OPEN ACCESS

Global Journal of Research in Business Management
ISSN: 2583-6218 (Online)
Volume 04 | Issue 04 | July-Aug. | 2024
Journal homepage: https://gjrpublication.com/gjrbm/

Research Article

Implications of Public Sector Expenditure on Human Development in Nigeria: Ardle Approach

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DOI: 10.5281/zenodo.13165694 Submission Date: 10 June 2024 | Published Date: 02 Aug. 2024

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Abstract

The study examined the effect of public sector expenditure on Human development in Nigeria for the period 1970-2022 based on data obtain from central bank annual bulletin and world bank and using auto regressive distributive Lag to determine the short run and long run effects of the variable of study. Kernel test was conducted for normality of distribution of data set. The test for stationarity of the data series was performed using two different methods namely, the Augmented Dickey Fuller (ADF) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) procedure. The test for common stochastic trends or cointegration is performed using Bounds cointegration test procedure in order to further determine the long run time series properties. In the lag selection, optimality of the model was determined using both the Akaike Information Criterion (AIC) and Schwarz–Bayesian Criterion. Multiple regression OLS method was used. Specifically, there is no significant effect of capital expenditure, recurrent expenditure and total expenditure on human development index in Nigeria. Although the short run effects were significant and negative, the long run effects were insignificant. We recommend that government should increase spending and set out a deliberate policy that will ensure expenditure boost human development in Nigeria as human capital is one of the drivers of economic growth.

Keywords: Recurrent Expenditure, Capital Expenditure, Human Development Index.

1. INTRODUCTION

Emerging evidence is confirming the necessity of a multi-talented workforce as drivers of economic growth. Government and private businesses are now teaming efforts to offer people with good education through training, good medical facilities to enhance good health, cultural orientation and sporting facilities to enhance quality of human resources. The motive being provision of the right physical and mental conditions which can improve quality of human capital. Many prior studies (Wiratmoko and Purwanti, 2023; Linhartová (2020 Palevei, 2017; Florida, 2005) have highlighted the significance of good educational system, health care and other inputs as a necessity for a productive workforce. Human development is a strategy to improve human skills, create avenues for people to make better choices that boost a healthier, longer and fulfilled lives. The predominant aim of every government's spending is to guarantee a long and healthy life for the citizens, ensure they are knowledgeable and enjoy a decent standard of living. Government expenditure on human development avails a country the opportunity of having a suitable, competent, healthy and educated labor force to contribute meaningfully to national development. Spending on human capital is considered to be one of the most important capital investments, providing the highest rate of return in terms of output. The knowledge-based theory postulates that knowledge as an intrinsic value drives productivity and performance in every economic setting. Thus, success in a modern economic setting requires individuals to have a wide range of skills, motivations, and abilities.

Many theoretical propositions have been made concerning human capital management. Growth model proposed by Romer (1972) opines that investment in human capital is an essential tool in ensuring long term growth while Richard Florida (2005) espoused that society's economic performance is a function of individual creativity. According to Florida, national economies with workers showing a higher level of creativity grow the fastest. From the perspective of the

knowledge-based theory human capital for any individual is a combination of the right education and skills acquired. This accounts for organizations requiring constant up scaling of skill by their employees. Prior studies however produce mix results in terms of impact of government expenditure on human development. Whilst some studies found negative relationship of government spending to human development other studies found positive relationship. This lacuna provides the motivation for this study.

2. EMPIRICAL REVIEW

Agu, Inyiama and Ubesie (2024) examined the effect of government expenditure on human capital index in Nigeria for the period 2001 to 2021. Government expenditure on administration, economic services, and social community services were the independent variables of the study, while human capital index was the dependent variable. Result of the study revealed that administration expenditure has a significant negative effect on human development index while expenditure on economic services has a non-significant positive effect on human development index. However, social services expenditure has a significant positive effect on human development index.

Wiratmoko and Purwanti, *(2023)* examines whether government expenditure on health, education, housing and public facilities, and social protection functions influence the Human Development Index. Result confirmed that government spending on health, education, and social protection functions significantly influences the HDI value. The education and social protection functions have a positive effect, while the health care function has a negative effect.

Omodero (2019) assessed the impact of government general spending on human development in Nigeria from 2003 to 2017. The purpose is to determine the response of human development index (HDI) to recurrent and capital government expenditure. The results indicate that government's capital expenditure and inflation have insignificant negative influence on HDI.

Edeme and NKalu (2019) evaluates public expenditure in Nigeria in the last decade based on composition and distributional impacts on human development at the state-level considering education, health, agriculture and rural development water resources energy, housing and environmental protection. Using data generated from 20 states from 2007-2017, the empirical analysis indicates that the efficacy of education, health, agriculture and rural development and water resources in improving human development is greater than that of energy, housing and environmental protection expenditure. More interestingly, the positive effect of capital expenditure is mitigated by increased recurrent expenditure. The combination of these factors strongly reduces the capability of public expenditure to foster human development.

