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The Influence of Public Education Financing on Primary Education Enrollment in Tanzania

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Abstract

This study examines the role of education financing in expanding access to primary education in Tanzania, using the Autoregressive Distributed Lag (ARDL) approach on annual time-series data from 2001 to 2023. Against the backdrop of Tanzania's commitments to universal primary education under the 1977 Universal Primary Education (UPE) program and the 2014 Fee-Free Education Policy, the analysis incorporates variables such as education financing, infant mortality rate, urbanization, per capita income, and population dynamics. Structural break analysis using the Zivot-Andrews test identifies a significant policy shift in 2015, prompting the inclusion of a dummy variable to capture post-reform effects. Results confirm a robust positive long- and short-run relationship between education financing and enrollment, underscoring the critical role of sustained public investment. The infant mortality rate shows a persistent negative impact, emphasizing health-education linkages, while urbanization shows mixed effects (negative in the long run vs. delayed short-run benefits). Diagnostic tests confirm model stability (CUSUM/CUSUMSQ) and residual normality. The study advocates for increased education budgets, integrated health interventions, and strategic urban planning to address access barriers. By bridging gaps in empirical literature on financing-enrollment dynamics in Tanzania, this research reinforces human capital theory and offers actionable insights for policymakers to achieve Sustainable Development Goal 4 (Quality Education).

1.0 Introduction

The government of the United Republic of Tanzania recognizes education's central role in achieving its overall development goal of improving citizens' quality of life. It considers providing quality universal primary education for all the most reliable way to build a sustainable future for

the country. This is well articulated in the Tanzania Development Vision 2025 and the National Strategy for Growth and Reduction of Poverty. Tanzania is also a signatory to several international agreements, including Education for All (EFA) and the Sustainable Development Goals (SDGs).

Primary school education is the initial part of the compulsory, free basic education every Tanzanian child must have. It is an essential component of human capital and plays an important role in a country's economic growth and development. Primary school education increases the number of people with the skills, experience, and education needed to increase a country's gross domestic product and standard of living. It is the starting point from childhood to adulthood and is vital for any enterprise or society that wishes to survive the stiff challenges of an emerging world (Msabila, 2013).

In this perspective, Tanzania, like other developing countries, has been striving to provide basic education under the auspices of Article 26 of the UN Declaration of Human Rights of 1948; EFA goals that were established in Jomtien, Thailand in 1990 and later revised in Dakar, Senegal in 2000; as well as the second Millennium Development Goal, which requires that Universal Primary Education should be achieved by 2025. The Millennium Goal's target 2a is to ensure that all boys and girls complete a full course of primary schooling by attaining a net enrolment ratio in primary education; an appropriate proportion of pupils starting grade 1 who reach the last grade of primary education and a literacy rate of 15–24-year-olds, women and men (Oseni et al., 2020).

School enrollment represents the largest component of investment in human capital in most societies (Adewumi & Enebe, 2019). Empirical evidence on the positive growth effect of human capital seems strong. Studies of the rates of return to education attribute a positive value to the rate of return to primary education (Galabawa, 2007). This means that by acquiring primary education, one can increase one's earnings. If this relationship holds, primary education generates a positive externality and should be subsidized. Secondly, it is often claimed that financial constraints prevent children from accessing basic education, so public intervention in primary education will give more of the population access to primary education, leading not only to more growth but also to more equality in the long run. Likewise, primary school enrollment in Tanzania resulted directly from the Universal Primary Education (UPE) scheme launched in 1977. The Universal Primary Education (UPE) program in Tanzania was officially launched in 1977. It was part of the broader efforts under President Julius Nyerere's government to expand access to education and achieve universal primary enrollment. This initiative was driven by Tanzania's socialist policies outlined in the 1967 Arusha Declaration, aiming to eliminate illiteracy and improve education for all children (UNESCO, 2011).

