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Health Expenditure and Industrial Productivity in Nigeria

[1]**Malachy Ashywel Ugbaka & [2]Mercy Chijioke Ihuoma**
[1&2]*Department of Economics,*
University of Calabar, Nigeria

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Abstract

The research investigated the relationship between health outcomes and industrial productivity in Nigeria for the period 1990 through 2022 with the use of the autoregressive distributed lag (ARDL) methodology. The study found that in both long run and short run period, changes in mortality rate, morbidity rate, infant mortality, literacy rate and life expectancy significantly affect the level of industrial productivity in Nigeria. However, in the long run, while economic growth and labour productivity positively affect industrial productivity, their impact on the dependent variable were abysmal. This contradicts the short run significant relationship established between the explanatory variables and the explained variable. Given the outcome of the estimations in both long and short run periods, the study concludes that health outcomes significantly affect industrial productivity in Nigeria. The study submits that industrial productivity should be stimulated by providing better healthcare services/facilities that will ensure reduction in mortality rate, morbidity rate and infant mortality.

Keywords: *Health Expenditure, Industries, Productivity, Economic Growth, Autoregressive*

Corresponding Author: **Malachy Ashywel Ugbaka**

Background to the Study

Affected individuals bear a heavy burden due to illness and bad health. Illnesses can make a person debilitated, unable to work or learn, and typically unable to support their dependents, including children. However, when taken as a whole, it appears possible that a high disease burden could negatively affect a nation's industrial production, growth, and economic development. Programs to combat diseases like HIV/AIDS, TB, malaria, and others, including reproductive health, are frequently implemented in Nigeria within a deficient healthcare system, with minimal effect on the typical Nigerian. A sizable portion of the poor's preventable mortality is explained by disease load. As sick people frequently are unable to contribute to increased productivity, the burden of diseases actually constitutes a fundamental health risk that is extremely severe and affects impoverished households in that way (Yaqub and Umoru, 2013). Maternal mortality, childhood immunization, and life-saving anti-retroviral medications for HIV/AIDS are considered to be some of the greatest successful public health initiatives in contemporary history. Nonetheless, alarming new data on Nigeria's health state was released by the World Health Organization (WHO) (Ugbaka, Awe, and Inak, 2019). The 54-year average life expectancy is less than the 73-year global average. In contrast, Egypt's 66 deaths per 1,000 live births, which ranks 11th in the world, and South Africa's 300 deaths per 1,000 live births, which ranks 10th in the world, are nearly ten times lower than Egypt's 814 deaths per 100,000 live births in 2015 (Central Intelligence Agency, 2016). According to Umoru and Yaqub (2013), the maternal mortality rate in the region is among the highest in the world, with around one mother dying for every 100 delivery. The adult mortality rate is also higher than the sub-Saharan African norm, with less than five deaths per hundred deliveries. The administration was eager to refocus the nation's development policies when democratic governance was restored in 1999. Rapid industrial productivity, however, does not appear to be in the cards despite these attempts. According to statistics, industrial productivity fell off and on over the assessment period. From N34, 477.32 million in 1990 to N1, 215,912.20 billion in 1997, it increased steadily. However, in 1998, it had a severe decline to N882, 034.02 million, and it then fluctuated between 1999 and 2001 (Awe, Ugbaka and Inak, 2019). Productivity grew from N2, 042,715.43 billion in 2002 to N16, 263,083.56 billion in 2011 and then somewhat more to N16, 975,344.36 billion in 2012. The productivity gain started in 2002. Productivity reached N18, 412,190.84 billion by 2014 (CBN, 2018). However, industrial productivity dropped to N14,372,781.47 billion in 2016, increased to N20,526.46 billion in 2017, up to N26,129,910.15 billion in 2018, and then somewhat reduced to N25,100 billion in 2020 (CBN, 2021).

