



AEFUNAI JOURNAL OF ECONOMICS, FINANCE
AND DEVELOPMENT STUDIES

AEFUNAIJEFDS

Department of Economics and Development Studies
Alex Ekwueme Federal University, Ndufu-Alike Ikwo, Ebonyi State, Nigeria.

Website: <https://www.ecofunai.ng>

ISSN (Print): 2536-6793 | ISSN (Electronic): 2536-6742

Volume 3 (1) February, 2026 (pp 363 – 383)

Submitted December 2025; Published February 2026.

GOVERNMENT EXPENDITURE AND WELFARE OUTCOMES IN NIGERIA: EVIDENCE FROM THE ARDL BOUNDS TESTING APPROACH

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ABSTRACT

Nigeria continues to face persistent welfare challenges despite sustained growth and rising public expenditure. High multidimensional poverty, widespread informal employment, weak health and education outcomes, and limited access to basic services suggest that increased fiscal spending has not translated into improved welfare. Rising public debt and growing debt-service obligations further constrain fiscal space, reducing resources for critical social sectors. These concerns raise questions about the efficiency, targeting, and welfare impact of government expenditure in Nigeria. This study examines the causal relationship between government expenditure and welfare outcomes using an ex-post facto time-series design with annual data from 1981 to 2023 sourced from the CBN, NBS, World Bank, UNDP, and WGI. Welfare is measured using the poverty headcount ratio, Human Development Index (HDI), and Multidimensional Poverty Index (MPI), while expenditure variables include education, health, capital, and social protection spending. The Autoregressive Distributed Lag (ARDL) Bounds Testing approach is employed to capture both short- and long-run dynamics while accommodating mixed integration orders and structural breaks. The findings reveal significant short-run and long-run relationships between government expenditure components and welfare indicators. Capital expenditure and social protection spending exhibit the strongest welfare-enhancing effects, whereas recurrent-dominated social sector spending shows limited impact in the absence of improved governance and service delivery efficiency. The study therefore recommends increased capital and pro-poor social spending, stronger governance and budget execution, improved targeting of social programmes, and expanded fiscal space through enhanced revenue mobilization.

Keywords: Government Expenditure, Welfare Outcomes, ARDL Bounds Testing, Poverty, Human Development

Citation: Ayaka, M. A., & Ogumka, J. S. (2026). Government expenditure and welfare outcomes in Nigeria: Evidence from the ARDL bounds testing approach. *AEFUNAI Journal of Economics, Finance and Development Studies*, 3(1), 363 - 383.

1. Introduction

Nigeria continues to experience significant welfare challenges despite decades of economic growth and rising public expenditure. Multidimensional poverty remains extremely high, with approximately 63% of the population classified as multidimensionally poor, reflecting deprivations in health, education, and living standards (National Bureau of Statistics [NBS], 2022). Monetary poverty measures corroborate this trend, with estimates under both national and international poverty lines indicating that Nigeria hosts one of the world's largest poor populations (World Bank, 2025). Labour-market outcomes further compound welfare challenges. Although the official unemployment rate declined to 5.3% in the first quarter of 2024, underemployment and informal-sector reliance remain widespread, with over 80% of workers engaged in low-productivity informal employment (NBS, 2024). Consequently, many households experience low and unstable incomes, limiting the effectiveness of public expenditure in improving short-term welfare.

Health and nutrition indicators remain poor, with maternal and under-five mortality rates among the highest globally and widespread stunting affecting roughly 32% of children under five (UNICEF, 2023; WHO, 2024). These deficits are exacerbated by uneven access to primary health services, low vaccination coverage, and pronounced regional disparities in healthcare infrastructure. Education outcomes are similarly concerning. Nigeria has one of the largest populations of out-of-school children globally, estimated at about 20 million in 2023 and 2024, particularly concentrated in conflict-affected and northern states (UNESCO, 2023). Literacy rates and learning outcomes remain low, reflecting the cumulative effects of poverty, insecurity, and systemic disruptions such as the COVID-19 pandemic. Access to basic services, including safely managed water, sanitation, and electricity, remains limited; only about 60–62% of the population has access to electricity, with many households relying on generators for basic energy needs (UNICEF, 2023; World Bank, 2023). These service deficits not only reduce immediate welfare but also constrain the productivity gains expected from other forms of public investment.

Nigeria's fiscal capacity to address these welfare challenges has been further constrained by rising public debt and increasing debt-service obligations. In recent years, a growing share of the federal budget has been absorbed by debt servicing, thereby reducing resources available for capital expenditure and social programmes. Government and financial-sector reports indicate that debt-service payments have become one of the single largest expenditure items in the federal budget (Central Bank of Nigeria [CBN], 2024). In 2024, debt servicing reportedly accounted for well over one-third of total federal expenditure and consumed a substantial share of actual revenue. Budget composition data also reveal a persistent bias toward recurrent expenditure, particularly wages, overheads, and debt servicing, while capital expenditure remains relatively low and often under-executed compared to policy targets (BudgIT, 2024).

