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TERTIARY SCHOOL ENROLMENT IN NIGERIA: ASYMMETRIC EFFECTS OF COST-OF-LIVING SHOCKS

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Abstract: This study employs the nonlinear autoregressive distributed lag (NARDL) framework to examine the asymmetric effects of cost-of-living shocks on tertiary school enrollment in Nigeria from 1981 to 2024. Drawing on household investment and family stress models, the analysis incorporates both positive and negative cost-of-living shocks alongside other determinants; government education expenditure, secondary school enrollment rates, real GDP per capita, exchange rate movements, and the disruptive effects of Academic Staff Union of Universities (ASUU) strikes. Unit root tests confirm a mix of I (0) and I (1) variables, and bounds testing indicates the existence of a long-run relationship between the variables. The results reveal that rising living costs significantly depress tertiary enrollment, while cost-of-living reliefs have a positive but often short-lived effect. Secondary school enrollment strongly promotes tertiary participation, whereas recurrent ASUU strikes and exchange rate volatility exert mixed, lag-dependent effects. Education expenditure shows delayed and inconsistent influence on enrollment. Diagnostic and stability tests confirm the robustness of the model. The findings highlight the need for targeted policies to manage cost-of-living pressures, expand student financial aid, stabilize the macroeconomic environment, and reduce institutional disruptions. By integrating macroeconomic and supply-side factors, this study offers new empirical evidence on the nonlinear dynamics linking household affordability, institutional stability, and higher education participation in Nigeria.

Keywords: Tertiary enrollment, Cost-of-living shocks, NARDL, Education Policy, ASUU strikes
JEL codes: I23, I22, E31, C22, and I28

Introduction

Tertiary education is pivotal in fostering human capital development, innovation, and economic growth. In Nigeria, increasing tertiary school enrollment is essential for attaining sustainable development goals and improving the country's global competitiveness. However, recent macroeconomic instability, characterized by persistent inflationary pressures and rising cost of living, has heightened concerns regarding higher education accessibility and affordability (Ofor Douglas, 2024). While inflation measures the general rise in prices, cost-of-living shocks reflect the broader effects of price surges on household finances, directly influencing families' ability to fund tertiary education.

Existing studies on education and macroeconomic variables in Nigeria (Ahmed and Okoye, 2024; Glory Ifezue Foundation, 2024) have largely examined linear relationships between aggregate inflation and enrollment rates, often neglecting the possibility that positive and negative cost-of-living shocks may influence tertiary enrollment asymmetrically. A sharp increase in living costs may deter enrollment more strongly than an equivalent decrease particularly in the context of weak institutional support, income instability, and limited student loan systems. This indicates that enrollment responses to cost-of-living changes may be more complex than previously assumed.

Few studies have integrated education spending, exchange rate fluctuations, and supply-side constraints, such as recurrent disruptions from the Academic Staff Union of Universities (ASUU) strikes into a unified framework for analyzing tertiary enrollment trends. This study addresses these gaps by applying a nonlinear approach to examine the asymmetric effects of cost-of-living shocks on tertiary school enrollment in Nigeria from 1981 to 2024. The analysis also incorporates other determinants, such as real GDP per capita, government education expenditure, secondary school graduation rates, exchange rate movements, and the disruptive effect of ASUU strikes.

The remainder of this paper is organized as follows: Section 2 reviews the study's theoretical framework and relevant empirical literature. The data sources, variables, and econometric methodology employed are described in Section 3. Section 4 presents and interprets the empirical results, and Section 5 discusses the findings, draws conclusions, offers policy recommendations, and outlines directions for future research.

2 Literature Review

2.1 Theoretical Framework

This study utilizes various economic and educational theories to elucidate the asymmetric effects of cost-of-living shocks on tertiary school enrollment in Nigeria. The framework integrates both demand- and supply-side perspectives, acknowledging that macroeconomic volatility, household income constraints, and institutional factors collectively affect higher education participation.