Linhartová (2020) verified whether government investment in areas that develop human capital can indeed aid its development in the Czech Republic for the period 1995 t0 2018. The analysis revealed that in the Czech Republic, spending on recreation, culture, and religion had the largest influence on developing human capital for the period under review. Expenditure on education and health, which most studies cite as the main tools for cultivating human capital, placed only third or fourth regarding their contribution to developing human capita.

Palevei (2017) investigated the impact of governance, health expenditure, and education expenditure on human development by using panel data from 33 provinces in Indonesia in 2008 and 2012. Human Development is measured by Human Development Index (HDI. The results of the study show that governance, health expenditure, and education expenditure impact human development significantly. Governance and health expenditure are found to have positive impact on human development; meanwhile health expenditure is discovered to affect human development negatively.

3. METHODOLOGY

3.1 Research Design

The study adopts longitudinal and ex-post facto design because of the number of years in the study and the use of secondary data derived from publications by the World Bank, Central Bank of Nigeria Bulletin, Federal Office of Statistics. In the study purposive sampling method was usedin gathering data. . Thus, the sample consisted of 53 years (1970-2022) observations which was considered a good representative of the population and adequate for reliable empirical results based on data availability. To analyze the impact of Government expenditure and Human development in Nigeria, the study employed the autoregressive distributive lag (ARDL) model. This model has several advantages. First, it is a dynamic single-equation time series model that incorporates the lagged values of the dependent variable and/or the explanatory variables as additional explanatory variables (Brooks, 2014). Hence, it is suitable for capturing both the persistence in the dependent variables and the spread effects of the explanatory variables. Secondly, as a dynamic model, it is suitable for capturing both the short run and the long run dimensions of the impacts of Government expenditure components and human development. Thirdly, compared to other dynamic time series models (such as VAR, VEM, Granger Causality), the ARDL is not sensitive to sample size as it produces reliable estimates even when the sample size is relatively small.

3.2 Variables of the study

3.2.1 Independent variables

The independent variables used in the study are Capital expenditure and Recurrent Expenditure.

3.2.2 Dependent variable

The dependent variables for this study is human development proxy as human development indexare change in gross domestic product, inflation, unemployment rate and human development index.

3.2.3 Control variables

The control variable for the study is money supply. Essentially because the volume of money in circulation will impact on economic activities.

Measurement of Variables summarized on Table 3.1 below:

Independent Variable	Measurement	Expected Sign
Capital Expenditure (CAE)	ratio of total capital expenditure in a given fiscal year reported by CBN	Positive
Recurrent Expenditure (REX)	total recurrent expenditure reported by CBN	Positive
Total Expenditure	Total expenditure of government as reported by CBN	Positive
Dependent Variable		
Human Development index (HDI)	A summary composite measure in health, knowledge and standard of living as published by Federal office of statistics	Positive
control Variables:		
Money supply (MOS)	Amount of money is circulation as determined by CBN	Negative/positive

3.8 Model specification

$$HDI = =\beta_0 + \beta_1 Log CAE + \beta_2 Log REX + \beta_3 Log TEX \ \ \beta_3 Log MOS + U_1, t$$

The hypotheses express Human Development Index as an econometric function of its own one period lagged value, CAE, REX, MOS and one control variable public debt. We expect that the variables would enter human development index model positively and significantly since the government has increased indirect taxes the revenue from those taxes is used to help improve spending which in turn will impact human development. In other words, we expect apriori, that all would be positive and statistically different from zero.

Estimation techniques

Unit root test

Datta and Kumar (2011) note that regressing a non-stationary series on another would generate spurious results. In an attempt to guide against this, Augmented Dickey-Fuller (ADF) technique developed by Dickey and Fuller (1979) was employed. This test is necessary as it guides the study on the selection of appropriate estimation techniques required for the analysis.

Autoregressive distributed lag (ARDL)

Following the unit root test, the study proceeds to examine short and long run relationship among the variables. This is done using autoregressive distributed lag (ARDL) known as the bound test approach to co-integration. ARDL model developed by Pesaran, Shin and Smith (1996) and later popularized by Pesaran, Shin and Smith (2001) is more advantageous to other co-integration procedures as it can be used when the variables under consideration are integrated of order zero I (0) and order one I (1) but will crash when integrated stochastic trend of I(2) is found. With this, bound test eliminates the variability in the order of integration against co-integration approach. Also, it produces better result because the error correction mechanism can be obtained via simple linear transformation, which integrates short-run adjustments with long-run equilibrium without losing any information in the long run. In line with Pesaran et al. (2001), the unrestricted error correction mechanism for testing co-integration among the variables used in this study is stated as follows:

$\Delta HDI_t = \beta_0 + \sum\beta_1 \Delta Log CAE_{t-1} + \sum\beta_2 \Delta Log REX_{t-1} + \sum\beta_3 \Delta Log TEX_{t-1} \sum\beta_4 \Delta Log MOST_{t-1} + \alpha_0 + \alpha_1 \Delta Log\ CAE_{t-1} + \alpha_2 \Delta Log\ REX_{t-1} + \alpha_3 \Delta Log\ TEX_{t-1} + \alpha_4 \Delta Log MOS_{t-1} + U_4, t$ ……...