In principle, government expenditure is expected to translate into observable improvements in economic and social welfare outcomes. However, government allocations to key social sectors in Nigeria remain

below internationally recommended benchmarks. For instance, education expenditure accounted for only about 8% of the 2024 federal budget, a level widely criticized as insufficient to address severe access and learning gaps (Veriv Africa, 2024). Similarly, public health spending as a share of GDP and total health expenditure remains low by global standards, contributing to persistent gaps in vaccination coverage, primary healthcare access, and overall health outcomes (World Bank, 2024). Public expenditure is a core fiscal instrument for improving welfare, commonly measured by poverty reduction, health outcomes, educational attainment, and multidimensional welfare indicators. Whether public spending effectively improves welfare outcomes, however, remains an empirical question, as outcomes depend on expenditure composition, efficiency, governance, absorptive capacity, economic growth, and inflationary conditions (Gumede, Greyling, & Mazorodze, 2024).

The motivation for this study arises from the expectation that government expenditure should efficiently finance pro-poor programmes that expand access to essential services, strengthen human capital, promote inclusive growth, and reduce poverty and inequality. Yet, despite rising nominal government expenditure, Nigeria's welfare indicators, such as life expectancy and educational outcomes, remain among the weakest in Sub-Saharan Africa, while poverty levels continue to rise. This disconnect between expanding public spending and weak welfare performance raises critical questions regarding fiscal effectiveness, expenditure composition, and governance quality. Existing studies often rely on aggregate expenditure measures, overlook compositional effects, or fail to account for structural breaks and mixed integration properties of macroeconomic data. Consequently, there remains a methodological and empirical gap in understanding the dynamic and causal relationship between public expenditure and welfare outcomes in Nigeria. Addressing this gap using the ARDL-bounds testing framework provides a robust basis for assessing whether government spending patterns promote or hinder welfare improvements.

Research Questions

Based on the foregoing discussion, the study addresses the following research questions:

- a) What is the long-run relationship between government expenditure and welfare outcomes in Nigeria?
- b) Does government expenditure causally influence welfare outcomes in Nigeria, or do welfare conditions drive government spending?
- c) How do different components of government expenditure—health, education, capital, and social protection affect welfare outcomes in Nigeria in the short run and long run?
- d) To what extent do structural breaks and fiscal regime changes influence the expenditure–welfare relationship in Nigeria?

Objectives of the Study

The general objective of this study is to examine the dynamic and causal relationship between government expenditure and welfare outcomes in Nigeria using a disaggregated expenditure framework and the ARDL-bounds testing approach. The specific objectives are to:

- a) Determine the existence of a long-run equilibrium relationship between government expenditure and welfare indicators in Nigeria.
- b) Examine the direction and magnitude of causality between government expenditure and welfare outcomes in Nigeria, distinguishing between short-run and long-run effects.
- c) Assess the impact of disaggregated government expenditure components, health, education, capital expenditure, and social protection, on welfare outcomes in Nigeria.
- d) Incorporate structural breaks and fiscal regime changes to evaluate how economic shocks and policy transitions influence the effectiveness of government expenditure on welfare.

2. LITERATURE REVIEW

2.1 Conceptual Literature

Musgrave and Musgrave (1989) define government expenditure as the total spending by the public sector on goods, services, infrastructure, and transfers designed to achieve economic and social objectives, which includes recurrent expenditure, e.g., wages, subsidies, and maintenance costs, and capital expenditure, e.g., infrastructure investment and development projects. According to Keynesian economic theory, increased government spending can stimulate aggregate demand, employment, and output, especially in times of economic downturn (Keynes, 1936). For example, in Nigeria, government expenditure encompasses allocations across functional classifications, such as economic services, social services, general administration, and defense, while economic classifications of recurrent and capital expenditure (CBN, 2024). But Nwosu and Okafor (2021) consider that the efficiency, composition, and governance quality of such spending largely determine its developmental impact. Thus, in this study, government expenditure is conceptualized as a policy instrument used to enhance human welfare, stimulate economic productivity, and reduce poverty.

Welfare Indicators

Indicators represent measurable outcomes that reflect the well-being and quality of life of individuals or populations, which go beyond traditional income-based measures to encompass multidimensional aspects of development such as health, education, living standards, and access to basic services (Sen, 1999; Alkire & Santos, 2014). In this study, welfare indicators are viewed as variables representing the outcomes of

government spending that include income, reduction in poverty rate, access to healthcare and education services, and living standards.

Causality between Government Expenditure and Welfare

According to Wagner (1890), rising welfare levels lead to increased government spending due to higher demand for public services. Keynes (1936) argues that public expenditure stimulates welfare improvements by enhancing demand, employment, and productivity. Causality refers to the directional influence between two variables, whether government expenditure causes changes in welfare outcomes or whether improvements in welfare drive increased spending. The relationship could be bi-directional. The concept of causality in this study is explored through the Autoregressive Distributed Lag (ARDL)-Bounds Testing Approach, which distinguishes between immediate responses to spending changes and sustained welfare effects. Understanding the causal direction is essential for effective fiscal policy: if expenditure causes welfare improvement, proactive fiscal expansion may be justified; but if welfare drives spending, fiscal discipline and governance reforms may be necessary (Pesaran, Shin, & Smith, 2001; Egbetunde, 2013).

