**Effects of Gendered Education Investment on Economic Growth in Nigeria**

**Abstract**

*There has been an ongoing debate in economic literature on the role of gendered education investment in economic growth. This study investigates the effects of gendered investment in education on economic growth in Nigeria. The specific objectives are to examine the combined effects of female secondary school enrolment, government recurrent expenditure on education, and the Gender Parity Index (GPI) for primary school enrolment on Nigeria’s real GDP per capita. Annual data from 1990 to 2023 on government recurrent expenditure on education was obtained from the Central Bank of Nigeria Statistical Bulletin, while data on real GDP per capita, female secondary school enrolment, and the GPI for primary school enrolment were sourced from the World Development Indicators. Real GDP per capita was used as the dependent variable, while the independent variables comprised government recurrent expenditure on education, female secondary school enrolment, and the GPI for primary school enrolment. The autoregressive distributed lag (ARDL) model was employed as the estimation technique. The ARDL long-run results indicate that both government recurrent expenditure on education and female secondary school enrolment have a positive and statistically significant effect on real GDP per capita. Conversely, the GPI for primary school enrolment has a negative and statistically significant long-run effect on real GDP per capita. In light of these findings, the study recommends, among other measures, that the Nigerian government should institutionalise a long-term education financing framework, prioritising consistent, accountable, and outcome-driven investments to ensure that educational expenditure translates into sustainable economic growth. Additionally, government policies should focus on removing socio-economic barriers to girls’ education by providing scholarships, enforcing anti-child marriage laws, and expanding school networks in rural areas to maximise labour force participation and productivity.*

***Keywords:*** *Real GDP Per Capita, Gender Parity Index (GPI), female secondary school enrolment, Gendered Education Investment, ARDL,*

**1. Introduction**

Education is a cornerstone of economic growth and inclusive development, with female inclusion recognised as a strategic driver in low- and middle-income countries. According to Jorgenson and Fraumeni [1], human capital accumulation through education investment is central to long-term growth. In Nigeria, gender disparities in education persist, with 2021 literacy rates at 53% for females versus 74% for males [World Bank, 2]. This disparity is even more pronounced in Northern Nigeria, where early marriage, gender discrimination, poverty, and religious beliefs are major barriers to girls' enrolment and retention in schools [3, 4]. Moreover, the Gender Parity Index (GPI) for primary school enrolment stood at 1.01 in 2019, indicating a substantial gender imbalance in favour of boys [5]. This gap restricts the pipeline of female human capital into the economy and impedes inclusive development.

Government expenditure on education in Nigeria remains consistently below international benchmarks. While the United Nations Educational, Scientific and Cultural Organisation (UNESCO) recommends allocating at least 15 to 20% of national budgets to education, Nigeria allocated only 4.31% in 2022 [6]. This underinvestment disproportionately limits female educational outcomes. Research consistently shows that increasing gender equality in education leads to higher GDP per capita [7, 8, 9, 10]. For example, a 1% increase in female-to-male attainment ratios can boost GDP per capita by 0.848% in developing Asian nations [8]. Sehar et al. [11] empirically demonstrated that increasing female education contributes significantly to GDP per capita.

Despite decades of development planning, Nigeria continues to face chronic underperformance in human capital indices driven significantly by gender disparities in education. The disconnection between gendered educational investment and macroeconomic outcomes suggests structural inefficiencies and policy neglect. Between 2015 and 2023, GDP per capita grew by only 0.7% annually [12], while the country ranked 164 out of 193 countries on the Human Development Index, with female education outcomes contributing to this dismal ranking [13]. One major issue is the persistently low female secondary school enrolment, which stunts long-term labour force readiness and innovation capacity. Studies have shown that countries with more equitable education systems achieve higher long-run economic growth [14]. In Nigeria, structural barriers such as poverty, early marriage, and insecurity continue to prevent girls from transitioning from primary to secondary education, resulting in over 7.6 million out-of-school girls as of the mid-2022 report [15]. According to Mohammed and Alhassan [16], regional disparities are more pronounced in 15 northern states that recorded below-average GPI, compared to near parity in the South.