Enrollment rates in Tanzanian primary schools have fluctuated significantly over the past decade. From 2012 to 2015, the rate declined from 93.088% to 83.422%. However, it rose steadily in 2016, reaching 87.622% in 2017 and peaking at 95.880% in 2020. Despite a drop to 88.255% in 2022, the rate improved slightly to 93.0738% in 2023. These changes reflect policy shifts, economic

conditions, and demographic changes. For example, introducing free secondary education has positively affected primary school enrollment. Social well-being, population growth, and inflation are also expected to influence future enrollment rates. Additionally, wealthier nations tend to have higher enrollment rates because individuals and governments are more willing to invest in education. Countries that spend more on education often see higher enrollment rates. Interestingly, some countries with lower-than-average GDP spending on education still achieve strong educational outcomes, suggesting that other factors, such as resource allocation and infrastructure investment, play a crucial role. Education systems in developing countries are more sensitive to funding increases, with even small investments yielding larger impacts on outcomes than in developed nations.

Over time, primary education has been taking the largest share of the allocated budget, followed by secondary education. Consistent with expectations, the budget share of primary education steadily increased from 55.5% in 2013/14 to 58.2% in 2015/16, then rose sharply to 63.3% in 2016/17, the year following the free education reform (REPOA, 2020). Recently, the Tanzanian government has allocated a larger share of its budget to the education sector than in previous years. Government expenditure on primary education in Tanzania, expressed as a percentage of total government expenditure on education, has varied over the years. According to available data, in 2014, approximately 49.15% of the government's education budget was allocated to primary education. This increased from 41.91% in 2009. The highest recorded allocation during this period was 61.77% in 2004, while the lowest was 39.15% in 1974 (World Bank, 2024).

Nevertheless, research on factors influencing school enrollment has been extensive over the past several decades, yielding insights into the theoretical and empirical dynamics between public spending and educational participation. Using the 2006 Somali Multiple Indicator Cluster Survey (MICS), Moyi (2012) examined and extended knowledge of patterns of educational enrolment and attendance in Somalia and identified the major challenges of expanding access to education. The study reported large differences in access to schooling in Somalia. Furthermore, access to school depended on gender, age, and place of residence. Nomads, girls, people experiencing poverty, and Central-South residents were found to be most disadvantaged. These findings are supported by Ojewumi and Oladimeji (2016), who assessed the effect of government expenditure on the education sector in Nigeria and, surprisingly, reported that capital and recurrent expenditure had negative effects on the education sector (school enrolment).

Conversely, a study by Carsamer and Ekyem (2015) on the effect of the level of governments' educational expenditure on school enrolment at primary and secondary levels using a sample of 20 countries in sub-Saharan Africa over fifteen years indicated that an increase in educational expenditure positively increased school enrolment at both primary and secondary school levels. These findings align with a study by Sarah et al. (2024), which examined the effects of public investment on primary school enrollment in low- and lower-middle-income countries (LMICs) over three decades, from 1990 to 2020. Autoregressive distributed lag models evaluate the long-

term influence of public spending on enrollment for the full sample and four distinct sub-samples, while also probing the potential non-linear nature of this relationship. Findings reveal that public expenditure has a significant, positive impact on enrollment across LMICs, including low-income countries (LICs), lower-middle-income countries (LMCs), and sub-Saharan Africa (SSA) in the long run. These effects persist under non-linear model specifications. This research offers fresh empirical insights by adopting a long-term view of the nexus between educational funding and enrollment trends in LMICs. These findings highlight the critical role of sustained, efficient funding in achieving enrollment goals, a cornerstone of sustainable development.

Similarly, Oseni et al. (2020) report similar findings on government spending and school enrolment in sub-Saharan Africa. Using data from 24 countries from 2000 to 2016, this study assesses the effect of government educational spending on primary school enrolment in SSA using the System-GMM approach. The results show that government spending has a significant ($p \leq 0.05$) and positive effect on primary school enrolment in SSA. Different diagnostic tests further confirm the results, including the Arellano-Bond test for first- and second-order autocorrelation in the disturbance term and the Hansen J-test for the validity of the instrumental variables. Other variables analysed (control), which have a positive influence on enrolment, include GDP, the general number of teachers available, and the percentage of trained teachers. Population growth rate negatively influences enrolment. The study therefore concludes that increasing government spending on education in SSA is sine qua non for improving primary school enrolment in the region.

