EGM) that analyzed growth-health connection. The EGM incorporates a process that describes how public health investments impact productivity and economic development. These models, in the opinion of Piabuo and Tieguhong (2017), emphasize the importance of human capital development to economic progress and growth. Neo-classical growth theories attribute economic expansion to population, expansion, savings, and investment in knowledge and human capital, research and development, and public infrastructure. According to this school of thought, human capital is considered in the form of skilled labour, which can be augmented by education, training and investment in health.

The endogenous growth model has been able to account for income divergence between rich and poor nations. To this extent, Romer (1990) emphasized that economic growth depends on the stock of human capital, which in

turn is determined by growth. The human capital stock is endogenized, and thus, its effects on growth are more dynamic than those thought by the neoclassical school. Solow (1956) emphasized that and every other thing remained the same, economies with larger savings would benefit from higher per capita income.

The Autoregressive Distributed Lag Model (ARDL) was used in this paper to examine the long-term and short-term effects. A modified model developed by Agbai *et al.* (2023) titled "Public Health Expenditure and Health Indicators on Productivity in Nigeria" serves as the foundation for the model adapted for this paper. The original model is expressed as follows:

$GDPL = (PHE, MMR, HPR, LER)$ - - - - - - - 1

Where**:** GDPL = Gross Domestic Product per labour (Productivity), PHE = Public health expenditure, MMR = Maternal mortality rate, HPR = HIV/AIDs prevalence rate and LER = Life expectancy rate. However, the model was modified by including relevant health care spending indicators. These indicators include heaper capita healthcare expenditure capital health care expenditure, recurrent health care expenditure, and out-of-pocket health care spending. Thus, the modified model is expressed as follows:

$LP = f(HEXP, RHEX, CHEX, OPHS)$ - - - - - - 2

Explicit, equation 2 can be written as follows:

$LP_t = \beta_0 + \beta_1 HEXP + \beta_2 RHEX + \beta_3 CHEX + \beta_4 OPHS + \varepsilon_t$ - - - - 3

Where: LP = Labour productivity; HEXP = Health expenditure per capita; RHEX = Recurrent health expenditure; CHEX = Capital health expenditure; OPH = Out-of-pocket health spending; t = Time Period (annually); β_0 = Intercept term and $\beta_1 - \beta_4$ = Parameters for the Variables. Furthermore, the apriori expectations of the parameters is that $\alpha_1 to \alpha_3 > 0$; and $\alpha_4 < 0$.

Variables Description

Table 1 provides a specific summary of variable description, and source of data.

Table 1: Descriptions and measurements of the variables

Variable	Acronym	Description	Measurement	Source
Labour Productivity	LP	This is the quantity of labour that is required to produce a unit of output.	Annual ₦' Billion	labour Productivity Database (2024)
Health Expenditure Per Capita	HEXPc	This is the amount of health expenditure per capita in US dollars.	Annual US$ Billion	World Development Indicators (World Bank, 2024)
Recurrent Health Expenditure	RHEX	This is expenditure incurred periodically by the government on drugs, salaries of health staff, etc.	Annual ₦' Billion	CBN Statistical Bulletin, 2023
Capital Health Expenditure	CHEX	This fund is invested by the government on building durable assets such as hospitals and health equipment.	Annual ₦' Billion	World Development Indicators (World Bank, 2024)

Out-of-Pocket Health Spending	OPHS	This represents individuals' direct payments while receiving health services	Annual (Percentages)	World Development Indicators (World Bank, 2024)

Source: Researcher's Compilation, 2025

4. Results and Discussion

4.1. Descriptive Statistics

Table 2 presents the descriptive statistics for the paper.

Table 2: Descriptive Statistics

	LLP	LHEXP	LRHEX	LCHEX	LOPHS
Mean	17.78966	4.122139	4.847301	4.099260	4.268221
Maximum	18.11129	4.664567	6.129769	4.628876	4.348830
Minimum	17.53975	2.870849	2.722610	2.842516	4.097042
Std. Dev.	0.153252	0.528445	1.010691	0.534164	0.070863
Skewness	0.291046	-1.529999	-0.478909	-1.491820	-1.172929
Kurtosis	2.487546	4.162404	2.080308	4.081626	3.415315
Jarque-Bera	0.601440	10.71477	1.763249	10.07203	5.675540
Probability	0.740285	0.004713	0.414110	0.006500	0.058556
Observations	24	24	24	24	24

Source: Author's Computation, 2025 (Eviews-12)

Table 2 presents the descriptive revealed the mean of labour productivity, health expenditure per capita, recurrent health expenditure, capital health expenditure, and out-of-pocket health spending as follows: 17.78966, 4.122139, 4.847301, 4.099260, and 4.268221, respectively. Their median is also given as 17.79359, 4.266225, 5.235485, 4.235635, and 4.287519, respectively. The maximum values of labour productivity, health expenditure per capita, recurrent health expenditure, capital health expenditure and out-of-pocket health spending are given as: 18.11129, 4.664567, 6.129769, 4.628876 and 4.348830, respectively, and their minimum values are: 17.53975, 2.870849, 2.722610, 2.842516 and 4.097042, respectively.