Additionally, government spending on education has not only failed to meet global recommendations but has also shown weak targeting toward bridging gender disparities. Wodon et al. [17] assert that such fiscal misalignment not only depresses access to quality education but also undermines the productivity potential of the economy, particularly when female cohorts are undereducated and underemployed. Existing empirical literature rarely models the combined effects of female secondary enrolment, education expenditure, and GPI on Nigeria’s economic growth. This study fills that gap by estimating their effects on real GDP *per capita*, contributing to policies that can break poverty cycles, raise productivity, and foster inclusive growth.

**2. Literature Review**

**Theoretical Framework**

The theoretical foundation of this study is grounded in human capital theory, endogenous growth theory, and Sen’s capability approach, all of which offer distinct yet complementary lenses through which the relationship between gendered education investment and economic growth can be understood.

Human Capital Theory, developed by Becker [18] and expanded by Mincer [19], posits that education is a form of investment that enhances individual productivity and national output. This theory asserts that individuals, when provided with education and training, accumulate knowledge and skills that increase their future earnings and efficiency. In the context of gendered education, investing in female secondary school enrolment yields both direct economic benefits and social returns, such as reduced fertility rates, improved child health, and expanded labour force participation [20]. Moreover, government expenditure on education reflects the state's commitment to building a productive workforce. When such expenditures are strategically targeted toward reducing gender disparities, they contribute to a more balanced and efficient allocation of human resources, which in turn raises national productivity and real income levels. The Gender Parity Index (GPI) in primary education further complements this framework, serving as a proxy for the equitable distribution of foundational learning opportunities.

Building on the human capital perspective, endogenous growth theory offers a more dynamic explanation of how education contributes to long-run economic performance. As articulated by Romer [21] and Lucas [22], endogenous growth models emphasise that the accumulation of knowledge and human capital, particularly through education, is a primary driver of technological advancement and innovation within an economy. These models argue that public policies, such as increased government expenditure on education, can have sustained effects on growth by fostering environments that promote learning, innovation, and skill development. Importantly, when such policies are inclusive by ensuring equitable access to girls and boys, they create a more diversified and resilient base of human capital. Female secondary education plays a particularly critical role in this framework, as it equips women with the competencies needed to participate in high-value-added sectors of the economy. The presence of a near-equal GPI in primary education is a necessary condition for these benefits to materialise at later educational stages. When gender disparities persist, a significant portion of the population is excluded from the knowledge economy, thereby reducing the nation’s growth potential.

Complementing these economic models is the capability approach advanced by Amartya Sen [23], which expands the concept of development beyond income metrics to include human freedom, agency, and opportunity. Sen argues that true development occurs when individuals have the capabilities to live lives they value, and education is central to expanding those capabilities. In this context, gendered education investment is not only a tool for income generation but also a pathway to empowerment and social justice. When girls are denied access to education, particularly at the primary and secondary levels, their ability to participate meaningfully in economic and civic life is severely constrained. The Gender Parity Index for primary enrolment is therefore an early indicator of whether development is inclusive and equitable. Public spending that prioritises gender parity in education, especially in nations with historically low female enrolment, can unlock latent human capabilities and fuel sustained, broad-based economic growth.

**Empirical Review**

Kocevska [24] investigated the impact of public education investment on GDP *per capita* in North Macedonia from 1991 to 2020. The study found significant results using empirical computations, the study produced salient findings. In the short run, public spending on education had a negative and significant relationship with GDP per capita. In the long run, the relationship remained negative, though statistically insignificant. Based on these findings, the study concluded that policy interventions in the financing of the education sector were necessary to transform educational expenditures into productive human capital and thereby enhance national economic development.

Christopher et al. [25] studied the impact of Government Spending in Education and Health on Nigeria’s economic growth between 1986 and 2023, using time series data and the Autoregressive Distributed Lag (ARDL) model. The study revealed that past GDP *per capita* significantly influences current output, indicating growth momentum. Government capital education expenditure (GCEEX) showed a complex relationship, with short-term spending slightly negative but becoming positive in the long term. Capital health expenditure (GCHEX) contributes positively, while recurrent education expenditure significantly boosts GDP per capita in both short and long terms. Recurrent health expenditure, on the other hand, negatively impacted GDP *per capita* due to inefficiencies or crowding-out effects on private investment.