In Nigeria, the health sector has not gotten enough attention. This is demonstrated by the fact that in 2014, the total amount spent on health accounted for 3.67% of GDP. In other words, the total amount spent by the government relative to GDP reached its maximum point in 2007 and its lowest point in 2002, at 2.47 and 2.43 percent, respectively, with an average of 3.53 percent for the period under consideration. Nigeria is ranked 164th in the world in 2014, well below the global average of 6.82 percent (The Global Economy, 2015). There are a wide range of negative effects from this lack of attentiveness. For example, the life expectancy is low, particularly in comparison to other emerging nations. In Nigeria, rising government spending and rising per capita GDP may not necessarily translate into improved social welfare and

health outcomes. The necessity for this research stems from the possibility that knowledge about the associations between health statuses, as opposed to generic health data, may help us better comprehend Nigeria's industrial productivity situation. Thus, the purpose of this study is to investigate the connection between Nigeria's industrial productivity and health status. The remainder of the work is organized as follows: part two of the paper contains the literature review. The methodology is presented in Section 3, and the data analysis, interpretation, conclusion, and recommendations are presented in Sections 4 and 5.

Literature Review

The connection between industrial production and health status has been the subject of numerous relevant studies in both developed and developing nations. This section reviews a few of these studies. Using a simultaneous regression model, Obienyi, Yuni, Ojike, and Uwajumogu (2018) investigated the relationship between labour productivity and industrial output in Nigeria as well as the effect of health outcomes on labour productivity. The findings demonstrate that, as predicted, health outcomes have a major and beneficial impact on labor productivity, which in turn has a considerable impact on industrial production. Thus, maintaining health outcomes is necessary to guarantee labor productivity, and maximizing labor productivity is necessary to raise Nigeria's industrial output. According to the report, the rate of population expansion in relation to resources needs to be checked. Additionally, as the nation's electrical production significantly influences industrial output, more deliberate efforts must be taken to govern it.

Eneji, Dickson, and Onabe (2013) looked at the relationship between national productivity, health status, and healthcare spending in Nigeria between 1999 and 2012. According to their opinion, the main problem facing policymakers is deciding how to divide up the little resources available among the many goals that support economic growth and the fight against poverty. These goals include capital investments in infrastructure that will boost productivity and in health and education. Regression analysis was done using both primary and secondary data. Spending on public health care was thought to be the explanatory factor for productivity, poverty alleviation, and health status. In the case of Nigeria, the causal relationship is weak. They contend that if people are a nation's most valuable resource, then the state of their health dictates the direction and type of sustainable human development, and their health condition defines the trajectory of development. They advocated for a system in which everyone had access to healthcare, or universal healthcare coverage.

An empirical investigation by Kumar and Kober (2012) looked at how urbanization, health, and education affected the overall factor productivity of many different nations. They found that total factor productivity (TFP) is highly impacted by the degree of urbanization as well as health capital, which is measured by life expectancy, infant mortality, and malaria risk.

By offering a worldwide overview of the state of the art in the domains of workplace health promotion and health management, Kirsten (2010) investigated the connection between productivity and health at work. Economic demands combined with the prevalence of chronic diseases have proven to be a major concern for both companies and employees.

Although there is a noticeable global trend toward more workplace health promotion, there are still relatively few businesses that tackle workplace health proactively and comprehensively. According to the report, the methods for occupational health services that are already in place are inadequate to handle the problems that exist. Only by integrating all health-related services within a company and addressing organizational, psychological, and personal health concerns can improved employee health be sustained.

Aluko and Oluseyi (2015) investigated the relationship between health and economic development in Nigeria using a vector error correction model. Their research revealed a unidirectional causal association between health indicators and economic growth, despite a similar positive relationship between the two variables. Idowu (2013) used quarterly data covering the period from 1995 to 2009 to apply Granger causality and co-integration techniques to assess the relationship between health and economic growth in Nigeria. The study found a long-term, favorable, and significant link between economic growth and health outcomes in Nigeria. Granger causality studies revealed a two-way relationship between per capita GDP, health spending, life expectancy, and fertility rate.

Using panel unit root tests and panel co-integration analysis, Mehrara and Musai (2011) investigated the causal link between health expenditure and GDP in a panel of eleven sampled oil exporting countries. Oil revenues were the third variable in a three-variable model that they employed. Their findings demonstrate a strong causal relationship between health spending in oil-exporting nations and oil income and economic growth. While both the short- and long-term, health spending has no appreciable impact on GDP. Their results demonstrate how highly vulnerable oil-dependent nations are to fluctuations in oil prices. Consequently, an institutional system that disentangles decisions about health spending from current revenue is needed to protect the economy from the volatility of oil revenue.