The ARDL long-run model is estimated if cointegration is found while the short-run model is estimated if otherwise

$\Delta HDI = \beta_0 + \beta_1 Log CAE_{t-1} + \beta_2 Log REX_{t-1} + \beta_2 Log TEX_{t-1} \beta_3 Log MOST_{t-1} + U_4, t$ … (

$\Delta HDI = \alpha_0 + \alpha_1 \sum \Delta Log\ CAE_{t-1} + \alpha_2 \sum \Delta Log\ REX_{t-1} + \alpha_3 \sum \Delta Log\ TEX_{t-1} + \alpha_4 \sum \Delta Log MOS_{t-1} + ECM + U_1 + ECM + U_4$

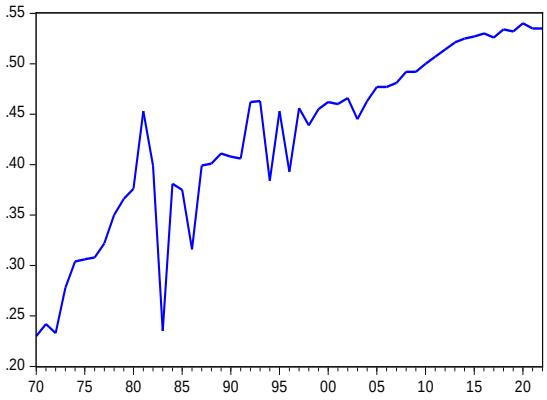
4.0 RESULTS

4.2 Descriptive Statistics

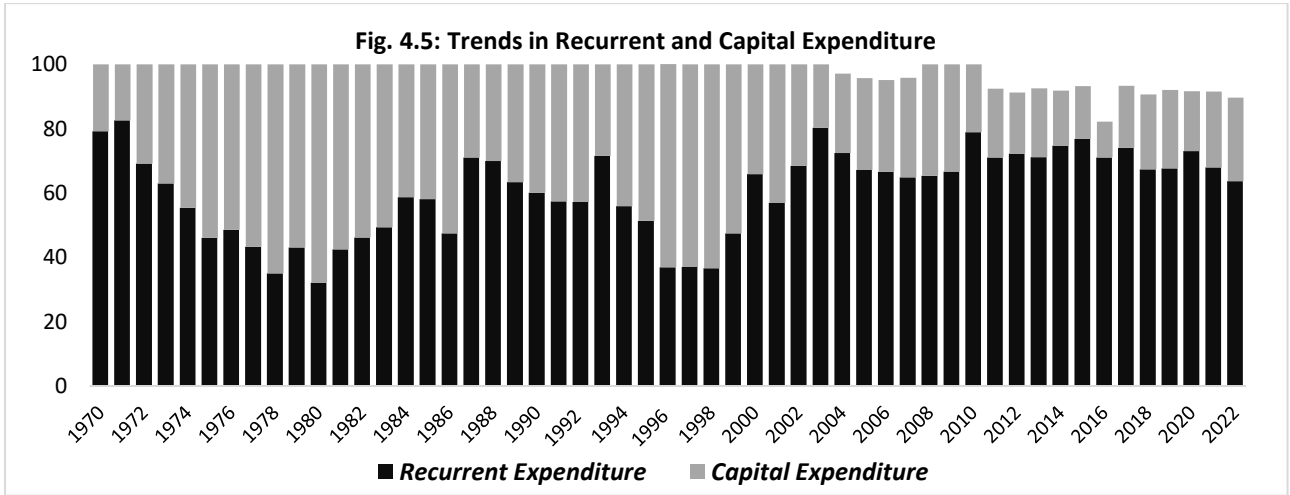
4.2.1 Trend Analysis

In Figure 4.1, the trend in human development index (HDI) for Nigeria is presented. There is a clear pattern of upward movement over the period, from as low as 0.25 in 1970 to over 0.5 in 2022. Thus, there is evidence that human development has progressed relatively well over the period. However, both the speed of progress and the current situation of HDi in the country is rather unexcitable. For the 53-year period, HDI increased only 0.29 points, which is a growth of less than 0.01 points per years. Moreover, the current HDI score of less than 0.55 indicates that Nigeria can still be considered as a low human capital country.

Fig. 4.1: Trends in HDI



The trend in public expenditure (in terms of recurrent and capital) is presented in Figure 4.7. Generally, recurrent expenditure has dominated government's fiscal application over the years. The proportion of recurrent expenditure reached over 80 percent in 2003 and was well over 75 percent in many of the years. It is seen that the share of capital expenditure increased significantly in mid-1970s (following the oil boom), but it quickly reduced in the 1980s. The share of capital expenditure in total expenditure was higher than the share of recurrent expenditure between 1975 and in 1996 and 1997. For the other years, recurrent expenditure dominated. Also, the share of recurrent expenditure has remained very high since the advent of democracy in Nigeria from 1999. Thus, the less directly productive recurrent expenditure has been the main bulk of fiscal spending in Nigeria over the years.



4.2.2 Summary Statistics

The descriptive statistics for the variables used in the empirical analysis is presented in Table 4. 1. The average HDI for the period is 0.43, which is low and shows that overall, human development has been below the median global level. The maximum HDI score is 0.54 while the minimum is 0.29, which shows considerable increase in the score over the years. Both the standard deviation (0.09) and the skewness (-0.67) scores show that the HDI in Nigeria has remained very close to the mean value over the years.