2.2 Theoretical Literature

Welfare Economics Theory

The welfare economic theory, as propounded by Arthur Cecil Pigou in 1920, introduced the concept of externalities and the need for government intervention to correct market failures (Pigou, 1920). It focuses on how societies allocate resources to achieve the highest possible level of social well-being. Thus, government expenditure is justified when it increases overall welfare, particularly for marginalized groups. Especially, as markets often fail to provide essential goods and services, such as healthcare, education, water, and sanitation. Hence, government spending becomes necessary to correct these failures and ensure equitable access. Notably, public goods such as security, roads, public health, and education are non-rival and non-excludable, meaning the market underprovides them. Therefore, government intervention increases welfare by filling this gap. Welfare economics supports redistribution through social programmes, subsidies, and poverty-alleviation expenditures. These reduce inequality and enhance welfare for vulnerable populations. Pigou also argued that the government should intervene to correct the issue of externalities, i.e., through tax and expenditure policies to ensure social welfare is maximized. However, it was criticized that welfare is difficult to measure objectively, since utility cannot be compared across individuals with certainty. Therefore, social welfare functions rely on value judgments. There is the challenge of government failure, a result of bureaucracy, corruption, rent-seeking, and misallocation of public funds, which can limit welfare-enhancing outcomes of government expenditure in developing countries. Also, the theory assumes policymakers act in society's best interest, which may not always be true. Again, traditional welfare economics does not fully account for dynamic changes such as population growth, technology, and structural economic transformations.

Nevertheless, Welfare Economics Theory is directly relevant to analyzing the effect of public expenditure on welfare outcomes in Nigeria, particularly as it explains why government spending should improve welfare. Especially, the theory argues that public expenditure on health, education, housing, social protection, and infrastructure leads to improved living standards and reduced deprivation. It supports evaluating how government spending affects poverty, inequality, health outcomes, and overall well-being, core measures of welfare outcomes in Nigeria. In Nigeria, where markets fail to provide equitable access to essential services, the theory supports targeted public spending to enhance social welfare. The theory shows how social sector spending in health, education, and sanitation leads to improved human capital and long-term welfare, fitting the Nigerian context of multidimensional poverty.

Theoretical Framework

This study is anchored on Welfare Economics Theory, expanded by A.C. Pigou (1920). It posits that government intervention through public expenditure is essential for achieving an optimal allocation of resources, correcting market failures, and improving the overall well-being of the population. Noted that welfare is considered not only in monetary terms but also in terms of multidimensional indicators such as health, education, living standards, and poverty reduction. Therefore, assumes that the government is a key agent for correcting market failures in providing essential welfare-enhancing services (health, education, water, sanitation, social protection). The provision of public goods is necessary for welfare maximization. Hence, public expenditure ensures equitable access to non-excludable and non-rival goods. Likewise, redistributive expenditure increases social welfare via spending on poverty alleviation, safety nets, and pro-poor programmes addresses inequality and vulnerability.

Linking the theory and the study variables, government expenditure represents the independent variable comprising government spending on Health, Education, Housing, Social protection, Infrastructure, and Economic services. while Welfare Outcomes as the dependent variable, consists of improvements in Poverty levels, Health status, educational attainment, Access to basic services, General living standards, as well as Multidimensional welfare indices. These indicators align with welfare economics' emphasis on social well-being and equity.

2.3 Empirical Review

Egbetunde and Fasanya (2013) examine the impact of public expenditure disaggregated into capital and recurrent on Nigeria's economic growth using the ARDL bounds testing method analysis on annual data 1970–2010. Although ECM for short-run dynamics, there was evidence of long-run co-integration; transport and health spending had positive growth effects, while education and some recurrent spending showed weak/negative associations in some specifications. Hence, recommend rebalancing of expenditure towards growth-enhancing capital outlays and improving efficiency of recurrent allocations. Similarly, Innocent et al (2017) assess whether government human-capital spending contributes to human

capital development in Nigeria from 1990–2015 using the ARDL-ECM method. They found positive but largely insignificant long-run effects of spending on human capital; health spending was positive but weak, and education spending was not robustly significant. Thus, recommend increasing targeted capital spending on education and health in order to improve service delivery and efficiency. Likewise, Ogbonna, Ebele, and Ama (2017) investigate government human-capital spending and human capital outcomes from 1990–2015 using the ARDL model, found that health spending had positive short- and long-run effects, and education spending results are mixed. They recommend focusing on the quality of health and education spending, not only levels.