In order to determine whether health capacity has any bearing on labor productivity, Ugwu (2015) looked at the relationship between health capitals and labour productivity in Nigeria using the neo-classical growth framework approach, the ordinary least squares method, and annual time series data covering the years 1970–2013.income. The findings show that spending more on health care compared to schooling improves labor force health, which in turn affects labor productivity in the nation. Nonetheless, he suggested that higher government spending on labor and health care will raise labor productivity in Nigeria. Umoru & Yaqub (2013) examined how health capital in Nigeria affected labor productivity. The estimating process used the Generalized Method of Moment (GMM) methodology after testing for co-integration and unit root. They discovered that a major factor influencing labor productivity is the investment in health capital. The analysis shows that investing in health capital increases labor force productivity. Nigeria's economy is heavily dependent on labor, so maintaining a healthy workforce is essential to maximizing output. The statistical significance of the education-labor and health capital-labor interaction variables is another important conclusion of the research. To increase labor force productivity, the Nigerian government must spend in health and education in order to build capacity. By doing this, the economy would be shielded against further unfavorable trends in productivity growth.

Odubunmi, Saka, and Oke (2012) looked at the connection between Nigeria's economic growth and health care spending from 1970 to 2009. Using Johansen's multivariate co-integration technique, they discovered that there was at least one co-integrating vector that described a long-term link between population, health spending, foreign aid, economic growth, and total savings. However, the co-integrating equation exhibits some discrepancies in the signs of the foreign aid and health spending coefficients, which have been linked to either insufficient funding for health services or some diversification of foreign aid to other uses.

In their study, Karim and Shabbir (2012) looked at the elements of human capital and talked about how important they are to attaining sustainable industrial development. A single-equation regression model of Malaysia's manufacturing sector development, spanning the years 1981 to 2010, was created for analytical purposes. The results emphasized the importance of human capital, whereby the employment variable has the largest elasticity in terms of its contribution to the manufacturing sector's GDP share. Labor productivity and human capital investments in healthcare and education came next. It is anticipated that as employment increases, more output will be produced to satisfy local need as well as export demand. Additionally, lower manufacturing costs are achieved through increased labor productivity, and funding for health and education initiatives helps to improve the competencies of industry workers.

The long-term link and causation direction of government health spending, poverty, and health status in Nigeria were examined by Riman and Akpan (2010). They established a substantial causal bi-directional link between life expectancy and poverty in Nigeria by using the Granger causality test and the Vector Error Correction Model (VECM). Additionally, their research indicates that there is a persistent correlation between health condition and poverty. They did discover, however, a non-significant long-term correlation between government health spending and health status. They concluded that in order to improve the nation's health, policies that would raise adult literacy rates, lower poverty rates, and lessen income inequality are necessary. Raising budgetary allocations for the health sector on its own, without also lowering the poverty rate, will not be enough.

Theoretical Framework

The Solow growth model's total factor productivity (TFP) serves as the foundation for the efficiency theory of production. Solow (1957) posits that the efficiency parameter, or total factor productivity, functions similarly to the residual term in a traditional econometric model. It encompasses all other explanatory variables that are not explicitly included in the model but nonetheless have a significant impact on the behavior of the dependent variable. The following is how the Solow's production function is used to derive the TFP:

$$Q = Af(K, L) \qquad (1)$$

Where Y is aggregate output, A is efficiency parameter also called total factor productivity (TFP) technological progress or Solow's residual, K is capital and L is labour. In line with Mankiw, Romer and Weil (1992), the modified Solow's growth model is such that K in equation (1) is further disaggregated into human capital (K_h) and physical capital (K_p). Therefore, equation (1) becomes:

$$Y = Af(Kh, Kp, L) \qquad (2)$$

The empirical form of equation (2) is stated as follows:

$$Y = AKh^{\alpha_1}Kp^{\alpha_2}L^{\alpha_3} \qquad (3)$$

Where α_1,α_2 and α_3 are partial output elasticities with respect to human capital (K_h), physical capital (K_p) and labour (L). Here, human capital (K_h) is captured by health. The total factor productivity (A) is "what is left over" after accounting for economic growth resulting from capital, and labour. In words, productivity growth is what remains in output growth after subtracting out growth in the factors of production (capital and labor). The total factor productivity (TFP) is the part of output growth that we cannot explain using growth in capital and labour. Mathematically, the TFP can be derived from equation (4) as follows:

Given that: $Y = AKh^{\alpha_1}Kp^{\alpha_2}L^{\alpha_3}$ (5)

Take natural logarithm of both sides of equation (5) as follows:

$$In(Y) = In(AKh^{\alpha_1}Kp^{\alpha_2}L^{\alpha_3}) \qquad (6)$$

Where In is natural logarithm. Applying the law of logarithm, equation (7) becomes:

$$In(Y) = In(A) + In(Kh)^{\alpha_1} + In(Kp^{\alpha_2}) + In(L)^{\alpha_3} \qquad (8)$$

According to the law of indices, equation (2.10) becomes:

$$In(Y) = In(A) + \alpha_1 In(Kh) + \alpha_2 In(Kp) + \alpha_3 In(L) \qquad (9)$$

Making $In(A)$ subject formula in equation (9), we have:

$$In(A) = In(Y) - \alpha_1 In(Kh) - \alpha_2 In(Kp) - \alpha_3 In(L) \qquad (10)$$

Where:

$In(A) = \%\Delta A = \frac{\Delta A}{A}$= Relative Change in A= Growth in TFP

$In(Y) = \%\Delta Y = \frac{\Delta Y}{Y}$= Relative Change in Y= Growth in Y

$In(Kh) = \%\Delta Kh = \frac{\Delta Kh}{Kh}$= Relative Change in Kh = Growth in Kh

$In(Kp) = \%\Delta Kp = \frac{\Delta Kp}{Kp}$= Relative Change in Kp = Growth in Kp

$In(L) = \%\Delta L = \frac{\Delta L}{L}$= Relative Change in L= Growth in L

Model Specification

The specification of the relationship between health status and industrial productivity is rooted in the modified Solow growth model which incorporates human capital and efficiency theories into the growth model as hypothesized by Mankiw, Romer and Weil (1992) as:

$$Y = f(L, K, H) \qquad (11)$$

Where Y is total product, L is labour, K is physical capital and H is a function of human capital. In the present study, human capital (H) is proxied by health status which is a function of Life expectancy (LEX), Morbidity (MOR), Mortality (MORT) and Infant Mortality (IMR). Hence, equation (11) becomes:

$$Y = f(L, K, \text{LEX}, \text{MOR}, \text{MORT}, \text{IMR}) \qquad (12)$$

If we replace total product (Y) by industrial productivity (INDP), equation (12) becomes:

$$INDP = f(L, K, \text{LEX}, \text{MOR}, \text{MORT}, \text{IMR}) \qquad (13)$$

Incorporating labour productivity, real GDP and literacy rate as factors that explain industrial productivity, equation (13) becomes:

$$INDP = f(\text{LEX}, \text{MOR}, \text{MORT}, \text{IMR}, \text{LAP}, \text{RGDP}, \text{LTR}) \qquad (14)$$

The empirical form of equation (14) is specified as follows:

$$INDP_t = \beta_0 + \beta_1 LEX_t + \beta_2 MOR_t + \beta_3 MORT_t + \beta_4 IMR_t + \beta_5 LAP_t + \beta_6 RGDP_t + \beta_7 LITR_t + \mu_t \qquad (15)$$

From equation (15), we derive the granger equation for LEX=Life expectancy using INDP= Industrial productivity index, MOR=Morbidity, LAP=Labour productivity, RGDP=Real gross domestic product and LTR=Literacy rate as follows:

$$LEX = f(\text{INDP}, \text{MOR}, \text{LAP}, \text{RGDP}, \text{LITR}) \qquad (16)$$

The empirical form of equation (16) is specified as follows:

$$LEX_t = \beta_0 + \beta_1 INDP_t + \beta_2 MOR_t + \beta_3 LAP_t + \beta_4 RGDP_t + \beta_5 LITR_t + \mu_t \qquad (17)$$

Where INDP= Industrial productivity index, LEX= Life expectancy, MOR= Morbidity, MORT= Mortality, IMR=Infant Mortality, LAP=Labour productivity, RGDP= Real GDP, LITR= Literacy rate, μ=Stochastic error term, $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7$ = Parameters of the model to be estimated, and t= Time.