The values of standard deviation of labour productivity, health expenditure per capita, recurrent health expenditure, capital health expenditure, and out-of-pocket health spending are given as: 0.153252, 0.528445, 1.010691, 0.534164, and 0.070863, respectively. Labour productivity is found to be positively skewed, while health expenditure per capita, recurrent health expenditure, capital health expenditure, and out-of-pocket health spending are found to be negatively skewed.

The probability of the Jarque- Bera statistics 0.740285, 0.414110, and 0.058556 for labour productivity, recurrent health expenditure, and out-of-pocket health spending are found to be normally distributed at a 5% level of significance, while 0.004713 and 0.006500 for health expenditure per capita and capital health expenditure are not normally distributed at a 5% level of significance.

4.2. Unit Root Test

The Augmented Dickey-Fuller (ADF) unit root test results are displayed in Table 4 as follows:

Table: 3. Unit Root Test

Variables	ADF	1% CV	5% CV	10% CV	Order	P-Value
LLP	-4.243317	-3.788030	-3.012363	-2.646119	I (1)	0.0037

LHEXP	-4.066230	-3.769597	-3.004861	-2.642242	I (1)	0.0052
LRHEX	-5.443465	-3.769597	-3.004861	-2.642242	I (1)	0.0002
LCHEX	-4.047219	-3.769597	-3.004861	-2.642242	I (1)	0.0054
IOPHS	-4.969354	-3.769597	-3.004861	-2.642242	I (1)	0.0007

Source: Researcher's Computations using E-Views 12

Based on the result of the unit root test of labour productivity, health expenditure per capita, recurrent health expenditure, capital health expenditure and out-of-pocket health spending were not found to be stationary at level, as their ADF statistic values are lesser than their critical value with probabilities greater than 5% level of significance. However, they became stationary at the first difference. Thus, their order of integration is *I* (1).

4.3. Co-integration Results

The variables were all found to be integrated at first difference; hence, they all satisfied the ARDL-bound testing approach, which necessitates that every variable in the equation be static either at level or at first difference or modification. The Augmented Dickey-Fuller (ADF) unit root results presented in Table 3 imply that the bounds testing approach is applicable in this investigation. The cointegration test results are presented in Table 4:

Table 4. The Results of Bound Test Cointegration Analysis

F-Bounds Test		**Null Hypothesis: No-level relationship**		
F-statistic	7.456346	10%	3.03	4.06
K	4	5%	3.47	4.57
		2.5%	3.89	5.07
		1%	4.4	5.72

Source: Researcher's Computation Using EViews-12 (2025)

From the co-integration test captured in Table 3, it can be seen that the F-statistic value of 7.456346 is greater than the lower bound [*I* (0)] and upper bound [*I* (1)] critical values of 3.47and 4.57, respectively, at the 5% level of significant. Therefore, the variables are found to be co-integrated, and as such, long-run equilibrium relationship between health care spending and labour productivity for the period of study. Considering the cointegration of the dependent variable with regressors, this paper estimates the error correction and long-term models. Table 5 presents the outcomes of the estimates as follows:

Table 5. Result ARDL Error Correction Regression

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	4.199857	0.565580	7.425749	0.0000
@TREND	0.015547	0.002483	6.260857	0.0001
D(LHEXP)	-1.379101	0.134711	-10.23745	0.0000
D(LRHEX)	-0.015663	0.009339	-1.677071	0.1278
D(LCHEX)	1.392122	0.131788	10.56333	0.0000
D(LOPHS)	-0.042560	0.060825	-0.699719	0.5018
CointEq(-1)*	-0.279478	0.038085	-7.338350	0.0000
R-squared	0.947084			
Adjusted R-squared	0.914521			
F-statistic	29.08430			
Prob(F-statistic)	0.000000			
Durbin-Watson stat	2.024539			
LONG RUN				

LHEXP	1.114935	1.406021	0.792971	0.4482
LRHEX	-0.359298	0.236675	-1.518105	0.1633
LCHEX	-1.039966	1.360637	-0.764323	0.4642
LOPHS	0.826580	0.408021	2.025826	0.0734

Source: Researcher's Computation Using EViews-12 (2024)

Table 5 presents the results of the Autoregressive Distributed Lag (ARDL) model, focusing on both the short-run dynamics and the long-run relationship between the dependent variable, labour productivity, and the independent variables, health expenditure per capita, recurrent health expenditure, capital health expenditure out-of-pocket health spending, and the error correction model.