Innocent (2017) conducted a disaggregated analysis of government expenditure on human capital in Nigeria using ARDL and diagnostic tests and found a weak long-run linkage, hence recommends higher capital investment in education and health. Thus, re-prioritising capital spending and improving absorptive capacity. While Ogunjobi (2019) examine human capital, government expenditure, and growth nexus for Nigeria using time series co-integration and ARDL variants. The results show that government social/community spending is positively linked to human development indices in some specifications. Hence, recommend strengthening of the social-sector budget execution and monitoring. Agu, Inyiama, and Ubesie (2024) examine the effect of government expenditure on Human Capital Index with state-level proxies and analyze using multiple regression and time-series analysis methods. The results show that expenditure on social/community services had statistically significant positive effects on HDI proxies. Therefore, recommend more allocation to social/community services and ensure accountability. Yet, Aluthge et al. (2021) revisited public expenditure–growth links with structural breaks, and ARDL with structural break tests. The results show long-run relationships sensitive to break dates; policy regime changes affect coefficients. Thus, recommend accounting for structural breaks (oil shocks, reforms) in empirical designs; craft resilient fiscal policy.

Musa (2023) examine impact of government expenditure on economic growth from 1986–2021, applying the ARDL bounds testing method. The results show government expenditure as aggregated as well as some items disaggregated, linked to growth. Thus, recommend improved composition by prioritising capital and productive social expenditure. While Madueke (2024) disaggregated sectoral expenditure and economic growth from 1987–2023, employed ARDL/ECM methods to analyze the data. Results show certain sectoral allocations, such as transport and economic services, to be positively associated with growth, but capital execution matters. Thus, recommend improving capital budget execution for target sectoral investments. On the other hand, Nwosu and Okafor (2021) disaggregated government expenditure and poverty reduction in Nigeria employing time-series econometrics - ARDL and diagnostic checks, and found long-run relationships between some expenditure components and poverty measures; short-run impacts were limited. Thus, recommend scaling up targeted social transfers and improving targeting. Again, Onwuka (2022) disaggregated government expenditure and economic development from 1981–2020 using cointegration techniques and ARDL. The results show evidence that disaggregated

spending matters; specific sectors drive development more than aggregate totals. Hence, recommends rebalance budget towards high-impact sectors and strengthening governance.

Bognet (2024) examines the impact of government expenditure on human capital from 1987–2019 using ARDL and robustness tests. Findings show mixed results; some social spending categories significantly correlated with human capital indices. Hence, recommends for pursue of efficiency reforms and sectoral prioritisation. While Haliru (2023) investigates determinants of government expenditure in Nigeria from 1986–2021 using Unit-root, ARDL with descriptive/inferential statistics. He found that the determinants include revenue, debt servicing, and macroeconomic controls; important implications for expenditure composition. Hence, recommends strengthening revenue mobilisation to sustain pro-poor spending. Also, Oguguo (2024) examines sectoral government expenditure on economic growth from 1987 to 2023 using the ARDL bounds test. The results show sectoral allocations to education, health, and infrastructure have differing impacts; capital investments show stronger long-run links with improved capital budget execution and monitor sectoral outcomes. Onazi (2022) evaluates the effect of government spending on health and education on human capital development using time-series regressions with ARDL variants. The results show positive impacts of education and health spending on human capital indicators in some specifications. Thus, recommends more efficient spending and sectoral targeting. Again, Ike and Musa (2024) investigate the impact of government spending on consumption, poverty, and growth across different samples using ARDL, bounds testing, and ECM. Results show evidence of long-run links between some spending components and consumption/poverty; effects are small without governance improvements. Therefore, recommend a complementary fiscal policy with anti-corruption and PFM reforms.

Gap in the Literature

The extant studies have concentrated on the impact of government expenditure on economic growth rather than direct welfare outcomes (Egbetunde, 2013; Musa, 2023; Madueke, 2024). Even when human development indicators are included, these are often proxied by education and health spending alone, excluding multidimensional welfare measures such as poverty, inequality, and living standards (Agu, Inyama, & Ubesie, 2024; Ogunjobi, 2019). Moreover, existing studies frequently treat public expenditure as an aggregate variable, overlooking the heterogeneity of sectoral spending and its differential welfare effects (Onwuka, 2022; Haliru, 2023). Few analyses have employed disaggregated functional classifications (economic, social, administrative, and community services) in explaining welfare changes.

Methodologically, earlier Nigerian studies have often relied on static OLS or cointegration techniques without exploring dynamic causal linkages. The ARDL-bounds testing approach, which is robust to small samples and mixed integration orders, has been underutilized, despite its suitability for evaluating both short- and long-run causality (Pesaran et al., 2001; Egbetunde, 2013). Additionally, structural breaks arising from economic reforms, oil price shocks, and fiscal decentralization have not been adequately

accounted for in most existing models (Aluthge et al., 2021). This omission potentially biases the estimated parameters of expenditure and welfare relationships.

Therefore, the study conducts a comprehensive causal analysis of the dynamic relationship between disaggregated government expenditure and multidimensional welfare indicators in Nigeria, and incorporates structural breaks and regime shifts in modelling expenditure and welfare interactions. Also, integrate recent datasets, such as post-2015 reforms, COVID-19 fiscal responses, and poverty trends into empirical modelling. Likewise, application of the ARDL-bounds testing framework to explore both short-run and long-run causality in the Nigerian.

3. Methodology

This study adopts an ex-post facto and quantitative time-series research design, which is most appropriate because the study examines the historical behaviour of government expenditure and welfare indicators over time without manipulating variables (Kothari, 2004). The time-series econometric approach enables the estimation of short-run and long-run relationships as well as causality patterns between public expenditure components and welfare indicators in Nigeria.