Unit Root Test Results

The unit root result in Table 1 demonstrates the mixed order of integration of the estimate's variables. INDP, LAP, LTR, MOR, and RGDP are integrated of first order one, or (I (1)), whereas IMR, LEX, and MORT are integrated of order zero, or I (0). This points to a unit root issue, which is why a co-integration test is required to determine the variables' long-term relationship status. The autoregressive distributed lag (ARDL) bound test approach, as

outlined by Shin and Smith (2001), is utilized to investigate the presence of a long-term equilibrium relationship between the variables, given that the order of integration is mixed with (I(0) and I(1)). The model's parameters are also estimated using the ARDL estimation technique.

Table 1: Unit Root Test

	ADF			Philip-Perron		
Variable	**Level**	**1st difference**	**Order of integration**	**Level**	**1st difference**	**Order of integration**
IMR	-3.1395***		I(0)	-	-4.8154***	I(0)
INDP	-2.3321	-4.7904**	I(1)	-2.502	-4.7906*	I(1)
LAP	-1.0629	-1.9103**	I(1)	-0.4048	-1.9139**	I(1)
LEX	-4.0738**	-	I(0)	-4.5097**	-	I(0)
LTR	-2.1027	-7.1307**	I(1)	-2.1447	-7.1307**	I(1)
MOR	-2.0606	-2.8639**	I(1)	-0,4408	-2.9075	I(1)
MORT	-7.5390***	-	I(0)	-3.7409**	-	I(0)
RGDP	3.7489	-3.9299**	I(1)	3.9342	-3.3712**	I(1)

Source: Authors' computation.
FD signifies First Difference. * ** and *** denote significance at 1%, 5% and 10% respectively

ARDL Bound Test Result

The outcome of the bound, which is displayed in Table 1, indicates that the variables in the estimate have a long-term relationship. The F-bound test statistic value (21.39), which is higher than the critical values of F* at the 5% significant level and falls within the I (0) and I(1) bounds, lends credence to this assertion. As a result, the study confirms the existence of long-term relationships between the variables in the estimate and moves on to estimating the model's parameters using the ARDL technique.

Table 2: ARDL bound test Result for Industrial Productivity Equation

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	21.39064	10%	1.92	2.89
K	7	5%	2.17	3.21
		2.5%	2.43	3.51
		1%	2.73	3.9

Source: Computed by the authors using data for analysis

Interpretation of Results

Short Run Results

In contrast to the theory's prediction, Table 2 projected short-run result demonstrates a negative association between life expectancy and industrial productivity during the first-lagged era. Despite the statistical significance of the association, the coefficient's sign defies the presumption. On the other hand, the coefficient is currently appropriately signed and significant at the five percentiles. According to the size of the life expectancy parameter at the time, an increase of one year will result in a short-term 2.26 percent increase in industrial production during the current period. Conversely, in the first period lag, a one-year rise in life expectancy will unexpectedly result in a short-term 3.66 percent decrease in industrial output. This supports the findings of Bloom, Canning, and Sevilla (2001) and Kumar and Kober (2012) about the connection between total factor productivity and life expectancy.

In keeping with the theoretical prediction, the results likewise showed a negative and statistically significant association, at the five percent level, between the industrial productivity and the death rate during the short run period. According to the size of the mortality rate parameter at the current time, a 1% increase in the number of deaths per 1000 people will cause a short-term drop in Nigeria's industrial production of about 1.30%. Because of the mortality rate's statistical significance, which indicates that it has a significant impact on the country's industrial productivity, choices pertaining to industrial productivity must take this factor into sufficient account.

As of right now, the data indicates that Nigeria's industrial productivity is positively and significantly impacted by infant mortality. The present period's infant mortality parameter's sign deviates from the a priori prediction. It proved that an increase in infant mortality in Nigeria short-term boosts industrial production. At the five percent significant level, the first period lag yielded the right sign, indicating an inverse association between infant mortality and industrial production. The variable's statistical significance in both short-term periods indicates the critical role it plays in determining Nigeria's industrial productivity during the period.