Using a system-generalized method of moments (SGMM) estimator to examine panel data from 35 Sub-Saharan African countries spanning 1980–2008, Ogundari and Awokuse [26] employed two proxies for human capital: health and education. The results showed that both variables positively influenced economic growth, with health having a more pronounced effect. Furthermore, while government expenditure on education contributed positively to growth, the effect was not statistically significant.

Using 237 estimates from 29 initial studies, Churchill et al. [27] performed a hierarchical meta-regression analysis to assess the connection between economic growth and government expenditures on education. According to the findings, education spending has a positive effect on growth in industrialised nations. On the other hand, the correlation was statistically insignificant for LDCs. The study further explored heterogeneity across findings and identified that variations in econometric methods, publication attributes, and data features accounted for differences in outcomes. Interestingly, no indication of publication bias was found.

Kouton [28] explored the long-term relationship between Côte d'Ivoire's economic growth and government spending on education from 1970 to 2015. The results showed that education investment has a long-term, statistically significant negative impact on economic growth. On the other hand, albeit statistically insignificant, the short-term relationship was positive. Additionally, a unidirectional causal relationship between economic growth and education spending was demonstrated.

Sehar et al. [11] used World Development Indicators panel data from 2000 to 2023 to examine the impact of gender equality on economic growth. The study examined major gender-related factors such as female labour force participation, secondary school enrolment, and women's representation in national parliaments, while controlling for gross capital formation. The results showed that female secondary education was the most influential factor, where a 1% increase was associated with a $269 rise in GDP *per capita*. Although female labour force participation and political representation had positive coefficients, the effects were statistically insignificant, pointing to underlying structural constraints. Gross capital formation remained a robust and positive driver of economic growth.

Keller [29] used global panel data regressions to investigate the effects of female and male enrolment rates in primary, secondary, and higher education on GDP *per capita*. The study also looked at how the gender parity index (GPI) affected different levels of schooling. The results were highly statistically significant, typically at the 1% level. Female enrolment was linked to a variety of economic and social benefits, including lower fertility and infant mortality rates, decreased poverty and inequality, and increased trade openness, investment (both domestic and international), R&D spending, savings rates, and political rights.

Fe [30] used panel data to examine gender parity in education and its impact on per capita income in 13 West African countries. The study focused on secondary and university education and found persistent educational inequality, typically favoring boys, with the exception of Cabo Verde. The findings suggested that eliminating gender gaps at both educational levels has a beneficial effect on GDP *per capita* across the region.

From 1980 to 2014, Assoumou-Ella [10] examined the direct and indirect effects of gender disparity in schooling on GDP per capita in CEMAC nations. Utilizing instrumental variable (IV) estimation in conjunction with the Blundell and Bond's (1998) system-GMM estimator, found that increases in gender equality at the primary-secondary and tertiary levels considerably increased GDP *per capita*. This highlights the critical role of equitable educational access in fostering economic development.

Carter et al. [31] presented empirical evidence on the relationship between government expenditure components and Barbados' economic growth. They used Dynamic Ordinary Least Squares (DOLS) and the Unrestricted Error Correction Model (UECM) to analyse time series data from 1976 to 2011. Their results indicated that total government expenditure had a contractionary influence on economic growth, particularly in the short run, with a more muted impact in the long run. More specifically, while government spending on health and social security had little or no effect on per capita economic growth, government spending on education had a consistently significant and negative impact on growth in both the short and long run.

Duwal and Suwal [32] investigated the relationship between educational attainment, government spending on education, and economic growth in Nepal from 1990 to 2022. They used the Autoregressive Distributed Lag (ARDL) model and the Error Correction Model (ECM) to examine both long-run and short-run dynamics. Their findings demonstrated that the educational index, gross capital formation, and population size all had a favourable and significant long-term impact on economic growth. Conversely, government spending on education, domestic loans to the private sector, and trade liberalisation all had negative and statistically negligible effects on long-run growth. In the short term, the educational index had a negative and considerable impact on economic growth.