Table 4.1: Descriptive Statistics for Panel Data

Variable	Mean	Max.	Min.	Std. Dev.	Skew.	Kurt.	J-B	Prob
HDI	0.43	0.54	0.23	0.09	-0.67	2.57	4.32	0.12
TEXG	23.77	176.36	-82.24	42.59	1.13	5.79	27.89	0.00
CEXG	27.39	166.67	-78.57	52.07	0.91	4.01	9.34	0.01
REXG	37.18	860.00	-87.80	123.74	5.81	39.17	3126.02	0.00
MOSG	120.59	5136.53	-99.88	709.62	6.99	49.91	5190.70	0.00
POPG	2.67	3.11	2.28	0.18	0.60	3.32	3.37	0.19
TOPEN	29.63	55.02	7.52	10.38	-0.19	2.72	0.50	0.78

The average growth rates of the expenditure variables are reported in the Table. Average growth rate of recurrent expenditure at 37.18 percent per annum is highest among the expenditure components. Thus, it is seen that recurrent expenditure grows faster than total expenditure over the years. There were periods of very large increases in expenditure (especially recurrent expenditure as shown by a maximum growth rate of 860 percentage.

Table 4.2: Correlation Matrix

Correlation / Probability	HDI	TEX	CEX	REX	MOS	POP	TOPEN
HDI	1.0000						

	0.0000						
TEX	0.5911	1.000					
	0.00	-----					
CEX	0.5614	0.985	1.000				
	0.00	0.00	-----				
REX	0.5974	0.998	0.974	1.000			
	0.00	0.00	0.00	-----			
MOS	0.5970	0.939	0.899	0.947	1.000		
	0.00	0.00	0.00	0.00	-----		
POP	0.8878	0.804	0.765	0.812	0.808	1.000	
	0.00	0.00	0.00	0.00	0.00	-----	
TOPEN	0.1267	-0.125	-0.081	-0.143	-0.177	0.037	1.000
	0.36	0.31	0.50	0.30	0.20	0.79	-----

Source: Author's computation

Among the expenditure variables, there is a strong positive correlation among the three variables. Indeed, the correlation coefficient between Tex and REX is 0.998, while it is 0.985 with CEX. Also, CEX is correlated with REX with a coefficient of 0.974. This shows that the correlations among the expenditure variables are too large for these variables to be included in a single equation. In order to minimise the problem of multicollinearity in the estimates, the three variables are estimated in a recursive way. With this method, the effects of each variable on sustainable development are observed without encountering multicollinearity.

4.3 Tests for Time Series Properties of Dataset

The time series properties of the dataset are reported in this section. As noted earlier the investigation of these properties provide backing for the estimation procedure, while also helping to avoid estimation problems with the dataset.

4.3.1. Test for Normality of Data

The kernel density plots for human development I is reported below. The chart shows the variable is not normally distributed since the kernel plots are all concentrated away from the centre of the plot and there are also mostly widely spread. This outcome is to be expected since the datasets are widely obtained as a pool over different time periods. Thus, the OLS estimation of the relationship may not be feasible.

Fig. 4.8a: Kernel Density Test for HDI

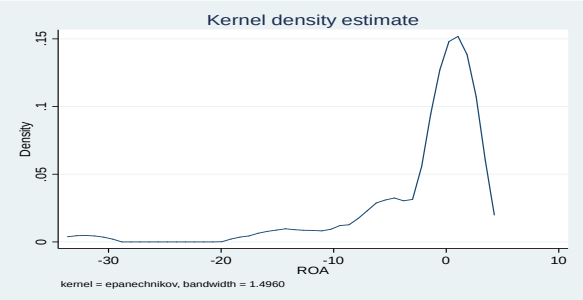


Fig. 4.8g: Kernel Density Test for TEX

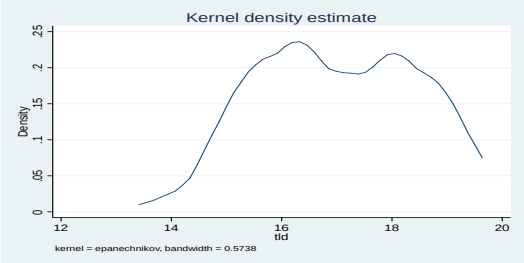
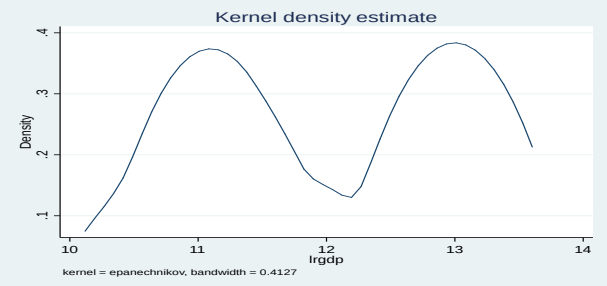


Fig. 4.8h: Kernel Density Test for CEX



Source: Author's computation

4.3.2 Unit Root and Cointegration Analysis

To investigate the level of stationarity using unit root tests for the variables. In this study, the test for stationarity of the data series is performed using two different methods namely, the Augmented Dickey Fuller (ADF) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) procedure. While the ADF test is an indirect process of testing for unit roots, the KPSS tests are more direct in terms of the null hypothesis. The results of the unit root tests are presented in Table 4.3.