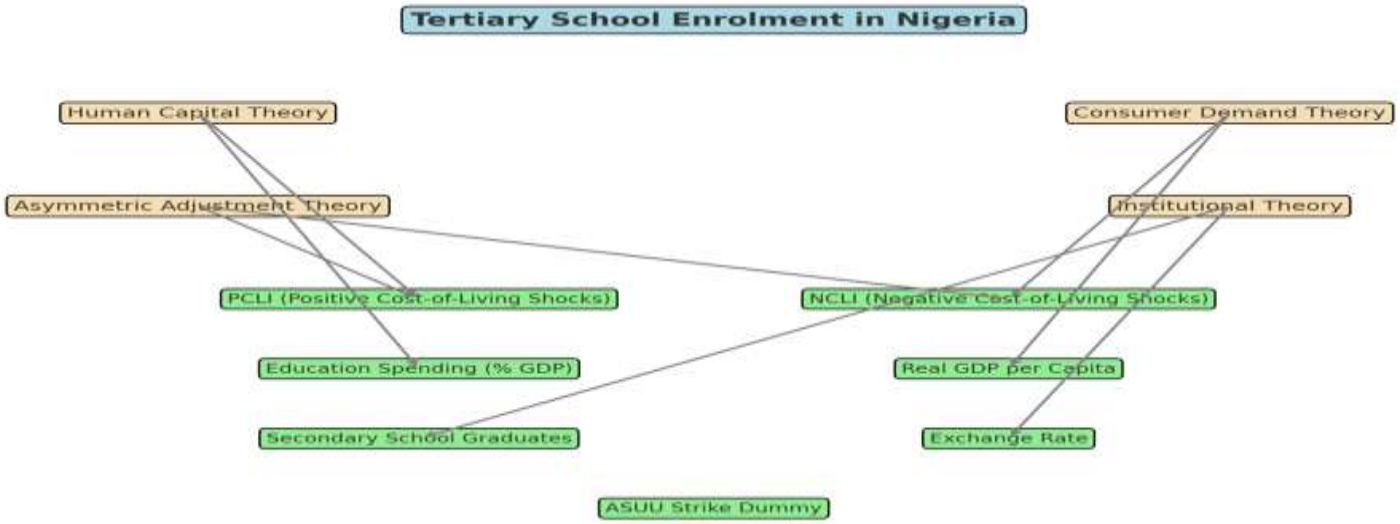
1. Human Capital Theory (Becker, 1964): The theory posits that education is an investment that enhances individual productivity and future earnings. Households make enrollment decisions by weighing the expected returns against the education costs. When the cost of living increases sharply, the opportunity cost of schooling increases, potentially deterring enrollment, especially for students from low-income households. Conversely, a decline in living costs could increase affordability though such effects may be muted if households prioritize other consumption needs over education.
2. Price Theory and Education Demand (Friedman, 1970): Price Theory emphasizes that demand falls as the price of a good or service rises, ceteris paribus. Applied to tertiary education, higher living costs raise the total price of obtaining a degree, not only tuition but also accommodation, transportation, and subsistence. Therefore, positive cost-of-living shocks (PCLI) may exert stronger negative effects on enrollment than the positive effects generated by NCLI.
3. Liquidity Constraint and Credit Market Imperfections (Stiglitz & Weiss, 1981): Credit constraints limit households' ability to finance education, especially in underdeveloped countries such as Nigeria. When living costs rise, families may be unable to borrow to smooth consumption, resulting in postponed or abandoned enrollment plans. Government education spending (EDREC_GDP) may moderate this effect by reducing the direct costs of higher education.

4. Exchange rate pass-through theory: Exchange rate fluctuations affect the cost of imported goods and services, including educational materials, laboratory equipment, and foreign tuition payments. As suggested by the exchange rate pass-through theory, depreciation of the naira increases these costs, compounding the impact of living expenses on enrollment decisions (Goldberg and Knetter, 1997).
5. Institutional Disruption Theory: Institutional disruptions, such as prolonged strikes by the Academic Staff Union of Universities (ASUU), interrupt academic calendars, increase uncertainty, and reduce perceived educational investment returns (Scott, 2008). The ASUU strike dummy (ASUUD) in the model captures this effect by recognizing that repeated disruptions may discourage prospective students from enrolling or lead current students to drop out.

2.1.1 Conceptual Linkage

As depicted in Figure I, tertiary school enrollment is directly influenced by both positive and negative cost-of-living shocks and indirectly by macroeconomic variables such as real GDP per capita, exchange rate movements, government education spending, and secondary school completion rates. Institutional disruptions act as an additional supply-side constraint, while household credit limitations intensify the sensitivity of enrollment to economic shocks. This framework supports the use of an asymmetric modeling approach to capture the differential effects of positive and negative shocks, thereby addressing the limitations of conventional linear models in the Nigerian education context.

Figure 1: The theoretical framework



2.2 Empirical Review

1. Macroeconomic Pressures and Education Outcomes

Ahmed and Okoye (2024) conducted a survey of 400 students and 80 staff at Federal Polytechnic, Oko, to assess the impact of inflation on Nigeria's educational system. Significant negative relationships were found between inflation and educational quality ($r = .606$, $p < .05$) as well as enrollment ($r = .464$, $p < .05$), alongside strong links to broader educational challenges ($r = .670$, $p < .05$). Similarly, the Glory Ifezue Foundation (2024) reported that inflation intensifies educational inequality by reducing low-income households' affordability while leaving wealthier families relatively insulated. Inflation-driven underfunding degrades instructional quality, ultimately affecting workforce readiness.

Cooper and Stewart (2021) reviewed experimental and quasi-experimental studies and found consistent evidence that higher household income improves educational attainment, cognitive development, and student well-being. The mechanisms include increased resource investment and reduced parental stress. In Massachusetts, Papay, Murnane, and Willett (2015) showed that income gaps persist in high school graduation and college enrollment, even after accounting for early academic disparities.

2. Household Capacity, Inequality, and Enrollment Decisions

Chen, Yuan, and Zhang (2023) used data from China Family Panel Studies and found that rising income inequality led to greater spending on formal and informal education, particularly tutoring, while reducing maternal time input. The drivers included cultural emphasis on education and heightened competition for access to tertiary education. In Nigeria, Ihugba et al. (2022) used ARDL bounds testing (1970–2020) to examine household economic capacity and tertiary enrollment, finding that GDP per capita had a negative relationship with enrollment, whereas household consumption showed a positive effect, suggesting that actual spending power is more decisive than macro income measures.

3. Institutional funding constraints and inflationary erosion

Uduma, Akpagu, and Mbazu (2024) linked declining tertiary education quality to chronic underfunding that began with the 1980s structural adjustment reforms. Recent inflationary pressures and subsidy removals have deepened the crisis, with education budgets from 2015 to 2024 consistently falling short of the 26% benchmark set by UNESCO. They recommended stronger fiscal discipline, prioritizing capital investments and meeting budgetary targets.