Table 3: Short run estimated result of industrial productivity equation

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LEX)	2.264473	0.179088	12.64447	0.0000
D(LEX(-1))	-3.660205	0.227419	-16.09452	0.0000
D(MORT)	-1.296118	0.111015	-11.67511	0.0000
D(IMR)	0.035303	0.005959	5.923957	0.0004
D(IMR(-1))	-0.076708	0.006131	-12.51101	0.0000
DLOG(LAP)	-2.979289	0.299378	-9.951582	0.0000
DLOG(RGDP)	3.973851	0.299384	13.27343	0.0000
D(LTR)	-0.130440	0.010142	-12.86127	0.0000
D(LTR(-1))	-0.033600	0.010624	-3.162567	0.0133
CointEq(-1)*	-0.406926	0.071701	-5.675318	0.0007

R-squared	0.969831	Mean dependent var	-0.012967
Adjusted R-squared	0.952862	S.D. dependent var	0.050757
S.E. of regression	0.011020	Akaike info criterion	-5.894496
Sum squared resid	0.001943	Schwarz criterion	-5.410613
Log likelihood	86.62845	Hannan-Quinn criter.	-5.755156
Durbin-Watson stat	2.124590		

Source: Computed by the authors using data for analysis

Even if the coefficient of labor productivity's sign over this era suggested a negative link with industrial productivity, it is statistically significant at the five percentiles. Growing labor productivity has a negative impact on industrial productivity, as indicated by the current period's sign and magnitude. This demonstrates that, even while labor productivity plays a crucial role in determining Nigeria's industrial productivity level in the near term, its current level of productivity is insufficient to have the intended effect. However, this is because Nigeria's mechanized production system is still at its lowest point, and the country's current use of crude means of production has had little impact on or substantial contribution to industrial productivity. Additionally, the outcome demonstrates that, in the short term, higher economic growth levels support existing levels of industrial productivity. This supports the theoretical claim that industrial productivity and economic growth in Nigeria are positively correlated. Based on the coefficient's magnitude, Nigeria's industrial productivity is expected to expand by around 3.97 percent in the near future when economic development improves by one percent. Furthermore, even though the literacy rate parameter's sign is statistically significant, it defies both the current period's theoretical proposition and the first period's lag. According to the parameter estimate, a decrease in industrial production will result from improvements in the literacy rate during both periods. In particular, in the short term, a unit percentage increase in the literacy rate has a 0.13 and 0.03 percent reducing effect on Nigeria's

industrial productivity in the current and one period lag, respectively. This could be explained by the high unemployment rate, which prevents many literate people from having instant opportunity to make a beneficial impact on the economy's industrial sector. The outcome demonstrates that, in the near term, Nigeria's industrial productivity is significantly influenced by its literacy rate. The short run model is well-behaved, as indicated by the coefficient of the error correction mechanism, given that it is fractional, correctly signed, and statistically significant. This validates the results of the ARDL bound tests, which suggested that there was a long-term link between the variables. Given that only 40% of the short run disequilibrium will be corrected in a given amount of time in the long run, the coefficient's size of 0.40 indicates that the pace of adjustment will be somewhat slow. Since changes in the explanatory variables account for almost 95% of short-term fluctuations in the level of industrial production, the model appears to be well-fitted, as indicated by the adjusted R-squared of 0.95. The no autocorrelation region is in proximity to the Durbin-Watson statistic of 2.12. This suggests that autocorrelation will have very little of an impact. The stability test presented in Figures 1a and 1b demonstrates the stability of the estimate variables.

Interpretation of the Long Run Estimation

The long run result is presented in Table 4. The outcome shows that a negative but significant relationship exists between life expectancy and industrial productivity in the long run. This result is consistent with the findings of the short run estimation at the first lagged period. It shows that one-year addition to life expectancy will reduce industrial productivity by 0.72 per cent in the long run. This is due to the inability of the aged workforce to productively engage in the production process which will invariably translate to reduction in industrial productivity. The long run relationships between mortality rate, morbidity rate and industrial productivity are negative and statistically significant according to the prescription of economic theories. The magnitude of the coefficients explains that one per cent increase in mortality rate and morbidity rate will bring about 1.03 per cent and 1.17 per cent increase reduction in industrial productivity, respectively in the long run. The established long run relationship between mortality rate and industrial productivity in the long run conforms to the outcome of the short run estimation. Though the long run estimation suggests that economic growth stimulates industrial productivity, its impact is statistically trivial unlike the short run effect. The situation may be attributable to inconsistency in the rate of economic growth experienced in the country in the recent years. Infant mortality and literacy rate are other explanatory variables that are statistically significant with the coefficients of 0.06 and -0.09, respectively. This signifies that increase in infant mortality and literacy rate by one per cent will trigger about a growth of 0.06 per cent and a reduction of 0.09 per cent in industrial productivity in Nigeria, respectively, in the long run. The values of the t-statistic of mortality rate, morbidity rate, infant mortality and literacy rate shows that these variables play important role in the determination of industrial productivity of Nigeria in the long run.