Table 4.3: Unit Root test for Variables

Variable	ADF Test		KPSS		Order of Integration
	Levels	*First Difference*	*Levels*	*First Difference*	
HDI	-2.172	-9.697**	0.961**	0.110	I(1)
MOS	-1.012	-7.003**	0.512**	0.140	I(1)
TEX	-3.263*	-3.454*	0.586*	0.205	I(0)

CEX	-0.358	-8.727**	0.968*	0.193	I(1)
DEBT	0.219	-5.890**	0.771**	0.402	I(1)
REX	0.804	-5.373**	0.841**	0.273	I(1)
POP	-3.273*	-3.171*	0.144	0.991**	I(0)
TOPEN	-2.938*	-3.085*	0.252	0.498*	I(0)

*Note: * indicates signifies at 5 percent; 95% critical values are reported in parentheses below each test value*
Source: Author's computation

From the results of the ADF tests reported in the first panel of the Table, it can be seen that the ADF test statistics for each of the variables in levels (except fo POP and TOPEN) are less than the 95 percent critical values indicating that they are insignificant. On the other hand, the test statistic values for the series in first differences are greater than the critical values at the 5 percent significance level (please, refer to the Appendix for the t-statistics). Thus, those variables are non-stationary in levels but their first differences were found to be stationary. This implies that most the variables in the study are integrated of order one (or I[1]). On the other hand INFL, TEX, POP and TOPEN are integrated of order zero (or I[0]).

As noted earlier, the KPSS test for stationarity tends to improve on the robustness of the unit root tests. According to Ighodaro and Adegboye (2020), "this test is more relevant in capturing the actual stationarity patterns of the series since the test hypothesis particularly show whether the series are stationary or not and not in reference to the possession of unit roots". The result shown in the second panel of Table 4.3 indicates that for each of the series, the null hypotheses of stationarity cannot be rejected for the variables in first differences (the tests statistics fail the test), apart from POP and TOPEN variables. This indicates that the series are difference-stationary and that all the variables are actually I[1]. This implies that a dynamic long run relationship may be estimated based on the ARDL approach to cointegration for the dynamic analysis. Essentially, it is appropriate to use cointegration analysis to estimate the relationships between the variables.

The tests of stationarity provide grounds for examining the long run properties of the dataset in terms of cointegration analysis. From the unit root tests,it is seen that most of the variables are I(1) while four are essentially I(0). Thus, there is the need to establish the cointegration status of the data in order to determine the long run equilibrium relationship among the variables. Note that not all variables in the model are integrated of the same order. Hence, the test for common stochastic trends or cointegration is performed using Bounds cointegration test procedure in order to further determine the long run time series properties. The evaluation of the Bounds cointegration results shown in Table 4.4 is based on the critical F-statistic values for the lower and upper bounds as also reported in the results. This test is interpreted based on the following procedure: if at any significance level, the estimated F-value is greater than both the lower test (I0 Bounds) and the upper test (I1 Bounds) values, then there is no cointegration among the variables. If the estimated F-value lies between the two Bounds values, then there is need to proceed with a lesser structure of the ARDL analysis. However, if the estimated value lies above both Bounds test values, then there is clear cointegration among the variables. Note that the test is conducted for the six equations that explain sustainable development.

Table 4.4: Bounds Cointegration Test

Test Statistic	Value	Signif.	I(0)	I(1)
Eqn: HDI				
F-statistic	6.42	10%	2.37	3.2
k	3	5%	2.79	3.67

Source: Author's computation

The results in Table 4.4 indicate that the computed F-values for the Bounds test for each of the equations of 8.41 are all larger than both the I(0) and I(1) Bounds tests at the 5 percent. The F-values therefore pass the significance test at the 5 percent level for all the sustainable development estimates equations. Thus, a long run relationship is established between sustainable development factors and both the public expenditure variables and other variables in the model. This provides a strong background for the analysis of the ARDL model in the study.

4.3 Regression Analysis

In this section the ARDL technique is used to estimate the relationships between the expenditure variables and the sustainable development factors in the study. The process of ARDL analysis involves first examining the lag selection procedure in order to determine the optimal lag length that expresses the relationship.

4.3.1 Lag Length Selection

The lags used for estimating the dynamic ARDL model is determined in this section. It is essential to determine the optimal lags since the ARDL framework (which is a cointegration-based analyses) can be susceptible to variations and long run instability if the lags are not properly specified (Akinsokeji, Adegboye & Edafe, 2016). The lags selection helps to obtain the maximum lag that can generate optimum values for ARDL relationships. In the lag selection, optimality of the model was determined using both the Akaike Information Criterion (AIC) and Schwarz–Bayesian Criterion (SC). The results are presented in Table 4.5.