Ozioko (2024) focused on political science education funding and identified instability, inflation-driven value erosion, and declining enrollment as major concerns. The proposed solutions include student support schemes, targeted funding, and broader economic policy reforms. Similarly, Edinoh, Odili, and Felicia (2024) reported that in Nigerian tertiary institutions, inflation reduces academic staff productivity and student outcomes. To sustain access and academic quality, they recommended salary adjustments, subsidized transportation, and expanded student loans and bursaries.

3 Methodology

3.1 Research Design

This study employs a quantitative, time-series econometric design to analyze the asymmetric effects of cost-of-living shocks on tertiary school enrollment in Nigeria from 1981 to 2024. The analysis employs the NARDL model of Shin, Yu, and Greenwood-Nimmo (2014) to elucidate the varying effects of positive and negative COV changes on tertiary enrollment. This approach facilitates both short- and long-run asymmetries, addressing the limitations of linear models that assume symmetric responses to macroeconomic shocks.

3.2 Data sources and variables

Annual data were sourced from multiple reliable databases, including the Central Bank of Nigeria Statistical Bulletin, World Development Indicators, and Academic Staff Union of Universities records. Table 1 lists the variables used in the model:

Table 1: Variables, definitions, and data sources

Variable Code	Variable Name	Definition and measurement	Source
TSER	Tertiary School	Gross tertiary enrollment ratio	World Bank WDI

	Enrollment Ratio	(percentage of the population of official tertiary education age)	
PCLI	Positive Cost of Living Shocks	Positive year-on-year changes in Consumer Price Index (CPI); negative or zero changes replaced with 0	Author's computation from the World Bank
NCLI	Negative Cost of Living Shocks	Negative year-on-year changes in the CPI; positive or zero changes replaced with 0	Author's computation from the World Bank
EDREC_GDP	Government recurrent expenditure on education (% of GDP)	Public recurrent spending on education as a percentage of GDP	CBN
SSER	Secondary School Enrollment Ratio	Gross secondary school enrollment (% of the population of official secondary school age)	World Bank
GDPPC	Real GDP per capita	GDP per capita in local currency units	World Bank
EXCR	Exchange Rate	Official exchange rate (Naira per the US dollar)	World Bank
ASUUD	ASUU Strike Dummy	Dummy variable: 1 = year with high-impact ASUU strike; 0 = otherwise	ASUU

Source: Compilation of Authors

Secondary School Enrollment Ratio measures the percentage of relevant age groups enrolled in secondary education in Nigeria. It is a key indicator of access to education and human capital development. The dataset combines actual United Nations Educational, Scientific and Cultural Organization (UNESCO) figures (1981–2018), linearly interpolated values for missing years, and projected estimates for 2019–2024 using a 10-year trend. In this study, SSER is used as a proxy for secondary education output, assuming that enrollment rates are strongly correlated with the number of eventual graduates.

3.3 Model Specification

Following Shin et al. (2014), the NARDL model is specified as follows:

$$TSER_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta TSER_{t-i} + \sum_{i=0}^{q} (\theta_i^+ \Delta PCLI_{t-i} + \theta_i^- \Delta NCLI_{t-i}) + \sum_{i=0}^{q} \gamma_i X_{t-i} + \lambda_1 TSER_{t-1} +$$

$$\lambda_2 PCLI_{t-1}^+ + \lambda_3 NCLI_{t-1}^- + \lambda_4 Z_{t-1} + \varepsilon_t \quad (1)$$

Where:

- $PCLI^+$ and $NCLI^-$ are the positive and negative partial sum decompositions of CPI changes, respectively.
- X_t is a vector of control variables (EDREC_GDP, SSER, GDPPC, EXCR, and ASUUD).
- p and q are optimal lag lengths determined by the Akaikinformation criterionon (AIC).
- The long-run relationships are tested using the bounds testing procedure of Pesaran, Shin, and Smith (2001).

3.4 Estimation Procedure

1. Stationarity Tests: The Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests were applied to determine the integration order of variables, ensuring none are I (2).
2. Lag Selection: Optimal lags for each variable were selected using AIC within the NARDL framework.
3. Bounds Testing: This test was conducted to verify the existence of co-integration between tertiary enrollment and the regressors.
4. NARDL Estimation: Short- and long-run coefficients for positive and negative shocks were estimated.
5. Asymmetry Tests: Wald tests were applied to assess the null hypothesis of symmetry $(\theta^{+} = \theta^{-})$ in both the short and long run.
6. Diagnostic and Stability Tests: Breusch–Godfrey LM test for serial correlation, Arch for heteroskedasticity, Jarque–Bera for normality, Ramsey RESET for functional form, and CUSUM/CUSUMSQ for parameter stability.

3.5 Justification of the Method

The NARDL model is particularly suitable for this study because it:

- Separates the effects of positive and negative cost-of-living shocks.
- Accommodates variables with mixed integration orders (I (0) and I (1)).
- Allows for both short- and long-run asymmetries in the relationship between macroeconomic shocks and education outcomes.