In the short run, the coefficient of health expenditure per capita is 1.379101 but is statistically significant at the 5% level (p = 0.000), indicating a negative or inverse relationship between health expenditure per capita and labour productivity in the short run. However, the coefficient for health expenditure per capita is 1.114935, which is positive but statistically insignificant at the 5% level of significance, as suggested by the probability value of 0.4482. This suggests that health expenditure per capita has a direct relationship with labour productivity eventually.

The coefficient of recurrent health expenditure is -0.015663 but is statistically insignificant at the 5% level, as suggested by the probability value of 0.1278. This indicates an indirect relationship between recurrent healthcare expenditure and labour productivity in the short run. However, the coefficient for recurrent health expenditure is -0.359298, which is negative and statistically insignificant at the 5% level of significance with a given probability value of 0.1633. This means that recurrent healthcare expenditure has an indirect relationship with labour productivity eventually. An increase in recurrent healthcare expenditure will lead to decrease in labour productivity.

The coefficient of capital health expenditure is 1.392122 with an associate probability value of 0.0000, which is below the 5% level of significance. This indicates that capital health expenditure is positive and statistically significant in influencing labour productivity in the short run. The long-run coefficient of capital health expenditure is 1.03966, which is negative and statistically insignificant with a probability value of 0.4642, which is greater than a 5% level of significance. This shows that capital health expenditure has a negative influence on labour productivity in the long run, and any increase in capital health expenditure will lead to decrease in labour productivity.

The coefficient of out-of-pocket health spending is -0.042560, which is negative and statistically insignificant at the 5% level with a probability value of 0.5018. This indicates that out-of-pocket health spending has negative influence on labour productivity in the short run. However, the long-run coefficient of out-of-pocket health spending is 0.826580, which is positive but statistically insignificant in influencing labour productivity at the 5% level of significance, as suggested by the probability value of 0.0734. This indicates that, in the long run, out-of-pocket healthcare spending has a direct relationship with labour productivity.

The coefficient of error correction term -0.279478, significant at the 5% level (p = 0.0000). This negative and significant coefficient confirms the existence of a long-run equilibrium relationship between variables. The magnitude of the coefficient indicates that approximately 27.9478% of the deviation from long-run equilibrium is corrected in each period, reflecting a relatively moderate adjustment speed.

The R-squared value of 0.947084 indicates that approximately 94.7084% of the variation in labour productivity is explained by the model. This means that only 5.2916% changes in labour productivity are other factors outside the model. The F-statistic of 29.08430 and its associated p-value (0.000000) indicate that the overall model is statistically significant, confirming the joint significance of the independent variables. The Durbin-Watson statistic of 2.024539 indicates that there is no evidence of autocorrelation in the residuals, suggesting that the model is well-specified.

3.4. Post-Estimation Test Results

The paper conducted a few diagnostic tests to assess the model's stability and applicability, as well as the validity of the results. Results is as presented in Table 6 as follows:

Table 6. Serial Autocorrelation, Heteroskedasticity, and Normality Tests

	X^2	Probability
Breusch-Godfrey Serial Correlation Test	0.277713	0.7655
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.576223	0.8157
Heteroskedasticity Test	0.439531	0.6515
Normality Test	2.248067	0.324966

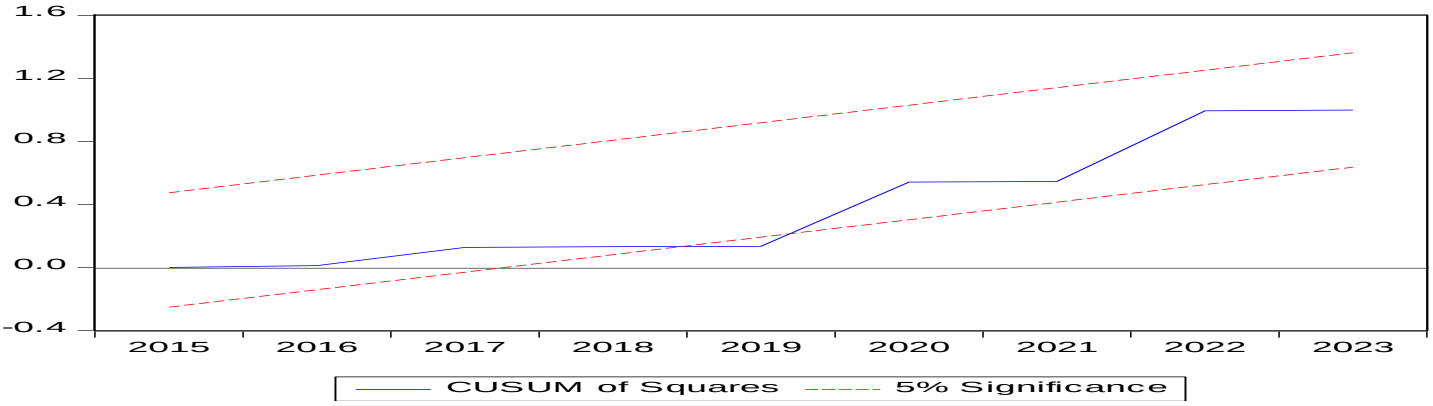
Source: Researcher's Computations based on E-Views 12