Table 4.5: Lag Length Selection Criteria

No of Lags	HDI	
	AIC	SC
0	3.62	3.9
1	-2.5	-0.78
2	-1.36	-1.74
3	-2.46	-1.44
4	-4.62*	-3.09*
5	-1.82	-1.33

Note: * indicates selected lag. Source: Author, computation.

The optimum lag length is determined by considering the least values for both of the test coefficients. The results shown in Table 4.5indicate that, for each of the equations (using the six sustainable development variables), the fourth lag possesses the minimum value. Note that the SC test for the INF equation indicates that second lag as optimal. However, given that the AIC test for the equation as well as all the other equations select the fourth lag, four lags are selected as optimal for all the equations. This implies the first four lagsare expected to be retained for the VECM estimation.

4.3.2 Analysis of ARDL Results

In this section, the estimated ARDL result for human development is presented and analysed. The result is reported in line with the model. As indicated earlier, the ARDL procedure generates two estimates for the equations: the short run estimates and the long run estimates. The diagnostic test in the equations in based on the adjusted R-squared values. This provides a consistent structure for the investigation of the dynamic relationship between the public expenditure and human development index in Nigeria. The equation is estimated in a recursive manner with each of the three expenditure variables included in three separate estimated equations.

A. Government Expenditure and HDI

The results for the effects of public expenditure on human development index (HDI) are presented in Table 4.6. The goodness of fit indicators in the model are impressive. The adjusted R-squared value for the equation with total expenditure is 0.897, while the value for the equation with capital expenditure is 0.892 and the value for the recurrent expenditure equation is 0.93. These outcomes indicate that at least, 89 percent of the variations on HDI was explained by the models specified in the study. Although the ARDL estimation already takes care of the first order serial correlated issues, the results of the D.W. tests are also reported. In all the estimates, the D.W. statistics had values that are sufficiently close to 2.0. This shows absence of first order serial correlation.

Table 4.6: Results for Government Expenditure and HDI

Variable	Total expenditure			Capital expenditure			Recurrent expenditure		
	Coeff.	t-Stat.	Prob.	Coeff.	t-Stat.	Prob.	Coeff.	t-Stat.	Prob.
Short run									
ΔTEX_t	0.022	1.84	0.08						

ΔCEX_t				-0.020	-8.012	0.00			
ΔREX_t							0.04	4.74	0.00
ΔREX_{t-1}							0.04	3.19	0.00
ΔREX_{t-2}							0.05	4.64	0.00
ΔREX_{t-3}							0.03	2.55	0.02
$\Delta LMOS$)	-0.024	-8.90	0.00	0.000	0.119	0.91	0.00	0.39	0.70
$\Delta LMOS_{t-1}$	0.001	0.60	0.55	0.019	6.201	0.00	0.00	-0.57	0.57
$\Delta LMOS_{t-2}$	0.018	6.17	0.00				0.02	7.55	0.00
$\Delta LMOS_{t-3}$							0.01	1.92	0.07
$\Delta TOPEN$	0.001	3.71	0.00	0.002	4.988	0.00	0.00	2.14	0.04
$\Delta TOPEN_{t-1}$	-0.001	-2.87	0.01	-0.001	-3.141	0.00	0.00	-2.23	0.04
ΔPOP	0.100	2.34	0.03	0.095	2.191	0.04	0.02	0.37	0.71
ΔPOP_{t-1}	-0.227	-3.76	0.00	-0.212	-3.412	0.00	-0.13	-1.84	0.08
ΔPOP_{t-2}	0.204	5.70	0.00	0.163	4.213	0.00	0.11	1.63	0.12
ΔPOP_{t-3}							0.11	2.15	0.04
ECM_{t-1}	-0.813	-8.51	0.00	-0.834	-8.244	0.00	-1.19	-6.72	0.00
Long run									
TEX	-0.004	-0.21	0.84						
CEX				-0.013	-0.867	0.39	-0.02	-1.23	0.23
REX									
LMOS	-0.017	-0.75	0.46	-0.013	-0.644	0.52	0.01	0.66	0.52
TOPEN	0.002	2.27	0.03	0.003	2.838	0.01	0.00	2.83	0.01
POP	0.000	0.23	0.82	0.001	1.024	0.31	0.00	-0.62	0.54
C	0.187	3.99	0.00	0.182	3.858	0.00	0.18	4.51	0.00
Adj. R-sq.	0.897			0.892			0.93		
D-W stat	2.008			1.971			1.95		

The upper panel of the Table shows the estimates for short run behavior of HDI in terms of expenditure effects. The result shows that total expenditure has a positive short run effect on HDI in Nigeria, although the coefficient is not significant at the 5 percent level. The coefficient of of capital expenditure however passes the test at the 1 percent level and is negative. This shows that increase in capital expenditure has negative effect on HDI in the short run. This result may be as a result of the fact that capital expenditures are long-term in terms of their effects on human capital. The coefficient of recurrent expenditure is significant for both the current and lagged effects. This result shows that recurrent expenditure has significant positive effect on HDI in the short run in Nigeria. The short run effects are shown to be both immediate and delayed. Thus, the result shows that only recurrent expenditures have positive immediate effects on HDI in Nigeria in the short run. The coefficient of money supply is mostly positive and significant in the short run results. The coefficient of trade openness is positive for current variable and negative in the lagged effect. Population growth is also shown to have positive short run effect on HDI.