4 Empirical Results and Interpretation

4.1 Unit root test

The unit root test is essential for evaluating the stationarity of a time series, as nonstationary data can lead to spurious regression outcomes (Granger & Newbold, 1974). This study utilized the ADF test (Dickey & Fuller, 1979) and the PP test (Phillips & Perron, 1988) to examine whether the variables in the model are stationary or require differencing to prevent erroneous conclusions. The ADF test extends the Dickey-Fuller test by including lagged difference terms to address serial correlation, assuming that the time series follows an autoregressive process. Conversely, the PP test uses a non-parametric correction to account for autocorrelation and heteroscedasticity in the error terms, making it robust to certain classical assumptions.

Table 2 summarizes the ADF and PP test results for each model variable. The test statistics for both tests are presented, along with the conclusion regarding the series' stationarity.

EDREC_GDP

Table 2: Unit root test results with integration order

Variable	ADF test statistic	PP test statistic	Order of integration	Stationarity
LTSER	-7.64	-11.13	I(1)	Stationary after the first difference
PCLI	6.51	-6.51	I(0)	Stationary at the level
NCLI	-6.26	-6.27	I(0)	Stationary at the level
EDREC_GDP	-5.18	-4.95	I(1)	Stationary after the first difference
LSSER	-5.42	-5.41	I(1)	Stationary after the first difference
LGDPPC	-4.77	-4.75	I(1)	Stationary after the first difference

LEXCR	-5.21	-5.22	I(1)	Stationary after the first difference
ASUUD	-6.59	-6.64	I(0)	Stationary at the level

Source: Author's calculations using Eviews 12 (July 2025)

Table 2 shows the results of the ADF and PP unit root tests for all variables in the model.

- The results indicate that PCLI, NCLI, and ASUUD are stationary at their levels [I (0)], indicating that they do not require differencing to achieve stationarity.
- LTSER, EDREC_GDP, LSSER, LGDPPC, and LEXCR are non-stationary at levels but become stationary after the first differencing, implying that they are integrated in order one [I (1)].
- Both the ADF and PP tests are consistent, confirming the integration orders across variables.

The presence of a mix of I (0) and I (1) variables meets the precondition for applying the NARDL model, which requires that none of the variables be integrated of order two [I (2)]. This mix allows us to test for both short-run and long-run asymmetric effects of positive and negative cost-of-living shocks on tertiary school enrollment.

4.2 Bounds Co-integration Test

Before estimating the NARDL model, it is essential to determine whether a long-run equilibrium relationship exists among the variables. The bounds cointegration approach developed by Pesaran et al. (2001) is particularly suitable because it accommodates regressors with mixed integration orders, I (0) and I (1), as observed in the unit root results. This test uses the F-statistic to evaluate the joint significance of the lagged level variables in the model. The null hypothesis of no cointegration is rejected if the computed F-statistic exceeds the upper bound critical value, indicating the presence of a stable long-run relationship among the variables.

Table 3: Bounds test results

F-Bounds Test		Null hypothesis: No relationship between levels		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	7.810207	10%	1.92	2.89
k	7	5%	2.17	3.21
		2.5%	2.43	3.51
		1%	2.73	3.9

Source: Author's calculations using Eviews 12 (July 2025)

The bounds cointegration test results in Table 3 show that the computed F-statistic (7.81) is well above the upper critical bound value at the 1% significance level (3.90). This indicates strong evidence against the null hypothesis of no long-run relationship. Therefore, a stable long-run equilibrium exists between tertiary school enrollment and its explanatory variables, justifying the estimation of both long-run and short-run asymmetric effects within the NARDL framework.

4.3 Long-run estimation

Given the presence of a long-run relationship confirmed by the bounds test, the next step involves estimating the long-run coefficients within the NARDL framework. These coefficients capture the asymmetric effects of

positive and negative cost-of-living shocks, alongside other explanatory variables, on tertiary school enrollment in Nigeria over the study period. The estimates provide insights into the long-term magnitude and direction of the variables' influence, offering a clearer understanding of structural relationships that persist beyond short-term fluctuations.

Table 4: Estimated Long-Run Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LTSER(-1)	0.310172	0.102035	3.039865	0.0103
PCLI	-0.007819	0.002641	-2.960560	0.0119
PCLI(-1)	-0.009359	0.002686	-3.484489	0.0045
PCLI(-2)	-0.004877	0.002464	-1.979465	0.0712
NCLI	0.008201	0.002344	3.498463	0.0044
NCLI(-1)	0.008542	0.002563	3.332119	0.0060
NCLI(-2)	0.009459	0.002763	3.422996	0.0051
NCLI(-3)	0.005611	0.002980	1.883264	0.0841
NCLI(-4)	0.006320	0.002540	2.488649	0.0285
EDREC_GDP	0.001270	0.002071	0.612906	0.5514
EDREC_GDP(-1)	0.001824	0.002688	0.678522	0.5103
EDREC_GDP(-2)	-0.005352	0.002682	-1.995286	0.0692
EDREC_GDP(-3)	0.004495	0.002222	2.023312	0.0659
LSSER	0.595418	0.210103	2.833930	0.0151
LGDPPC	-0.553308	0.191090	-2.895540	0.0134
LGDPPC(-1)	0.195854	0.265006	0.739054	0.4741
LGDPPC(-2)	0.409480	0.179133	2.285899	0.0412
LGDPPC(-3)	0.020751	0.083246	0.249275	0.8074
LGDPPC(-4)	-0.330666	0.073813	-4.479797	0.0008
LEXCR	-0.264682	0.180671	-1.464994	0.1686
LEXCR(-1)	-0.084397	0.251375	-0.335740	0.7429
LEXCR(-2)	0.331436	0.131281	2.524626	0.0267
ASUUD	0.108737	0.036137	3.008992	0.0109
ASUUD(-1)	0.061198	0.036591	1.672498	0.1203
ASUUD(-2)	-0.049120	0.041469	-1.184486	0.2592
ASUUD(-3)	-0.138888	0.040120	-3.461837	0.0047
ASUUD(-4)	-0.051813	0.040824	-1.269185	0.2284
C	1.495777	0.667064	2.242330	0.0446
R-squared	0.993401	D-W stat 1.998508		
Adjusted R-squared	0.978553	F-statistic)	0.000000	