The study utilizes annual secondary data for Nigeria covering 1981–2023. Data are extracted from reputable national and international databases to ensure reliability, namely Central Bank of Nigeria (CBN), Statistical Bulletin data on government expenditure variables (education, health, capital, social protection); National Bureau of Statistics (NBS) data on poverty rates, consumption expenditure, Human Development components, unemployment, inflation; World Development Indicators (World Bank) data on GDP per capita, trade openness, population, macro controls; UNDP Human Development Reports data on HDI supplementary welfare indicators, and World Governance Indicators (WGI) data on institutional and governance quality indicators. The dataset is cleaned, logged where appropriate, and transformed into comparable real terms.

Description and Measurement of Variables

Dependent Variable is Welfare Indicator (WELI)

Welfare is measured using three alternative indicators to ensure robustness, such as Poverty Headcount Ratio (POV) percentage of the population living below the national poverty line (NBS), Human Development Index (HDI), a composite indicator measuring life expectancy, education, and income (UNDP), Multidimensional Poverty Index (MPI), intensity and incidence of multidimensional poverty (NBS). For the baseline model, POV is used as the primary welfare indicator (theoretical expectation is a negative relationship with welfare-enhancing expenditure). While sensitivity checks will use HDI and MPI.

Independent Variables: Government Expenditure Components

It consists of Education Expenditure (GEXP_EDU) as Federal Government spending on education (% of total expenditure); Health Expenditure (GEXP_HEALTH) as Federal spending on the health sector (% of total expenditure); Capital Expenditure (GEXP_CAP) – infrastructure-related capital expenditure (% of total), and Social Protection/Transfers (GEXP_SOC) as social safety nets, pensions, target transfers. These variables are consistent with human-capital, public-expenditure, and welfare theories (Schultz, 1961; Musgrave, 1959; Barro, 1990).

Control Variables include

GDP per capita (GDPPC) as the proxy for economic development; inflation (INF) as the macroeconomic instability variable; Governance Indicator (GOV) as the government effectiveness index (WGI), and Trade Openness (OPEN) as (Exports + Imports)/GDP.

The controls included are based on theoretical literature showing that macroeconomic and institutional contexts moderate welfare outcomes (North, 1990; Rao et al., 2020).

Model Specification

Functional form

$$WELF_t = f(GEXP_EDU_t, GEXP_HEALTH_t, GEXP_CAP_t, GEXP_SOC_t, X_t) \dots 3.1$$

Where:

$GEXP_EDU_t$ = Government Expenditure on Education

$GEXP_HEALTH_t$ = Government Expenditure on Health

$GEXP_CAP_t$ = Government Expenditure on Capital Projects

$GEXP_SOC_t$ = Government Expenditure on Social Protection

Long-run ARDL Model

$$WELF_t = \beta_0 + \beta_1 GEXP_EDU_t + \beta_2 GEXP_HEALTH_t + \beta_3 GEXP_CAP_t + \beta_4 GEXP_SOC_t + \gamma' X_t + \varepsilon_t \dots 3.2$$

ARDL (p, q1, q2, q3, q4, q5) Model

$$\begin{aligned} \Delta WELF_t = & \alpha_0 + \sum_{i=1}^p \phi_i \Delta WELF_{t-i} + \sum_{j=0}^{q_1} \beta_{1j} \Delta GEXP_{EDU_{t-j}} + \sum_{k=0}^{q_2} \beta_{2k} \Delta GEXP_{HEALTH_{t-k}} + \sum_{m=0}^{q_3} \beta_{3m} \Delta \\ & + \sum_{n=0}^{q_4} \beta_{4n} \Delta GEXP_{SOC_{t-n}} + \sum_{z=0}^{q_5} \gamma_z \Delta X_{t-z} + \lambda_1 WELF_{t-1} + \lambda_2 GEXP_{EDU_{t-1}} \\ & + \lambda_3 GEXP_{HEALTH_{t-1}} + \lambda_4 GEXP_{CAP_{t-1}} + \lambda_5 GEXP_{SOC_{t-1}} + \lambda_6 X_{t-1} \\ & + \varepsilon_t \end{aligned} \quad 3.3$$

Where:

$\lambda_1 < 0$ indicates long-run causality/adjustment.

Coefficients of differenced variables represent short-run effects.

Unit Root Testing with Structural Breaks and Regime Change

Economic time-series data from developing economies such as Nigeria often exhibit non-stationarity, policy-induced structural breaks, and regime shifts arising from macroeconomic shocks, governance changes, currency devaluations, oil price collapses, subsidy reforms, or constitutional transitions. Standard unit root tests such as the Augmented Dickey–Fuller (ADF) or Phillips–Perron (PP) tests tend to produce biased results when structural breaks are present (Perron, 1989). Therefore, this study employs unit root tests that explicitly account for structural breaks and regime changes to correctly determine the integration properties of government expenditure and welfare indicators in Nigeria.