A recent study by REPOA (2020) analyzed government spending in the education sector, focusing on primary and lower secondary education. It found that increased government expenditure, particularly through the implementation of free education policies, led to a significant rise in primary school enrollment. For instance, Standard I enrollment increased from 87.622% in 2017 to 95.880% in 2020 following the introduction of free education. However, the study also noted challenges such as high pupil-teacher ratios and limited resources, which could impact the quality of education.

The reviewed literature on the link between public spending and educational outcomes presents mixed findings. Some studies identify a clear positive correlation between increased educational expenditure and educational outcomes (Anyanwu & Erhijakpor, 2007; Oseni et al., 2020; Carsamer & Ekyem, 2015; Sarah et al., 2024; REPOA, 2020). Others challenge this, arguing that more spending does not necessarily yield better results (Moyi, 2012; Ojewumi & Oladimeji, 2016; Amin & Ntembe, 2021; Hanushek & Woessmann, 2017). Further research indicates that the impact of investment on education may depend on broader socio-economic factors, such as a country's level of development and stability (Vegas & Coffin, 2015; Rajkumar & Swaroop, 2008). These conflicting views highlight the need for further research, which this study aims to address by

offering a comprehensive review of how public spending on education affects educational outcomes, specifically primary enrollment rates, over time, drawing on the Tanzanian context.

Theoretical underpinnings

This study is grounded in human capital theory (HCT), which posits that education and training are investments in individuals' skills and knowledge that yield long-term economic returns for both individuals and societies. Developed by Theodore Schultz and expanded by Gary Becker in the 1960s, HCT emphasizes that education enhances productivity, employability, and earnings, thereby contributing to economic growth (Becker, 1964; Schultz, 1961). Unlike rational choice theory, which focuses on individual cost-benefit calculations, HCT frames educational decisions as strategic investments where individuals weigh upfront costs (e.g., tuition, opportunity costs) against anticipated future benefits, such as higher income, improved health, and greater social mobility.

Central to HCT is the idea that reducing financial barriers to education, such as tuition fees, lowers the initial cost of investment and makes it more accessible, particularly for credit-constrained population common in many African contexts (Kroth, 2015). When governments subsidize or fully fund education, they effectively increase the net returns on human capital investments, incentivizing households to prioritize schooling. This is especially critical in settings where families face liquidity constraints but anticipate substantial monetary returns (e.g., wage premiums) and non-monetary gains (e.g., reduced health risks, intergenerational uplift) from education (Akhilesh, 2019). By aligning public funding with private incentives, HCT suggests that expanded access to education can drive broader economic development by cultivating a skilled workforce that can adapt to technological and market demands. Thus, under HCT, sufficient government investment in education not only addresses immediate affordability challenges but also signals the long-term value of human capital, encouraging enrollment and fostering systemic productivity gains.

2.0 Methodology

This study utilizes annual time-series data spanning from 2001 to 2023 for Primary School Enrollment, Education Financing, Population Aged 0–14, Infant Mortality Rate, Urbanization, and Per Capita Income. Education financing data were sourced from the Basic Education Statistics and the Ministry of Finance (MOF) budget books. In contrast, enrollment data were obtained from Basic Education Statistics provided by Tanzania's President's Office - Regional Administration and Local Government. The remaining data, including population, Infant Mortality Rate, Urbanization, and Per Capita Income, were extracted from the World Development Indicators database. The selected study period is guided by data availability.