Source: Author's calculations using Eviews 12 (July 2025)

The ARDL (1, 2, 4, 3, 0, 4, 2, 4) model for tertiary school enrollment (LTSER) indicates several notable long-run dynamics. The lagged-dependent variable is positive and significant, indicating persistence in enrollment levels, indicating that current participation is strongly influenced by previous years' rates.

The positive cost-of-living shocks in Table 4 have a negative and significant effect both contemporaneously and with a short lag, implying that rising living costs quickly reduce enrollment by constraining households' ability to finance higher education. In contrast, negative cost-of-living shocks exert a positive and significant influence across multiple lags, showing that reduced living costs temporarily boost enrollment through improved affordability. Education expenditure as a share of GDP is mostly insignificant in the short run, with only alternating lag effects, indicating that the impact of public spending is neither immediate nor consistently positive. Secondary school enrollment has a strong positive effect, underscoring the importance of the secondary education pipeline in driving short-run tertiary participation.

Real GDP per capita has mixed effects: the contemporaneous coefficient is negative and significant, while some lags are positive, showing that income growth may initially divert students into the labor market before encouraging further study. Apart from a positive and significant second lag, exchange rate effects are largely insignificant, which could indicate delayed adjustments in the cost or demand for higher education. The ASUU strike dummy reveals a distinctive pattern: early effects are positive, possibly due to delayed graduations increasing enrollment figures, while later effects turn negative, with a particularly strong disruptive impact three years after a strike. The model diagnostics showed excellent fit, with very high explanatory power ($R^2 = 0.9934$, adjusted $R^2 = 0.9786$), no evidence of serial correlation (Durbin–Watson ≈ 2), and an overall model significance at the 1% level.

4.4 Short-run Estimation

The short-run coefficient estimates from the ARDL error correction model capture the effects of the explanatory variables' immediate and dynamic adjustment on tertiary school enrollment in Nigeria. These coefficients reflect how changes in cost-of-living shocks, education spending, secondary school enrollment, real income, exchange rates, and ASUU strike activity influence enrollment in the current period and subsequent short lags. They provide insights into how quickly and in what direction a system responds to shocks before returning to its long-run equilibrium.

The error correction term (ECT), which measures the speed at which deviations from the long-run equilibrium are corrected, is central to this adjustment process. A statistically significant and negative ECT indicates that following a shock, tertiary enrollment adjusts at a predictable rate back toward its long-run path. The ECT magnitude reflects the proportion of disequilibrium corrected each period, thereby providing an estimate of the system's convergence speed and stability over time.

Table 5: Estimated Short-Run Results

ECM Regression
Case 2: Restricted constant and no trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PCLI)	-0.007819	0.001477	-5.295412	0.0002
D(PCLI(-1))	0.004877	0.001520	3.207953	0.0075

D(NCLI)	0.008201	0.001128	7.273703	0.0000
D(NCLI(-1))	-0.021390	0.002613	-8.186393	0.0000
D(NCLI(-2))	-0.011932	0.001846	-6.463191	0.0000
D(NCLI(-3))	-0.006320	0.001018	-6.211020	0.0000
D(EDREC_GDP)	0.001270	0.001273	0.997240	0.3383
D(EDREC_GDP(-1))	0.000857	0.001353	0.633214	0.5385
D(EDREC_GDP(-2))	-0.004495	0.001307	-3.438898	0.0049
D(LGDPPC)	-0.553308	0.110130	-5.024134	0.0003
D(LGDPPC(-1))	-0.099565	0.095891	-1.038320	0.3196
D(LGDPPC(-2))	0.309915	0.051367	6.033358	0.0001
D(LGDPPC(-3))	0.330666	0.051359	6.438339	0.0000
D(LEXCR)	-0.264682	0.097171	-2.723885	0.0185
D(LEXCR(-1))	-0.331436	0.089830	-3.689575	0.0031
D(ASUUD)	0.108737	0.024192	4.494713	0.0007
D(ASUUD(-1))	0.239821	0.033287	7.204543	0.0000
D(ASUUD(-2))	0.190701	0.034677	5.499308	0.0001
D(ASUUD(-3))	0.051813	0.024657	2.101367	0.0574
CointEq(-1)*	-0.689828	0.063733	-10.82373	0.0000

R-squared	0.932207	Durbin-Watson stat	1.998508
Adjusted R-squared	0.867803	S.D.-dependent var	0.149799

Source: Author's calculations using Eviews 12 (July 2025)

Short-run ARDL–ECM results show several statistically significant immediate and lagged effects on tertiary school enrollment in Nigeria.