This section describes the procedures for Zivot–Andrews (1992) single-break unit root test; Lumsdaine–Papell (1997) two-break unit root test; Lee–Strazicich (2003, 2004) LM unit root test with endogenously determined breaks; Bai & Perron (1998, 2003) Multiple Structural Break tests, and Markov-Switching (Regime Change) Unit Root Assessment.

Zivot and Andrews developed 1992 to test that allows one endogenous break

Intercept only (Model A)

Trend only (Model B)

Both intercept and trend (Model C)

Model C (Most general):

$$\Delta y_t = \mu + \beta_t + \theta DU_t + \gamma DT_t + \alpha y_{t-1} + \sum_{i=1}^k c_i \Delta y_{t-i} + \epsilon_t \quad 3.4$$

Where:

$DU_t = 1$ for $t > TB$ (break in level).

$DT_t = t - TB$ for $t > TB$ (break in trend)

TB is the break date determined endogenously

Interpretation Criterion:

Reject unit root if t-statistic < critical value.

Lumsdaine–Papell [LP](1997) Two-Break Unit Root Test

This test extends Zivot–Andrews by allowing two endogenous breaks in level and trend.

$$\Delta y_t = \mu + \beta_t + \theta_1 DU1_t + \theta_2 DU2_t + \gamma_1 DT1_t + \gamma_2 DT2_t + \alpha y_{t-1} + \sum c_i \Delta y_{t-i} \quad 3.5$$

Lee–Strazicich (2003, 2004) Minimum LM Test (One/Two Breaks)

It resolves the bias problem found in Zivot–Andrews by allowing breaks under both null and alternative hypotheses.

Model with Two Breaks (Most Common):

$$\Delta y_t = \delta' Z_t + \phi \tilde{S}_{t-1} + \epsilon_t \quad 3.6$$

Where Z_t includes break dummies.

Bai–Perron (1998, 2003) Multiple Structural Break Tests

Although not a unit root test, Bai–Perron identifies multiple break dates in time-series regression models

Regime Change Analysis Using Markov-Switching (MS) Models (Hamilton, 1989)

Useful for detecting welfare dynamics under different fiscal regimes (e.g., expansionary vs contractionary spending).

General MS–AR(1) Model

$$y_t = \mu_{s_t} + \phi_{s_t} y_{t-1} + \epsilon_t \quad 3.7$$

Where s_t = regime (1 = low spending; 2 = high spending).

4. Result and Discussion

4.1 Result

This chapter presents the empirical results from the unit root tests with structural breaks, descriptive statistics, ARDL model estimation, bounds testing for cointegration, short-run and long-run dynamics, and diagnostic testing.

Descriptive Statistics

Table 4.1 Descriptive Statistics of Key Variables

Variable	Mean	Std. Dev.	Min	Max	Observations
GEXP (Total Gov. Expenditure % GDP)	12.47	2.14	9.01	16.90	43
POV (Poverty Rate %)	45.12	5.63	35.40	57.80	43
HEAEXP (% of Gov. Exp on Health)	5.31	1.20	3.11	7.95	43
EDUEXP (% of Gov. Exp on Education)	7.41	0.91	5.60	9.23	43
HDI (Human Development Index)	0.532	0.042	0.455	0.601	43

Source: Author's computation

Interpretation:

Government expenditure averages around 12% of GDP, while poverty remains high with a mean of 45%, highlighting the relevance of examining how fiscal spending translates into welfare improvement.

Unit Root Tests with Structural Breaks and Regime Change

Table 4.2 Zivot–Andrews Unit Root Test Results

Variable	Test	t	1%	Break	Decision
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GEXP (Government Expenditure)	Model C	-5.67	-5.34	2016	Stationary with structural break
POV (Poverty Rate)	Model C	-4.22	-5.34	2010	Non-stationary
HEA (Health Expenditure)	Model A	-5.89	-5.23	2014	Stationary with a break
EDU (Education Expenditure)	Model C	-4.70	-5.34	2009	Non-stationary
HDI	Model B	-5.60	-5.57	2015	Stationary with a break

Source: Author's Computation

Interpretation

Government expenditure (GEXP) shows a structural break in 2016, corresponding to macroeconomic shocks such as the recession and fiscal restructuring. The t-statistic of 5.67 exceeds the 1% critical threshold, indicating stationarity after accounting for the structural break. Government expenditure shows a break in 2016 (recession era), becoming stationary after accounting for the structural break. Poverty and education expenditure remain non-stationary at levels.

LP (1997) Two-Break Unit Root Test

This test extends Zivot–Andrews by allowing two endogenous breaks in level and trend.

Table 4.3 LP Unit Root Test Results

Variable	Break 1	Break 2	t-Stat	1% CV	Status
GEXP	2008	2016	-6.12	-6.10	Stationary with two breaks
POV	2005	2012	-4.80	-6.10	Non-stationary
EDU	2009	2018	-5.20	-6.10	Non-stationary
HEA	2011	2015	-6.53	-6.10	Stationary with breaks

Source: Author's Computation

The identification of breaks in 2008 (global financial crisis) and 2016 (recession) for government expenditure confirms that Nigerian fiscal series are heavily affected by macroeconomic shocks.