2.1 Model specification

This study utilizes the framework introduced by Gupta et al. (1999, 2002), which builds upon the education production function by incorporating various control variables. The education production function is a theoretical model that explores how different economic and non-economic factors interact to influence educational outcomes, which is expressed as:

$$Y_i = f(X_{1i}, X_{2i}, Z_i) \quad \text{.....Equation 1.}$$

Where: Y_i represents educational outcomes, X_{1i} and X_{2i} denote economic and institutional inputs, and Z_i captures other contextual factors affecting the outcomes of the education system. Scholars such as Ude and Ekesiobi (2014), Senadza and Hodey (2015), and Musah et al. (2024) have also applied this model in their respective studies, highlighting its versatility and relevance in analyzing education outcomes.

Building on the foundational education production function model by Gupta et al. (1999), this study adapts the model to focus on basic primary education outcomes in Tanzania. The model includes key variables that reflect both economic and non-economic factors that influence educational outcomes, particularly in the Tanzanian context. The proposed model can be expressed as follows:

$$ENR = f(EDFIN, POP, IMR, URB, PCI) \quad \text{.....Equation 2.}$$

Where ENR is Primary School Enrollment, EDFIN is Education Financing, POP is Young Population Aged 0 -14, IMR is Infant Mortality Rate, URB is Urbanization, and PCI is Per Capita Income. These factors capture government investment in education, demographic pressure, child health, infrastructure access, and household economic conditions.

2.2 Definition of Variables

2.2.1 Dependent variable

Gross Enrollment Rate (GER) is adopted as the dependent variable to analyze factors influencing educational access. It represents the ratio of total enrollment at a specific education level to the population of the official age group for that level, expressed as a percentage. GER serves as a proxy for assessing a nation's investment in education infrastructure and accessibility. Widely used in studies on educational disparities, such as Mingat and Tan's (1998) cross-country analysis of developing economies, GER is also a key benchmark for evaluating education performance in the World Bank's EdStats database (World Bank, 2021).

2.2.2 Independent Variables

Education financing refers to the percentage of a country's GDP allocated to education sector expenditures, encompassing public and private investments in infrastructure, teacher salaries, and educational programs. This variable is measured as the annual percentage of GDP dedicated to education, following UNESCO's (2015) recommendation of 4–6% for sustainable development. Prior studies, such as Carsamer and Ekyem (2015) and Oseni et al. (2020), have used this metric to analyze the impact of fiscal commitments on educational outcomes.

2.2.3 Control Variables

Population: The population aged 0–14, expressed as a percentage of the total population, reflects the proportion of young dependents within a society. This demographic measure is crucial for understanding future demands on educational systems and social services. A higher share of the youth population often indicates increased pressure on educational infrastructure and resources (Salihu, 2020).

Infant mortality rate (IMR) is expressed as the natural logarithm of deaths per 1,000 live births under one year of age. Logged to address skewness and improve model fit, IMR serves as a proxy for overall health system quality and socioeconomic development. Higher IMR values indicate poorer health outcomes, which may indirectly impede educational participation. To align early-life health conditions with the typical school-starting age of 6, IMR data are lagged by 6 years. Consistent with prior research (Musah & Aawaar, 2022), this study adopts IMR as a key variable.

Urbanization captures the proportion of a population residing in urban areas, reflecting shifts from rural to urban living. It serves as a proxy for access to resources and disparities in service delivery. Furthermore, urbanization is closely linked to infrastructural development, as the concentration of people in urban centers often drives significant investments in public utilities, housing, and communication networks, thereby fostering broader economic growth and improved quality of life (El-Bouayady et al., 2024).

Per capita income: Higher household income reduces the financial burden of schooling, which can improve educational outcomes, such as increased enrollment rates (Gupta et al., 1999). Because education is a normal good, higher family income typically increases demand for education, holding other conditions constant. This study uses the natural logarithm of per capita income (GDP per capita) as a proxy for household income, following Grimm (2011) and De Carvalho (2008).