In the case of positive cost-of-living shocks (PCLI), the contemporaneous coefficient is negative and highly significant (0.0078, $p < 0.01$), indicating that sudden increases in living costs reduce tertiary enrollment in the short run. However, the first lag of PCLI is positive (0.0049, $p < 0.01$), showing a slight rebound effect in the following year—possibly as households adjust or find alternative means of financing education. Negative cost-of-living shocks (NCLI) display an even more dynamic pattern. The contemporaneous effect is positive and significant (0.0082, $p < 0.01$), indicating that reduced living costs immediately boost enrollment. However, all subsequent lags are negative and highly significant, implying that this boost is short-lived and the system quickly adjusts downward, perhaps due to other constraints, such as capacity limits in tertiary institutions.

Education expenditure as a share of GDP (EDREC_GDP) is mostly insignificant in the short run, except for the second lag (–0.0045, $p < 0.01$), which is negative. This counterintuitive sign could reflect inefficiencies in spending timing or allocation. Real GDP per capita (LGDPPC) shows strong and mixed short-run effects. The contemporaneous coefficient is negative (0.5533, $p < 0.01$), indicating that increases in short-term income may be associated with other spending priorities or economic adjustments that reduce enrollment. In contrast, the second and third lags are positive and highly significant, showing hat income growth takes time to translate into higher enrollment, likely due to delayed household and institutional responses.

The exchange rate (LEXCR) has significant negative effects both contemporaneously (−0.2647, $p < 0.05$) and at the first lag (−0.3314, $p < 0.01$), indicating that currency depreciation increases the costs associated with tertiary education, such as imported materials and technology thereby reducing enrollment. The ASUU strike dummy (ASUUD) shows positive and significant coefficients for the contemporaneous term and the first two lags, reflecting that strikes may temporarily inflate enrollment figures due to delayed graduations and prolonged student stays in the system.

The error correction term (CointEq(1)) is negative and highly significant (0.6898, $p < 0.01$), confirming cointegration and showing that approximately 69% of any deviation from the long-run equilibrium in tertiary enrollment is corrected each year. This relatively high adjustment speed indicates a strong tendency of the system to return to equilibrium following shocks.

4.5 Wald tests for asymmetry

Following Shin et al.'s (2014) nonlinear autoregressive distributed lag framework, the Wald test is employed to formally assess the null hypothesis of symmetry between positive and negative cost-of-living shocks in both the short and long run. The test evaluates whether the estimated coefficients for positive changes in the cost-of-living index (PCLI) are equal in magnitude but opposite in sign to those for negative changes (NCLI).

Rejecting the null hypothesis would indicate that positive and negative cost-of-living shocks have asymmetric effects on tertiary school enrollment, implying that the response to an increase in living costs is not simply the reverse of a decrease of the same size. This distinction is important for policy, as it reveals whether interventions need to be tailored differently for COL spikes versus declines.

Table 6: Wald test results

Test Statistic	Value	df	Probability
t-statistic	-4.808482	12	0.0004
F-statistic	23.12150	(1, 12)	0.0004
Chi-square	23.12150	1	0.0000

Source: Author's calculations using Eviews 12 (July 2025)

The Wald test result in Table 6 was conducted to examine the null hypothesis of symmetry between the effects of positive and negative cost-of-living shocks on tertiary school enrollment. The test strongly rejects the null hypothesis, with an F-statistic of 23.12 ($p < 0.001$), a t-statistic of 4.81 ($p < 0.001$), and a chi-square statistic of 23.12 ($p < 0.001$). These results confirm that the magnitude and direction of enrollment responses to increases in the cost of living differ significantly from those to decreases. This finding validates the choice of a nonlinear ARDL framework, as a standard linear model would mask these asymmetries. Specifically, the evidence suggests that cost-of-living increases exert a stronger adverse effect on enrollment than the corresponding positive impact of cost-of-living reductions, underscoring the vulnerability of tertiary education access to inflationary pressures in Nigeria.

4.6 Diagnostic and Stability Tests

A series of post-estimation diagnostic and stability tests were conducted to ensure the robustness and reliability of the estimated NARDL model. The diagnostic tests assess whether the model satisfies the key assumptions

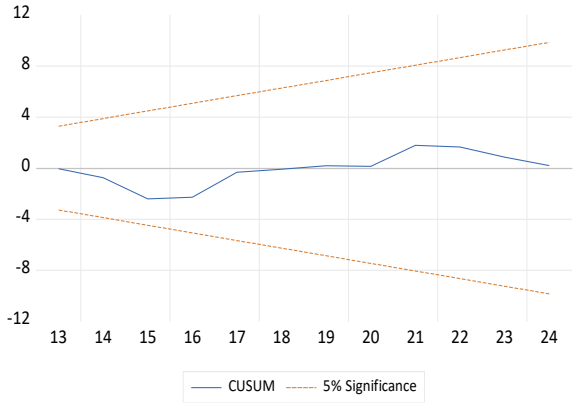
underlying the ARDL framework, including the absence of serial correlation, residual homoscedasticity, and error normality. Stability tests using the Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) procedures are used to evaluate whether the estimated coefficients remain stable over the sample period. These checks are essential for validating the empirical results and confirming that specification errors or structural instabilities do not drive the model's inferences.