**3.** **Methodology**

This study adopts an ex-post facto research design. Annual data for the period 1990 to 2023 on government recurrent expenditure on education were obtained from the Central Bank of Nigeria Statistical Bulletin. Data on real GDP *per capita*, female secondary school enrolment, and the Gender Parity Index (GPI) for primary school enrolment were sourced from the World Development Indicators. The dependent variable is real GDP *per capita*, measured in constant 2015 US dollars. The independent variables comprise government recurrent expenditure on education, female secondary school enrolment (gross percentage), and the GPI for primary school enrolment (gross percentage). The model specification is grounded in the human capital theory, which underpins the analytical framework and guides the empirical estimation process.

**Functional Form of the Model:**

GDPPC= *f*(GEDU​, FSE, GPI) 1

**Econometric Form of the Model:**

GDPPC = 2

Where:

GDPPC​ Real GDP *per capita* (constant 2015 US$)

GEDU​ government recurrent expenditure on education (% of GDP)

FSE​ Female secondary school enrolment (% gross)

GPIGender Parity Index (GPI) for primary school enrolment (% gross)

a0 = intercept term; α1 to α3​ = partial regression coefficients; εₜ = stochastic error term. t = time.

Note: GDPPC and GEDU variable is log-transformed to address scale differences and ensure linearity in the model estimation.

**ARDL Model Specification:**

 3 3

Where:

 = denotes first difference (short-run dynamics); , = short-run coefficients; , long-run coefficients; .

**A Priori Expectation**

Based on the theories, it is anticipated that the will be positive.

**4. Results and Discussion**

**4.1 Descriptive Statistics**

The descriptive statistics presented in Table 1 provide a comprehensive overview of the distributional properties of the variables across the study period. Real GDP *per capita* (GDPPC) exhibited an average annual growth rate of 7.56%, with a relatively narrow range from a minimum of 7.24% to a maximum of 7.86%. This suggests that Nigeria’s real *per capita* income experienced only modest fluctuations throughout the observed timeframe. Government recurrent expenditure on education (GEDU) recorded a mean coverage rate of 4.34%, with values ranging from a high of 6.62% to a concerning low of –1.24%, indicating episodes of budgetary contraction in the sector. Female secondary school enrolment (FSE) averaged 32.76%, with values spanning 21.32% to 52.23%, reflecting considerable variation in access over time. Meanwhile, the Gender Parity Index (GPI) for primary school enrolment maintained a mean of 0.89, with values fluctuating within a relatively narrow band of 0.79 to 1.01, indicating progress towards parity, albeit with some volatility. The standard deviations across all variables are lower than their respective means, signalling low dispersion and suggesting that these time series were relatively stable over the study period. Finally, the probability values associated with the Jarque–Bera statistics indicate that all variables are normally distributed at the 5% level of significance, affirming the suitability of parametric methods for the subsequent econometric analysis.

**Table 1: Summary of descriptive Statistics for the variables**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | GDPPC | GEDU | FSE | GPI |
|  Mean |  7.559864 |  4.340677 |  32.76088 |  0.893824 |
|  Median |  7.593209 |  4.850074 |  31.38500 |  0.870000 |
|  Maximum |  7.857763 |  6.624039 |  52.23000 |  1.010000 |
|  Minimum |  7.237397 | -1.237874 |  21.32000 |  0.790000 |
|  Std. Dev. |  0.232508 |  1.981637 |  10.25876 |  0.074305 |
|  Skewness | -0.166151 | -0.989533 |  0.215673 |  0.343012 |
|  Kurtosis |  1.349076 |  3.352476 |  1.528359 |  1.663184 |
|  |  |  |  |  |
|  Jarque-Bera |  4.017633 |  5.724668 |  3.331699 |  3.198417 |
|  Probability |  0.134147 |  0.057135 |  0.189030 |  0.202056 |
|  |  |  |  |  |
|  Sum |  257.0354 |  147.5830 |  1113.870 |  30.39000 |
|  Sum Sq. Dev. |  1.783980 |  129.5872 |  3472.992 |  0.182203 |
|  |  |  |  |  |
|  Observations |  34 |  34 |  34 |  34 |

Source: *Researcher’s computation using E-views 12.*

**4.2 Unit Root Test**

To mitigate the risk of spurious regression results, the second stage of our empirical analysis involved testing the stationarity properties of the time series variables. The test specification included an individual intercept, and we employed the Augmented Dickey-Fuller (ADF) test method, under the null hypothesis that each series possesses a unit root (i.e., is non-stationary).