2.3 Estimation Techniques

Unit root tests. Ensuring the stationarity of time series data is a critical initial step in econometric analysis. As highlighted by 4, non-stationary variables can produce spurious regressions, characterized by misleadingly high R2 values, misleadingly significant t-statistics, and the absence of meaningful relationships between variables. To avoid such erroneous inferences, it is imperative to verify that all series are stationary. This study employs the Augmented Dickey-Fuller (ADF) unit root test to determine the order of integration (I (0) or I (1)) for each variable, ensuring robustness in subsequent analyses.

Structural break analysis evaluated the effects of significant policy changes, including the introduction of fee-free education policy in 2014; structural breaks were identified using the Zivot-Andrews (1992) unit root test, which endogenously detects shifts in intercept, trend, or variance. Based on the structural breaks identified in Table 3, a dummy variable Dt was constructed to distinguish between the pre- and post-policy periods:

To capture the differential effects of education financing across policy regimes, an interaction term EDFINt × Dt was included in the ARDL framework to capture regime-specific effects.

ARDL approach to co-integration. This study employs the autoregressive distributed lag (ARDL) bounds testing approach, developed by Pesaran et al. (2001), because it offers methodological advantages over traditional cointegration techniques such as Engle-Granger (1987) and Johansen-Johansen (1990). Unlike these conventional tests, which require all variables to be integrated of order one, I (1) and often perform poorly in small-sample contexts (Reimers, 1992; Chaudhry & Choudhary, 2006), the ARDL approach offers greater flexibility by accommodating variables that are either stationary at level I (0) or first difference I(1). This flexibility is critical in empirical studies where mixed integration orders are common, as it avoids misclassifying variables and strengthens the robustness of cointegration analysis. Given these benefits and the ARDL bounds test results in Table 4, which indicate cointegration, we specify the following models to capture both long-run and short-run dynamics through the Error Correction Model (ECM).

ARDL Long-run model: We estimate the long-run relationship using an autoregressive distributed lag (ARDL) framework, validated by bounds test results confirming cointegration. The model is specified as:

Where the coefficients β1 to β7 are structured to allow time-varying parameter estimates, enhancing flexibility to capture evolving relationships. The model accommodates heterogeneity.

Short-run model. The short-run dynamics are analyzed through an Error Correction Model (ECM) derived from the ARDL framework. Engle and Granger (1987) pioneered the linkage between co-integration, error correction, and the Error Correction Mechanism (ECM). The ECM identifies causal drivers of both short-term fluctuations and long-term equilibrium relationships among

variables. A statistically significant negative coefficient on the ECM term confirms a stable long-run relationship among the model's variables, providing evidence of co-integration. This approach offers a straightforward way to validate co-integration without requiring complex testing procedures, as highlighted by Banerjee et al. (1998). The model is specified as:

Where q1 to q6 represent optimal lag lengths, is the speed of adjustment parameter, and EC represents the error correction term derived from the long-run relationship as given in the equation

Stability test: Brown et al. (1975) proposed two stability tests, the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares residuals (CUSUMSQ), to assess parameter stability in regression models using recursive residuals. The CUSUM test tracks the cumulative sum of residuals; instability is signaled if the sum crosses 5% critical bounds. The CUSUMSQ test evaluates cumulative squared residuals, with instability indicated by deviations beyond critical thresholds. Both tests graphically assess parameter stability by plotting cumulative values against significance boundaries, where breaches imply unstable coefficients.

3.0 Results and Discussion of Findings

3.1 Descriptive Summary

Table 1 shows that Primary School Enrollment averages 94.68%, reflecting strong participation in primary education. The average Education Financing of 4.55% of GDP falls within the UNESCO-recommended range of 4 – 6% for education spending but remains at the lower end of the spectrum, potentially limiting the scope for educational improvements. (UNESCO, 2015). Demographically, the percentage of the population aged 0–14 years is consistently high, averaging 44.40% with minimal variation, indicating a predominantly youthful demographic. Meanwhile, only about 30.60% of the population lives in urban areas, suggesting relatively low urbanization and potential differences in access to urban economic opportunities.