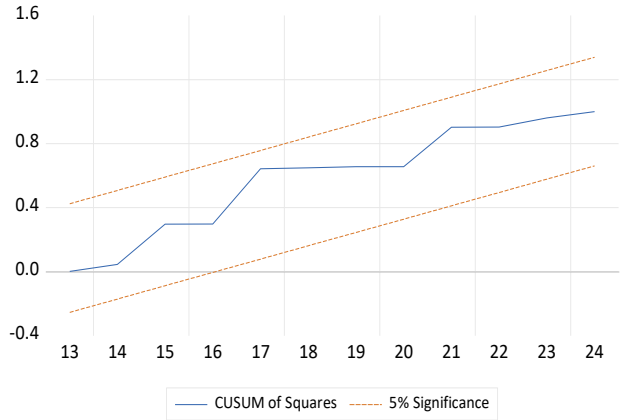
A summary of the diagnostic test results is provided below:

Table 7: Summary of the Diagnostic Test Results

Test	Test Statistic	p-value	Conclusion
Breusch-Godfrey Serial Correlation LM Test	0.087105	0.9173	No Serial Correlation
ARCH Heteroskedasticity Test	0.057074	0.8125	No heteroskedasticity
Jarque-Bera Normality Test	1.022000	0.599895	Residuals are normally distributed
Ramsey RESET Test (F-statistic)	0.064480	0.8042	The model is correctly specified
CUSUM Test	Stable	—	Parameters are stable
CUSUM of the Squares Test	Stable	—	Parameters are stable

Source: Author's computation using EViews (2025)





The diagnostic test results in Table 7 confirm that the estimated NARDL model meets the required statistical assumptions. The Breusch-Godfrey LM test showed no evidence of serial correlation in the residuals (p = 0.9173), whereas the ARCH test confirmed the absence of heteroskedasticity (p = 0.8125). The Jarque-Bera normality test indicates that the residuals are normally distributed (p = 0.5999), satisfying the assumption of normality. The Ramsey RESET test (p = 0.8042) shows that the model is correctly specified with no signs of FFM. Furthermore, both the CUSUM and CUSUMSQ stability tests indicate parameter stability over the sample period, reinforcing the reliability of the estimated coefficients for policy interpretation.

Discussion of the Findings

This study examined the asymmetric effects of cost-of-living shocks on tertiary school enrollment in Nigeria, guided by the household investment model of education and the family stress model. The results provide clear

evidence that positive and negative cost-of-living shocks influence tertiary enrollment in markedly different ways, consistent with the theoretical expectation of nonlinear responses.

In line with the household investment model, positive cost-of-living shocks (PCLI), which represent increases in living expenses, exert a negative and significant impact on tertiary enrollment in both the short and long run. This supports the argument that higher living costs reduce households' disposable income, thereby constraining their capacity to invest in higher education. This finding is consistent with those of Ahmed and Okoye (2024) and the Glory Ifezue Foundation (2024), who reported that inflationary pressures undermine affordability and access to education.

Conversely, negative cost-of-living shocks (NCLI), which represent reductions in living costs, have a positive and significant effect on enrollment. This aligns with the FSM, which confirms that reductions in financial strain can ease household decision-making and enable greater investment in education. However, the short-run effects indicate that these benefits may be temporary as some negative cost-of-living shocks are subsequently reversed, likely due to broader macroeconomic volatility. The positive association between secondary school enrollment (LSSER) and tertiary enrollment is consistent with supply-side expectations from the education pipeline theory, as a larger pool of secondary graduates naturally feeds into tertiary institutions. This supports Papay, Murnane, and Willett (2015) and Ihugba et al. (2022), who found strong linkages between lower- and higher-level enrollment patterns.

The real GDP per capita exhibits a mixed pattern. There is a contemporaneous negative effect in the short run but positive delayed effects in subsequent periods. This shows that sudden changes in income may initially disrupt financing plans for education, but sustained income growth eventually supports greater participation. Cooper and Stewart (2021) also noted this dynamic in the context of household income and children's outcomes. The insignificant short-run effect of education expenditure (EDREC_GDP) implies that increases in public spending may take time to influence enrollment, perhaps due to bureaucratic delays, poor targeting, or the dominance of recurrent over capital spending. This is consistent with Uduma, Akpagu, and Mbazu (2024), who noted that underfunding and misallocation weaken the immediate impact of government budgets on higher education outcomes. The exchange rate results confirms that currency depreciation only matters for tertiary enrollment with a lag, likely reflecting the time it takes for the adjustment of imported educational inputs and foreign tuition costs.

Finally, the ASUU strike dummy shows a short-term positive association with enrollment, possibly due to delayed graduations keeping students enrolled longer, but significant negative effects in later periods. This confirms the disruptive role of prolonged industrial action. This finding is consistent with the literature on institutional instability as a deterrent to human capital accumulation.

Overall, the findings affirm the asymmetric and dynamic nature of tertiary enrollment responses to COL shocks, highlighting the importance of considering both household-level constraints and institutional factors in policy design.

Conclusion

This study investigated the asymmetric effects of cost-of-living shocks on tertiary school enrollment in Nigeria from 1981 to 2024, applying the NARDL framework. The results confirm that positive and negative cost-of-

living shocks have distinct impacts on tertiary enrollment, with rising living costs significantly reducing participation, while cost-of-living relief boosts enrollment, albeit often temporarily. Secondary school enrollment, real GDP per capita, exchange rate dynamics, and recurrent disruptions from ASUU strikes were also found to shape enrollment outcomes in varying ways.

The findings support both the household investment model and the family stress model, indicating that affordability constraints, income volatility, and institutional instability jointly determine higher education participation. This study contributes to the literature by providing empirical evidence on the asymmetric enrollment responses to cost-of-living shocks and by integrating macroeconomic, supply-side, and institutional variables within a unified framework.