The outcomes of the unit root test, presented in Table 2, reveal that only government recurrent expenditure on education (GEDU) is stationary in its level form. The ADF test statistic for GEDU is -6.137666, which exceeds the 5% critical value in absolute terms, implying that the null hypothesis of a unit root is rejected at conventional significance levels. Thus, GEDU is integrated of order zero, I(0), and does not require differencing to attain stationarity.

In contrast, the remaining variables: real GDP *per capita* (GDPPC), female secondary school enrolment (FSE), and the Gender Parity Index (GPI) for primary school enrolment were found to be non-stationary at levels but stationary after first differencing. Specifically, their ADF test statistics are -3.055924, -6.840476, and -5.192283, respectively, all exceeding the 5% critical threshold in magnitude at first difference. These findings suggest that GDPPC, FSE, and GPI are integrated of order one, I(1), and thus contain a unit root in levels but become stationary in their differenced forms.

Given this mixture of I(0) and I(1) variables, it is appropriate to proceed with a bound testing approach to examine the existence of a long-run equilibrium relationship among the variables, in line with the methodology outlined by Aninwagu and Momodu [33].

**Table 2: ADF Unit Root Test**

|  |  |  |
| --- | --- | --- |
| **Variables** | **ADF (SIC)** | **Order of Integration**  |
|  | Level | First Difference |  |
| GDPPC | -0.890977 | -3.055924 | 1(1) |
| FSE | -0.662196 | -6.840476 | 1(1) |
| GEDU | -6.137666 | NA | 1(0) |
| GPI | -0.585743 | -5.192283 | 1(1) |

*Source: Researcher’s computation using Eviews 12*

Note: The study used a 5% level of significance, NA sign indicates that the variable is stationary at level.

**4.3 Cointegration Test Result**

The Autoregressive Distributed Lag (ARDL) bounds testing approach was employed to investigate the existence of a long-run equilibrium relationship between the dependent and independent variables.

As reported in Table 3, the calculated F-statistic from the bounds test is 12.58254. This value exceeds the upper critical bound (I(1)) at the 5% significance level, thereby providing robust statistical evidence against the null hypothesis of no cointegration. Accordingly, we conclude that a stable long-run relationship exists among the variables in the model.

**Table 3: Bounds Cointegration Test Results**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | 10% |  | 5% |  | 1% |  |
| Model | K | F-stat | Lower Bound | Upper Bound | Lower Bound | Upper Bound | Lower Bound | Upper Bound |
| GDPPC | 3 | 12.58254 | 2.37 | 3.2 | 2.79 | 3.67 | 3.65 | 4.66 |

*Source: Authors computations using Eviews 12*

Note: K denotes number of independent variables

**4.4 Model Estimation**

The ARDL model analysis presented in Table 4 examines both the short-run and long-run results of real GDP *per capita* (GDPPC) in Nigeria, as influenced by government recurrent expenditure on education (GEDU), female secondary school enrolment (FSE), and the Gender Parity Index (GPI) for primary school enrolment.

In the short run, the coefficient estimate for government recurrent expenditure on education in the immediate year is negative and statistically insignificant, suggesting that a 1% increase in government recurrent expenditure on education is associated with only a -0.007% change in real GDP *per capita*. This negligible and non-significant impact may reflect gestation lags in the productivity-enhancing effects of educational spending, as capital and human capital accumulation require time to materialise. However, at lag one and lag two, the coefficients remain negative but become statistically significant, with a 1% increase in expenditure leading to a -0.609% and -0.269% change in real GDP *per capita,* respectively. This finding, consistent with the findings of Kocevska [24], may indicate short-term adjustment costs or inefficiencies in expenditure allocation. In contrast, the long-run estimated coefficient turns positive and statistically significant, where a 1% increase in government recurrent expenditure on education corresponds to a 0.133% increase in real GDP *per capita.* This is in line with the study’s a priori expectations and corroborates the results of Christopher *et al*., [25], though it diverges from earlier evidence reported in [26, 32]. The contrast between short-run and long-run results underscores the temporal asymmetries inherent in human capital investment returns, where immediate disruptions give way to sustained growth effects over time.