Table 1. Descriptive statistics (n=23)

	Mean	Median	Maximum	Minimum	Std. Dev
Primary school enrollment rate	94.682	95.141	111.033	69.100	9.924
Education financing	4.552	4.150	6.500	2.500	1.294
Infant mortality rate	42.755	40.650	68.000	30.000	10.752
Per capita income	661.761	623.710	901.881	439.728	152.259
%Population (0-14 years)	44.399	44.743	45.329	42.916	0.792
% of urban population	30.598	30.550	37.409	23.100	4.488

3.2 Unit root test

The first step in our analysis is to test the stationarity of the variables under consideration using the ADF unit root test. Table 2 presents the results for both levels and first differences of the variables. The results show that some variables are stationary at level, while others become stationary after first differencing.

Table 2: ADF unit root results

	At levels		At first differences		
	t statistic	p value	t statistic	p value	Integration
EDFIN	-4.8696	0.0009	-11.8701	0.0000	0
lnIMR	-4.4895	0.0025	-3.7497	0.0131	0
PNER	-2.9555	0.0567	-3.1416	0.0403	1
lnPCI	-2.7239	0.0860	-7.7409	0.0000	1
URB	-4.3035	0.0033	-4.9210	0.0040	0
POP	-1.2180	0.6426	-6.8003	0.0000	1

Source(s): Authors' calculation, EDFIN = education financing, lnIMR=natural log of infant mortality rate, URB = urbanization, PNER=primary school enrollment rate, URB = urbanization rate, POP = % of the population aged 0-14.

As shown in Table 2, education financing, infant mortality rate, and urbanization are stationary at level, as indicated by p-values below 0.05. These variables are thus classified as I (0) (integrated of order zero). In contrast, primary school enrollment rate, population under 15, and per capita income are non-stationary at level but become stationary after first differencing, as shown by their significant p-values in first differences. These variables are classified as I (1) (integrated of order one). This mixed order of integration justifies applying the ARDL developed by Pesaran et al. (2001), which does not require all variables to have the same order of integration.

3.3 Structural Break Analysis

To account for potential shifts in the relationship between education financing (EDFIN) and GDP growth, we identified and tested structural breaks using the Zivot-Andrews (ZA) unit root test (Zivot & Andrews, 1992). We hypothesized breaks in education financing due to significant policy reforms, such as the implementation of the 2014 Fee Free Education Policy. The ZA results in Table 3 confirm a break in 2015, coinciding with the implementation of the Fee Free Education Policy. Furthermore, Figure 1 visually represents the identified structural breaks, showing changes in education financing over time. This visualization supports the ZA test findings and highlights the policy intervention period.

Table 3: Structural Break Detection (Zivot-Andrews Test)

	Break year	t-Statistic	Prob.	Break type
URB	-	-3.469142	0.214825	None
EDFIN	2015	-11.72563	0.001878	Intercept & Trend
lnIMR	-	-3.708183	0.514816	None
POP	-	-4.473631	0.221992	None
lnPCI	-	-7.627616	0.247094	None
PNER	-	-3.005727	0.182221	None