Policy Implications

1. Policymakers should focus on stabilizing the cost of living through targeted subsidies, improved transport systems, and inflation control policies to alleviate household financial strain and mitigate the impact of tertiary enrollment.
2. Introducing or expanding income-contingent student loan schemes, bursaries, and scholarship programs can mitigate inflationary shocks, enabling low- and middle-income students to continue tertiary education.
3. Targeting education expenditure toward capital investment, such as infrastructure, technology, and learning resources, can enhance tertiary institutions' long-term absorptive capacity and quality, making public spending more effective in increasing enrollment.
4. Government efforts to enhance secondary school retention and completion rates, particularly in rural and low-income areas, can directly and positively impact tertiary enrollment.
5. Stabilizing the naira and reducing the number of imported educational resources can support affordability for students reliant on foreign resources.
6. Strengthening collective bargaining, timely staff salary payment, and dispute resolution mechanisms can minimize academic disruptions.

Nigeria can enhance access to tertiary education, reduce vulnerability to macroeconomic shocks, and better position its human capital base for sustainable economic growth by addressing both household affordability and institutional stability.

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Summary of the Variables Used

YEAR	TSER	CPI	PCLI	NCLI	EDREC_GDP	SSER	GDPPC	EXCR	ASUUD
1981	2.36592	0.5	0	0	0.087	17.11	2162.2	0.62	0
1982	2.71085	0.5	0	-25	0.1043	21.03	1821.5	0.67	0
1983	2.88814	0.6	20	0	0.0986	25.18	1207.1	0.72	0
1984	3.0424	0.8	13.33	0	0.1246	28.84	890.4	0.77	0
1985	3.42953	0.8	0	-33.33	0.153	29.33	868.6	0.89	0
1986	3.59347	0.9	12.5	0	0.1529	27.22	628.2	1.75	0
1987	3.51985	1	0	-1.39	0.131	27.21	588.0	4.02	0

1988	3.8944	1.5	38.89	0	0.775	25.73	539.5	4.54	1
1989	4.16656	2.2	0	-3.33	1.5676	24.25	465.5	7.36	0
1990	3.79357	2.4	0	-37.58	1.1182	24.72	556.4	8.04	0
1991	3.843595	2.7	3.41	0	0.585	24.59	596.9	9.91	0
1992	3.924531	3.9	31.94	0	0.1287	24.46	508.5	17.3	1
1993	3.932064	6.2	14.53	0	4.0221	24.33	539.6	22.07	0
1994	3.87344	9.7	0	-2.52	3.4046	24.2	744.9	22	1
1995	3.893408	16.8	16.74	0	4.5013	24.07	1271.6	21.9	0
1996	3.905861	21.7	0	-44.03	5.1708	23.94	1632.7	21.88	1
1997	3.901193	23.6	0	-20.41	6.3923	23.81	1720.3	21.89	0
1998	3.893475	26	1.41	0	5.703	23.68	1822.5	21.89	0
1999	5.98658	27.7	0	-3.63	18.1954	23.55	480.7	92.34	1
2000	4.421777	29.6	0.32	0	23.0278	24.61	547.3	101.7	0
2001	4.550756	35.2	12.06	0	14.9595	27.03	566.4	111.23	1
2002	4.713147	39.7	0	-6.13	26.1927	29.61	712.2	120.58	1
2003	9.57164	45.3	1.32	0	19.6274	32.3	763.4	129.22	1
2004	9.82485	52.1	0.91	0	21.216	35	962.5	132.89	0
2005	10.43577	61.4	2.84	0	21.5744	34.96	1211.4	131.27	1
2006	8.636352	66.4	0	-9.71	29.2406	34.46	1599.5	128.65	1
2007	9.617153	70	0	-2.72	34.7532	31.87	1815.5	125.81	1
2008	9.628531	78.1	6.15	0	35.4015	35.39	2154.1	118.55	1
2009	9.579452	87.9	0.98	0	27.4008	39.23	1820.5	148.9	1
2010	9.60008	100	1.22	0	31.275	44.22	2202.3	150.3	1
2011	10.15372	110.8	0	-2.97	58.3888	45.56	2418.4	153.86	1
2012	9.740446	124.4	1.47	0	58.1346	47.18	2633.2	157.5	0
2013	9.768424	134.9	0	-3.83	61.7539	56.21	2872.8	157.31	1
2014	9.815667	145.8	0	-0.36	51.1892	45.62	3088.7	158.55	0
2015	9.869564	158.9	0.9	0	47.1126	46.78	2585.7	192.44	0
2016	9.798525	183.9	6.75	0	49.9446	42	2070.4	253.49	0
2017	11.57855	214.2	0.74	0	58.98	42.76	1876.3	305.79	1
2018	11.81077	240.1	0	-4.38	66.6619	43.51	2057.9	306.08	1
2019	10.76435	267.5	0	-0.68	83.1136	43.66	2265.2	306.92	0
2020	10.98805	302.9	1.82	0	92.3739	43.57	2019.7	358.81	1
2021	11.28543	354.3	3.74	0	85.7243	43.47	2017.3	403.58	0
2022	11.21215	421.1	1.88	0	94.1834	43.38	2139.4	426	1
2023	11.0625	524.9	5.8	0	98.1914	43.29	1596.6	780	0
2024	11.13703	699.4	8.59	0	67.0787	43.2	806.9	1465.04	0