The coefficient of the error correction terms for each of the equations is significant at the 1 percent level and has the expected negative sign. This shows that any short-term deviation of HDI from its long run equilibrium path will be restored in the long run. The coefficient of the error correction terms for the equations with CEX and TEX are similar with values around -0.8 which shows that adjustment to long run equilibrium for HDI is quite rapid in Nigeria. This is because up to80 percent of long run adjustment is completed in the first period. For the equation with REX, the coefficient of the error correction term is greater than one in absolute value. This indicates that adjustment to equilibrium is not asymptotic, rather recurrent expenditure enforces an unstable adjustment.

The stable impacts of the expenditure variables on HDI are examined by focusing on the long run estimates for each of the equations. The results are shown in the lower panel of the results in Table 4.6. In the result, the coefficients of all the three expenditure variables fail the significance test at the 5 percent level. This shows that public expenditure does not have significant long run effects on human development in Nigeria. Although the short run effects were observable and significant in the cases of capital and recurrent expenditures, there is evidence that the long run effects are

insignificant. Thus, the result reveals that after all necessary adjustments have been made, an increase in expenditure does not significantly influence human capital development in Nigeria.

4.4 Post Estimation Tests

In order to check for the robustness of the estimates in the study, the multicollinearity, normality and serial correlation tests are conducted, and the results are presented.

4.4.1 Multicollinearity Tests

Given that the explanatory variables in the models are all macroeconomic in nature, there is the need to test the probability of multicollinearity in the estimates. It should be noted that multicollinearity tends to amplify the standard errors of the estimates and render the reliability of the estimated models quite low. In Table 4.12, the results of the multicollinearity test for the each of the models results (containing the three expenditure variables separately) are presented. In the result, only the centred variance inflation factors (CVIF) variables are reported since each of the equations contains a constant term. The VIF value must be less than 5.0 for the variable in an equation to be free from collinearity. In the report on Table 4.12, the Centred VIF values for all the variables are less than 5.0. Thus, it can be seen that the estimated coefficients for the equations do not integrate excessively among themselves and the estimates are therefore reliable.

Table 4.12: Post Estimation Test Results

Variable	TEX	CEX	REX
TEX	2.233		
CEX		3.044	
REX			1.560
LMOS	3.253	3.791	2.933
TOPEN	2.662	3.102	2.400
POP	3.457	4.029	3.117

Source: Author's computations

4.4.2 Tests for Stability of Regression

The stability of the estimated coefficients is critical for the ramification of the long run relationships. The initial form of tests for stability is conducted by observing the residuals from the estimates in terms of their serial correlation and normality. The normality test is also conducted using the J-B procedure since this test also helps to determine stability of estimates. Note that the serial correlation tests are performed using the LM statistics. The results for all the estimates are presented in Table 4.13. From the results, none of the J-B and LM statistics passed the significance test even at the 5 percent level which implies that the null hypothesis is accepted in both cases. the tests indicate that the residuals are normally distributed and are devoid of serial correlation. Thus, each of the estimated equations can be adjudged to be stable and effective for long term prediction and analysis.

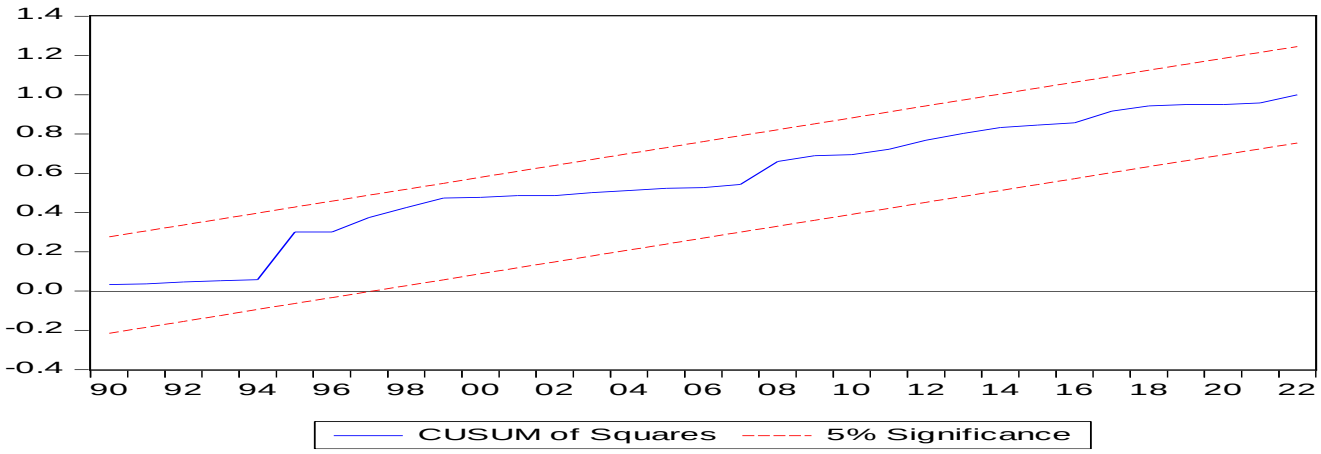
Table 4.13: Post estimation test results for serial correlation and normality