From Table 6, the model did not display serial correlation or heteroskedasticity during the study period. The heteroscedasticity tests indicated that the residuals were homoscedastic. The results of the diagnostic tests for serial correlation and heteroscedasticity suggest that the data are reasonably well behaved. Furthermore, the p-value for the normality test for the research period is greater than 0.05, indicating that the residues were distributed normally. This resulted in a uniform distribution of the residuals. As a result, the normal distribution null hypothesis was not rejected.

4.4.1 Stability Test Result

The stability test in Figure 1 also reveals that the output growth model is stable during the study period, as the plots of the charts lie within the critical bounds at 5% significant level. Bahmani-Oskooee and Rehman, (2005) noted that the null hypothesis that states the regression equation is correctly specified cannot be rejected when the plot of these statistics is within the critical boundaries at the 5% significant level.

Figure 4.1: Results of stability tests



Source: Researcher's Plot using E-Views 12.

5. Discussion

The findings revealed that health expenditure per capita is positive but statistically insignificant eventually. This implies that health expenditure per capita has direct relationship with labour productivity. This outcome is consistent with the *a priori* expectations of the investigation and studies such as Osim *et al.* (2024) and Hassan *et al.* (2016), which suggested a significant long-run relationship between health expenditure per capita and labour productivity. On the other hand, the result indicated that recurrent health expenditure has a negative and statistically insignificant relationship with labour productivity eventually. This outcome is not consistent with the *a priori* expectations of the research and an indication that bad managed recurrent health expenditure can impact negatively labour productivity. This finding agrees with the findings of other researches such as Abdulwahab and Isiaka (2021).

Furthermore, the findings revealed that capital health expenditure-negative and statistically insignificant relationship with labour productivity eventually. This outcome is not consistent with the *a priori* expectations of the research and an indication that bad managed capital health expenditure can impact negatively labour productivity. This finding agrees with the findings of other researches such as Abdulwahab and Isiaka (2021). The

findings show that out-pocket health spending has a positive but statistically insignificant relationship with labour productivity eventually. This outcome is inconsistent with the a priori expectations of the paper and Beylik *et al.* (2022), who found that out-of-pocket health spending encourages economic growth.

6. Conclusion and Policy Implications

This paper uses the ARDL technique to examine the impact of health care spending on labour productivity in Nigeria. This was achieved using annual data from 200 to 2023. The short-run result revealed that health expenditure per capita, recurrent health expenditure, and out-of-pocket health spending have a negative influence on labour productivity, whereas capital health expenditure has positive influence on labour productivity.

However, the long run result revealed that that health expenditure per capita is positively correlated with labour productivity. In other words, per capita health expenditure increases economic growth. On the other hand, the findings indicated that recurrent health expenditure appears to affect labour productivity negatively over the long-run and an indication that bad managed recurrent health expenditure can negatively impact productivity. Similarly, the estimated impact of capital health expenditure on labour productivity is negative and insignificant eventually. This implies that capital health expenditure stimulates labour productivity negatively. The results indicate that out-of-pocket health spending affects labour productivity positively eventually. Therefore, the following recommendations were raised based on the research findings.

i. Given the positive impact of healthcare expenditure per capita on labour productivity, the Federal Ministry of Health should intensify its investments in health care infrastructure in order to increase health expenditure per capital.

ii. A thorough audit of recurrent healthcare spending by the Federal Ministry of Finance, which will likely enhance the efficiency and accountability of these expenditures, is recommended because recurrent healthcare expenditure appears to affect labour productivity significantly and negatively in the long-run.

iii. The Federal Ministry of Health should actively investigate the development of the health care industry and allocation of fixed assets in the health care sector, considering the negative relationship between capital health expenditure and labour productivity.

iv. The Federal Ministry of Health, in collaboration with the National Health Insurance Authority, should strengthen the existing National Health Insurance Scheme in order to address challenges such as inadequate funding, drug stock outs, inefficient supply chain management, and regional disparities in pharmaceutical infrastructure**.**

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