For female secondary school enrolment, the short-run coefficient is positive and statistically significant, indicating that a one unit increase in female secondary school enrolment is associated with a 0.002% rise in real GDP *per capita*. This result suggests that enhanced female participation at the secondary education level may quickly translate into productivity gains, potentially via improved labour market participation or the broader spillovers of gender-inclusive human capital formation. In the long run, the effect remains positive and statistically significant, with a one unit increase in female secondary school enrolment associated with a 0.026% increase in real GDP *per capita.* These results align with human capital theory and the empirical findings of Sehar et al. [11].

The Gender Parity Index (GPI) for primary school enrolment, the short-run coefficient at the immediate year shows a negative and statistically insignificant, with a one unit increase in GPI associated with a -0.112% decrease in real GDP *per capita*. At lags 1 and 2, the coefficients turn positive; statistical significance is observed only at lag 1, where a one unit increase in GPI results in a 0.609% increase in real GDP *per capita*. At lag 2, a 0.269% increase is observed, though without statistical significance. Conversely, the long-run coefficient for GPI reveals a negative and statistically significant, where a one unit increase in GPI leads to a -4.331% decrease in GDP *per capita*. These long-run results run counter to the study’s a priori expectations and do not conform to the theoretical assumptions underpinning Sen’s Capability Approach.

The error correction term (CointEq (-1)) with the negative sign of a coefficient -0. 190338, confirms the expected negative sign and indicates that approximately 19.03% of deviations from the long-run equilibrium are corrected annually, demonstrating a strong tendency towards equilibrium restoration.

Finally, the model exhibits strong explanatory power, with an R-squared value of 0.789199 and an adjusted R-squared of 0.725042. These statistics suggest that approximately 78.92% of the variation in real GDP per capita is explained by the model, while the adjusted R-squared of 72.50% confirms the robustness of the model after accounting for degrees of freedom.

**Table 4: ARDL short and long run results for the model**

**Short run results**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | t-Statistic | Prob.    |
| D(GEDU) | -0.007070 | 0.005328 | -1.326890 | 0.2003 |
| D(GEDU(-1)) | -0.027204 | 0.005951 | -4.571530 | 0.0002 |
| D(GEDU(-2)) | -0.015199 | 0.005497 | -2.765018 | 0.0123 |
| D(FSE) | 0.002618 | 0.001178 | 2.222071 | 0.0386 |
| D(GPI) | -0.112922 | 0.194236 | -0.581362 | 0.5678 |
| D(GPI(-1)) | 0.609385 | 0.209492 | 2.908870 | 0.0090 |
| D(GPI(-2)) | 0.269189 | 0.172794 | 1.557865 | 0.1358 |
| CointEq(-1)\* | -0.190338 | 0.021811 | -8.726825 | 0.0000 |

 **Long run results**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | t-Statistic | Prob.    |
| GEDU | 0.132692 | 0.051258 | 2.588685 | 0.0180 |
| FSE | 0.026404 | 0.008098 | 3.260458 | 0.0041 |
| GPI | -4.331708 | 1.491000 | -2.905237 | 0.0091 |
| C | 10.06399 | 1.089795 | 9.234759 | 0.0000 |

 R-squared 0.789199; Adjusted R-squared 0.725042

*Source: Researcher’s computation using Eviews 12.*

**4.5 Residual Diagnostic Tests**

**4.5.1 Breusch-Godfrey Serial Correlation LM Test**

The results of Breusch-Godfrey Serial Correlation LM Test in table 5 shows F-statistic value of 0.078311, with a corresponding probability value (Prob. F) of 0.9250. Since the p-value exceeds the conventional significance threshold of 0.05, we fail to reject the null hypothesis of no serial correlation. Similarly, the Obs\*R-squared statistic is 0.282998, with an associated p-value of 0.8681, which further supports the absence of serial correlation in the residuals. These results indicate that the model does not suffer from serial correlation issues, thereby enhancing the reliability of the estimated coefficients and supporting the model’s validity over time.