Model	Test	Stat. (prob)
HDI	Normality test (J-B)	1.23 (0.31)
	Serial Correlation LM Test	1.25 (0.64)

Note: p-values in parentheses. Source: Author's computation

A visual test of the stability of the estimates is also conducted using the CUSUM of squares tests. This helps to eliminate doubt about possible outlier regression for any of the groups in the sample. The charts in Figures 4.9 to 4.14 show the result of the CUSUM of squares test for recursiveness of error accumulation for the five categories of revenues that were performed in the study. It can be seen that the CUSUM of squares line lies entirely within the dotted 5 percent significance bound line throughout the chart for each of the charts. This reveals that the estimations are all stable within the analysis and there are no issues of structural breaks or outlier effects in the estimations.

Fig. 4.9: CUSUM for HDI



4.5 Tests of Hypotheses

The tests of the hypotheses of the study is performed within the 5 percent level of significance. The focus is on the long run estimates for each hypothesis since the long run estimates provide more stable impact measurements.

Hypothesis One: There is no significant effect of capital expenditure, recurrent expenditure and total expenditure on human development index in Nigeria

For the test of this hypothesis, the focus is on the coefficients of TEX, CEX and REX in the long run estimates in Table 4.6. In the results, the coefficient of TEX is -0.004 ($p > 0.05$), the coefficient of CEX is -0.013 ($p > 0.05$) and that of REX is -0.02 ($p > 0.05$). For each of the variables, the coefficient fails the significance test at the 5 percent level. This shows that the null hypothesis cannot be rejected in this case. Thus, the result reveal that there is no significant effect of capital expenditure, recurrent expenditure and total expenditure on human development index in Nigeria. The effects that were observed in the study were only short term and not long run.

5.1 Discussion of findings

The goal of the study was to determine the influence of public expenditure in human development in Nigeria. In the study human development was measured using the human development index while public expenditure was considered in terms of capital versus recurrent segments, while total expenditure was also included for robustness.

The dynamic flows in human development implies that a dynamic structure was devised for the analysis and the ARDL estimation framework was adopted for the empirical analysis. The data used was annual secondary data for the period of 1970 to 2022. From the analytical framework, both the long run and short run impacts of public expenditure on human development were obtained, although the focus was on the more stable long run estimates. In general, the results from the study confirmed public expenditure can help to drive human development in Nigeria. In particular, the following findings were made:

1. That there is no significant effect of capital expenditure, recurrent expenditure and total expenditure on human development index in Nigeria. Although the short run effects were significant and negative, the long run effects were insignificant.
2. That the long run effects of public expenditure on human development are generally different from the long run effects.

5.2 Recommendations

The following recommendations are made based on the findings from the study:

1. Firstly, public expenditure that focusses specifically on human capital development needs to be boosted in Nigeria. The study has demonstrated that public expenditure do not deliver long run effects on human capital development. Since human capital development involve income, health and education, public expenditure from budgets must consider these social aspects as priority both in relation to capital and recurrent spending.
2. Finally, there is need to boost the macro economy in order to improve on the absorption capacity as well as the productive base of the economy. If the absorption capacity in the economy is boosted, then public spending can have more multiplier effects on human development in the long run in Nigeria.

5.3 Conclusion

Public expenditure forms the basis for overall aggregate expenditure drive in many developing countries, including Nigeria. This is the reason for continued empirical interest on the roles of financing and spending patterns on the economy. More importantly, human development involves coordination of all aspects of the economy, including the private and public sectors both in terms of investment and decision-making. In this study, the role of public expenditure in the drive for human development in Nigeria was examined. There is evidence that focus on increasing public expenditure can boost human development in the economy. The study has shown that the government needs to take lead as a crucial factor in human development in Nigeria.

5.4 Suggestions for Further Study

This study focused on public sector expenditure and Human Capital development using autoregressive distributive. Human development was proxied using Human development index. Other studies can use different methodologies to study the effect of fiscal policies on economic performance and growth. Also, other studies can use different variables to study the effect of governmental expenditure on the economy. More control variables such as public debt, interest rate and exchange rate can be introduced to decipher the effect of expenditure on the economy of Nigeria.

5.5 Contribution to knowledge

The goal of the study was to determine the effect of public sector expenditure on sustainable development. The study achieved the stated objective and contributes to knowledge as follows:

1. Future scholars and policy makers will find the work useful
2. The study contributes to knowledge by identifying that public expenditure do not deliver long run effects on human capital development. Since human capital development involve income, health and education, public expenditure from budgets must consider these social aspects as priority both in relation to capital and recurrent spending.

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CITATION
Asian A Umobong. (2024). Implications of Public Sector Expenditure on Human Development in Nigeria: Ardle Approach. In Global Journal of Research in Business Management (Vol. 4, Number 4, pp. 77–89). https://doi.org/10.5281/zenodo.13165694