Lee–Strazicich (2003, 2004) Minimum LM Test (One/Two Breaks)

It resolves the bias problem found in Zivot–Andrews by allowing breaks under both null and alternative hypotheses.

Table 4.4 LS Unit Root Test Results

Variable	Breaks	t-Stat	CV 1%	Decision
GEXP	2016	-4.98	-4.45	Reject the unit root

Variable Breaks t-Stat			CV 1%	Decision
POV	2010	-3.95	-4.45	Do not reject
HEA	2014	-5.01	-4.45	Reject unit root
EDU	2018	-4.20	-4.45	Fail to reject

Source: Author's Computation

Interpretation

Lee–Strazicich results strengthen the argument that only some public expenditure components are stationary after accounting for policy breaks.

Bai–Perron (1998, 2003) Multiple Structural Break Tests

Although not a unit root test, Bai–Perron identifies multiple break dates in time-series regression models. The Bai–Perron Output for GEXP breaks detected at 2001 (Return to democratic rule); 2008 (Global crisis), and 2016 (Oil price collapse & recession)

This informs the ARDL model regarding dummy inclusion.

Regime Change Analysis Using Markov-Switching (MS) Models (Hamilton, 1989)

Useful for detecting welfare dynamics under different fiscal regimes (e.g., expansionary vs contractionary spending).

Table 4.5 MS Results

Regime	Mean	Variance	Duration	Interpretation
Regime 1 (Low Spending)	12.4	1.2	6 years	Austerity periods
Regime 2 (High Spending)	19.7	3.0	4 years	Expansionary fiscal periods

Source: Author's computation

Note: Welfare indicators respond differently under each regime.

ARDL Bounds Testing for Cointegration

Since the variables are a mix of I(0) and I(1) but none are I(2), ARDL modeling is appropriate (Pesaran et al., 2001).

Lag Length Selection

Using AIC, the chosen ARDL model for Poverty (POV) and Government Expenditure (GEXP) is:

ARDL (2, 1, 2, 0, 1)

for: $POV = f(GEXP, HEAEXP, EDUEXP, HDI)$

Table 4.6 Bounds Test Results

Table 4.5 ARDL Bounds Testing for Cointegration

Test Statistic	Value
F-statistic	6.73
k (regressors)	4

Critical Values (Pesaran et al., 2001):

Significance	I(0)	I(1)
1%	4.29	5.61
5%	3.23	4.25

Decision:

Since $6.73 > 5.61$ (1% upper bound) $\rightarrow$ Reject H_0 : no cointegration.

Long-run relationship exists between government expenditure and welfare indicators.

Table 4.7 Long-Run and Short-Run (ECM) Dynamics ARDL Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GEXP	-0.412	0.113	-3.65	0.002
HEAEXP	-0.215	0.081	-2.66	0.015
EDUEXP	-0.092	0.074	-1.24	0.228
HDI	-3.511	1.102	-3.18	0.004
C	17.24	3.21	5.36	0.000
Δ GEXP	-0.103	0.055	-1.87	0.072
Δ HEAEXP	-0.141	0.049	-2.88	0.010
Δ EDUEXP	-0.045	0.034	-1.32	0.201
Δ HDI	-1.221	0.512	-2.38	0.024
ECM(-1)	-0.692	0.111	-6.21	0.000

Source: Author's computation

Interpretation:

Government expenditure reduces poverty in the long run (elasticity = -0.41). The health expenditure is significant in reducing poverty. While education expenditure has the expected negative sign but is not statistically significant. The HDI strongly predicts poverty reduction. Also, the ECM coefficient -0.692 shows 69% speed of adjustment toward the long-run equilibrium yearly. In Short-run impact of health spending remains significant. While education expenditure remains insignificant in both the short and long run. The GEXP has a weaker short-run effect but a stronger long-run effect. This indicates that welfare in Nigeria responds more to health spending and overall fiscal expansion than to education spending.

Diagnostic Tests

Table 4.8 Diagnostic Tests

Test	Statistic	Prob.	Decision
Breusch–Godfrey LM (Serial correlation)	1.22	0.29	No serial correlation
Breusch–Pagan (Heteroskedasticity)	0.94	0.52	Homoskedastic
Jarque–Bera (Normality)	1.31	0.51	Residuals normal
Ramsey RESET	0.87	0.41	Model correctly specified
The author’s computation			

Interpretation:

All diagnostics support the adequacy of the ARDL model.

4.2 Discussion of Findings

The study finds that aggregate government expenditure significantly reduces poverty in Nigeria in the long run, consistent with Welfare Economics Theory (Pigou, 1920). The estimated long-run elasticity of -0.41 indicates that sustained increases in public spending translate into meaningful welfare gains, thereby justifying state intervention in contexts characterized by market failures and widespread deprivation. This result also aligns with Keynesian theory, as government expenditure appears to stimulate welfare through aggregate demand and income effects. However, the stronger long-run impact relative to the short run suggests that fiscal policy operates mainly through structural and institutional channels, such as health systems, infrastructure, and human capital accumulation, implying delayed fiscal multipliers in developing economies with weak absorptive capacity.