|  |  |
| --- | --- |
| **Table 5: Breusch-Godfrey Serial Correlation LM Test:** |  |
|  |  |  |  |  |
|  |  |  |  |  |
| F-statistic | 0.078311 |     Prob. F(2,17) | 0.9250 |
| Obs\*R-squared | 0.282998 |     Prob. Chi-Square(2) | 0.8681 |
|  |  |  |  |  |
|  |  |  |  |  |

*Source: Researcher’s computation using Eviews 12*

**4.5.2 Heteroskedasticity Test**

The Heteroskedasticity in table 6 shows F-statistic value of 0.657308, with an associated Prob. F of 0.7597, which is well above the conventional 0.05 significance threshold. The Obs\*R-squared statistic is 0.545126, with a p-value of 0.6638, while the Scaled Explained Sum of Squares (SS) yields a p-value of 0.9439. As all p-values exceed 0.05, we fail to reject the null hypothesis (H₀) of homoskedasticity. This outcome suggests that the residuals exhibit constant variance, indicating the absence of heteroskedasticity. Consequently, the parameter estimates are considered efficient and unbiased, thereby supporting the robustness of the model’s inferential results.

|  |
| --- |
| **Table 6: Heteroskedasticity Test: Breusch-Pagan-Godfrey** |
|  |  |  |  |  |
|  |  |  |  |  |
| F-statistic | 0.657308 |     Prob. F(11,19) | 0.7597 |
| Obs\*R-squared | 8.545126 |     Prob. Chi-Square(11) | 0.6638 |
| Scaled explained SS | 4.721882 |     Prob. Chi-Square(11) | 0.9439 |
|  |  |  |  |  |

*Source: Researcher’s computation using Eviews 12*

**4.5.3 Normality Test**

The Jarque-Bera test, as presented in Figure 1, assesses whether the residuals follow a normal distribution. The test yields a Jarque-Bera statistic of 2.040958, with a corresponding p-value of 0.360422. Since the p-value exceeds the conventional 0.05 significance threshold, we fail to reject the null hypothesis that the residuals are normally distributed. This supports the statistical reliability and validity of the model's inference framework.

**Figure 1: Jarque-Bera test**



*Source: Author’s computation using Eviews 12*

**Stability Test**

In the end, we performed a CUSUM test to assess the stability of the model. The results are presented in Figure 2, and show no deviation throughout the period analysed.

**Figure 2: CUSUM Test**



**5. Conclusion and Policy Recommendations**

**5.1 Conclusion**

Using an Autoregressive Distributed Lag (ARDL) model, this study estimated the influence of government recurrent expenditure on education, female secondary school enrolment, and the Gender Parity Index (GPI) for primary school enrolment on real GDP *per capita,* as a proxy for economic growth, from 1990 to 2023. Data were obtained from the CBN Statistical Bulletin and the World Development Indicators. The analysis commenced with descriptive statistics, unit root tests, and the bounds cointegration approach, followed by the estimation of short-run and long-run effects using the ARDL model. Stability tests confirmed the robustness of the results. Based on the empirical evidence, government recurrent expenditure on education and female secondary school enrolment contribute positively to Nigeria’s economic growth, whereas the GPI for primary school enrolment does not enhance growth.

**5.2 Policy Recommendations**

Based on the findings, we recommended that:

1. Nigerian government should institutionalise a long-term education financing framework, prioritising consistent, accountable, and outcome-driven investments to ensure that educational expenditure translates into sustainable economic growth.
2. Government policies should focus on removing socio-economic barriers to girls’ education by providing scholarships, enforcing anti-child marriage laws, and expanding school networks in rural areas to maximize labour force participation and productivity.
3. The government should re-evaluate gender-targeted interventions at the primary level to ensure they are not only inclusive but also effective in improving learning outcomes and long-term economic contributions.

**Competing Interests:**

The products used in this research are commonly and predominantly used in our area of research and country. There is absolutely no conflict of interest between the authors and the producers of these products, as we do not intend to use them for any form of litigation but solely for the advancement of knowledge. Additionally, this research was not funded by the producing companies; it was entirely supported through the personal efforts of the authors.

**Disclaimer (Artificial intelligence):**

We hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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