Recommendation

This research investigated the relationship between health outcomes and industrial productivity in Nigeria for the period 1990 through 2022 with the use of the autoregressive distributed lag (ARDL) methodology. The study found that in both long run and the short run

period, changes in mortality rate, morbidity rate, infant mortality, literacy rate and life expectancy significantly affect the level of industrial productivity in Nigeria. However, in the long run, while economic growth and labour productivity positively affect industrial productivity, their impact on the dependent variable were abysmal. It is therefore interesting to, recommend that industrial productivity should be stimulated by providing better healthcare services/facilities that will ensure reduction in mortality rate, morbidity rate and infant mortality. This will promote the health of the workforce of the economy, hence, improving the productivity of the industrial sector in Nigeria. Also, the government should as well implement an all-inclusive social program that will improve life expectancy in Nigeria given its positive and significant effect on industrial productivity of the country. The economic growth of the economy should be encouraged so as to intensify the level of industrial productivity in Nigeria.

References

Aluko, O. O. & Oluseyi, A. S. (2015). Exploring the effect of health on economic growth in Nigeria: A vector error correction model approach, *International Journal of Economics, Commerce and Management*, 3(9), 659-678.

Central Bank of Nigeria (2021). *Economic and financial review, Bank of Nigeria*, 12.

Eneji, M. A., Dickson, J. V. & Onabe, B. J. (2013). Healthcare expenditure, health status and national productivity in Nigeria (1999-2012), *Journal of Economics and International Finance,* 5(7), 258-272.

Idowu, O. (2013). The impact of health on economic growth in Nigeria, *Journal of Economics and Sustainable Development*, 5(19), 159-166.

Kirstein, W. (2010). Making the link between health and productivity at the workplace: A global perspective. *Industrial Health*, 48, 251-255.

Kumar, N. F. & Kober, G. (2012) Impact of health, education, and urbanization on total factor productivity, *Journal of Economic Literature* 36, 766-817.

Mackintosh, M. & Tibandebage, P. (2016). Health as a productive sector: Integrating health and industrial policy, *Economic and Social Research Foundation,* 8(69), 2-6.

Obienyi, P., Yuni, D. N., Ojike, R. & Uwajumogu, N. R. (2018). Health, labour productivity and industrialization in Nigeria, *World Applied Sciences Journal*, 36(2), 353-360.

Odubunmi, A. S., Saka, J. O., & Oke, M. D. (2012). Testing the co-integrating relationship between health care expenditure and economic growth in Nigeria*, International Journal of Economics and Finance*, 4(11), 28-32.

Ugwu, I. E. (2015). The effect of health capital on labour productivity in Nigeria from 1970-2013, *A Standard Neo-classical Growth Framework Approach.*

Umoru, D. & Yaqub, J. O. (2013). Labour productivity and health capital in Nigeria: The empirical evidence. *International Journal of Humanities and Social Science*, 3(4), 1-12.

Yaqub, J. O. & Umoru, D. (2013). Impact of public health spending on infant and under-5 mortalities and life expectancy. *International Journal of Humanities and Social Science*, 3(4), 21-30.

Karim, A. & Shabbir, J. (2012). Human capital and sustainable industrial development in Malaysia. *Journal of International Academic Research,* 10(2).

Riman, H. B. & Akpan, A. (2010). Government health expenditure, poverty and health status in Nigeria. *Journal of Economics and Sustainable Development*. 5(19), 2014.

Ugbaka A. M., Awe, E. O., & Osigbemhe, I. (2019). Implication of healthcare outcomes on economic growth in Nigeria, *Confluence Journal of Economics and Allied Science (CJEAS)*. 3(1), 281-299, May, 2020. ISSN: 2437-1661