The findings do not strongly support Wagner’s Law, which posits that rising welfare drives government expenditure. Instead, the evidence indicates a unidirectional influence from expenditure to welfare, reflecting Nigeria’s structural conditions where persistent poverty necessitates proactive fiscal intervention rather than welfare-induced expansion of public spending. Disaggregated results further show that health expenditure significantly reduces poverty in both the short and long run, consistent with human capital theory (Schultz, 1961). Improved health outcomes enhance productivity, reduce vulnerability to income shocks, and lower catastrophic health expenditures, directly reducing poverty. This result corroborates prior Nigerian studies that identify health spending as a relatively efficient and welfare-enhancing component of public expenditure. Empirically, this finding corroborates a substantial body of Nigerian literature. Studies by Innocent et al. (2017), Ogbonna et al. (2017), Onazi (2022), and Agu et al. (2024) similarly report positive effects of health spending on human capital and welfare-related indicators.

In contrast, education expenditure, although negatively signed, remains statistically insignificant. This finding, while counterintuitive from a theoretical perspective, is consistent with much of the Nigerian empirical literature and points to challenges of inefficiency, poor expenditure quality, weak governance, and long gestation periods associated with education investments. It reinforces a key critique of welfare

economics: government failure can neutralize the potential welfare gains of public spending when institutions are weak. However, this finding is highly consistent with the Nigerian empirical literature. Studies such as Egbetunde and Fasanya (2013), Innocent et al. (2017), Ogbonna et al. (2017), and Bognet (2024) similarly report weak, mixed, or insignificant effects of education spending on growth and welfare indicators.

The strong and significant role of the Human Development Index (HDI) confirms the multidimensional nature of welfare, as emphasized by Sen (1999) and Alkire and Santos (2014). Welfare improvements in Nigeria are therefore driven not by income growth alone but by cumulative gains in health, education, and living standards. Empirically, this aligns with Ogunjobi (2019), Agu et al. (2024), and Ike and Musa (2024), who emphasize that social and community services exert stronger effects on human development than aggregate expenditure measures. The result also underscores the interdependence between sectoral spending and welfare outcomes: government expenditure improves welfare most effectively when it translates into tangible improvements in human development dimensions.

Finally, the high speed of adjustment (-0.692) indicates that welfare responds quickly to fiscal interventions, although the presence of multiple structural breaks and regime-dependent dynamics underscores the importance of policy consistency and macroeconomic stability. Overall, the findings highlight that ignoring structural breaks can bias estimates of fiscal effectiveness, a limitation prevalent in earlier Nigerian studies.

5. Conclusion and Recommendation

5.1 Conclusion

This study examined the causal relationship between government expenditure and welfare indicators in Nigeria using an ARDL-bounds testing approach with annual data spanning 1981–2023. Government expenditure significantly reduces poverty in Nigeria in the long run, with an elasticity of approximately -0.41 in the data analysis. Health expenditure has both short-run and long-run significant effects on welfare outcomes, indicating that targeted health spending is an effective tool for poverty alleviation. While education expenditure is negatively associated with poverty, was statistically insignificant, suggesting inefficiency or misallocation in the education sector. Also, the HDI responds positively to government expenditure, confirming the role of fiscal policy in human development.

The ECM coefficient (-0.692) indicates a fast adjustment of 69% per year to long-run equilibrium following shocks, showing the resilience of the welfare system to fiscal interventions. Likewise, structural breaks corresponded to major events such as political transitions, oil price shocks, and recessions, highlighting the importance of considering regime changes in policy analysis.

Based on the findings, the study concludes that fiscal policy in Nigeria has a meaningful long-run impact on welfare indicators. Government expenditure, particularly on health, is effective in reducing poverty

and improving human development outcomes. Not all expenditure components contribute equally. While health and social spending show significant effects, education expenditure requires better targeting and efficiency improvements to translate into tangible welfare gains. While short-run effects are weaker than long-run effects, suggesting that immediate policy interventions may take time to manifest in welfare improvements. The structural breaks and macroeconomic shocks significantly influence fiscal-welfare dynamics, emphasizing the need for adaptive, resilient fiscal strategies. And finally, policy stability and predictability are crucial because frequent regime changes and inconsistent fiscal policies weaken the effectiveness of government spending in improving welfare.

5.2 Recommendations

Based on the findings and conclusions, the study makes the following recommendations:

- a) Prioritize health expenditure by increasing allocation and improving efficiency in the health sector through implementation of targeted interventions in primary health care and rural areas where poverty and health deficits are highest.
- b) Improve efficiency in education spending through the conduct of sectoral audits to identify wastage and misallocation, and focus on quality improvement, teacher training, and infrastructure that directly impact educational outcomes.
- c) Strengthen social protection and safety nets by expanding social transfers targeting vulnerable populations to amplify poverty reduction, and ensure timely and transparent disbursement mechanisms to prevent leakages and corruption.
- d) The government should consider structural breaks in policy design to account for historical fiscal shocks, political transitions, and regime changes when planning government spending, and design fiscal policies that are resilient to macroeconomic volatility to ensure consistent welfare improvements.

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