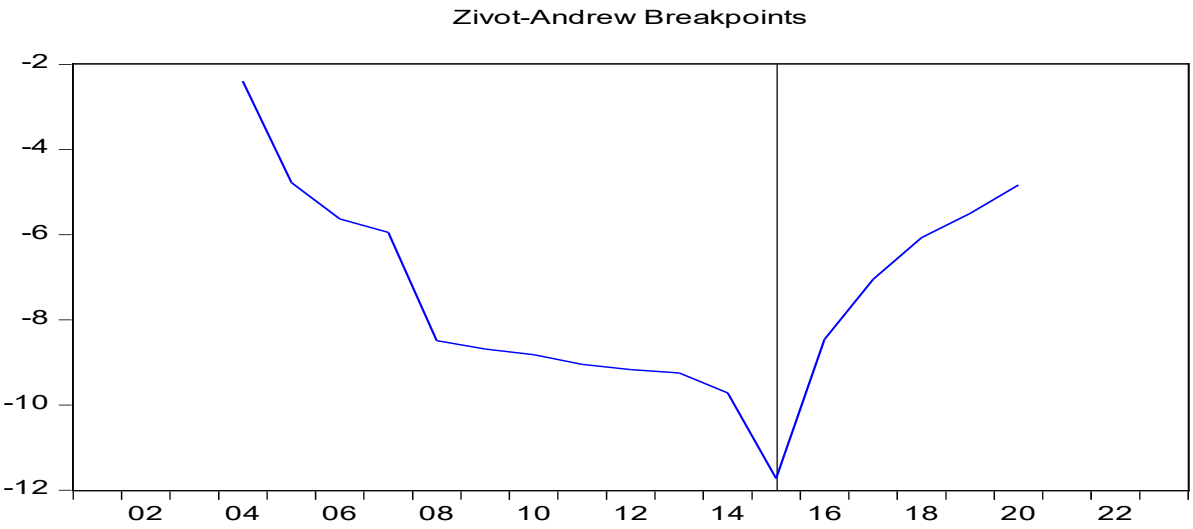


Figure 1: Structural Breaks in EDFIN

3.4 Lag length selection

To determine the optimal lag length for the ARDL model, we used several information criteria, including the Akaike Information Criterion (AIC), Schwarz Criterion (SC), Hannan-Quinn Criterion (HQ), and Final Prediction Error (FPE). Table 4 presents these criteria results for different lag lengths. As shown in Table 4, the lag length selection process indicates that the optimal lag order is 2 based on the FPE, AIC, and HQ criteria. Specifically, at lag 2, FPE, AIC, and HQ are minimized (*denotes the selected lag), suggesting this lag order provides the best trade-off between model fit and complexity. The Log Likelihood (LogL) also increases significantly from lag 1 to lag 2, further supporting the choice of lag 2 as the optimal lag length.

The LR (Likelihood Ratio) test confirms the significance of moving from lag 0 to lag 1 and from lag 1 to lag 2, with the LR statistic reaching its highest value at lag 2. This result aligns with the

information criteria, reinforcing the decision to select lag 2 for the ARDL model. Thus, the optimal lag length for the ARDL model is 2, which will be used in subsequent analyses to estimate both short- and long-run relationships among the variables.

Table 4. Lag Length Selection Order Criteria

Dependent Variable	Lag	LogL	LR	FPE	AIC	SC	HQ
NER	0	283.8545	NA	5.34e-19	-27.88545	-27.63652	-27.83686
	1	384.5162	140.9263*	3.04e-22	-35.45162	-33.95802*	-35.16005
	2	418.7754	30.83327	2.17e-22*	-36.37754*	-33.63927	-35.84300*

3.5 ARDL Bounds Test for Co-integration

Table 4 presents the ARDL bounds test for co-integration, which examines the long-run relationship among the variables. The computed F-statistic is 7.8558, which exceeds the upper-bound critical values at all significance levels (1%, 2.5%, 5%, and 10%). Since the computed F-statistic value (7.8558) is greater than the upper-bound critical values, we reject the null hypothesis of no long-run relationship. This confirms a significant long-run co-integrating relationship among the variables.

Table 4: The Bounds test for co-integrating relationship

Test Statistic	**Value**	**Signif.**	**I(0)**	**I(1)**
F-statistic	7.8558	10%	2.08	3
		5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

3.6 The relationship between education financing and enrollment

Tables 5 and 6 show robust evidence that education financing has a statistically significant positive relationship with primary school enrollment in both the long run (ARDL cointegration) and short run (error correction model). This underscores the critical role of sustained public investment in addressing structural barriers to education, such as infrastructure gaps, teacher shortages, and inequitable access. The consistency of these findings across temporal dimensions aligns with human capital theory and corroborates empirical evidence from prior studies (Carsamer & Ekyem, 2015; Oseni et al., 2020; Sarah et al., 2024), reinforcing the need to prioritize fiscal allocations to education.

Tables 5 and 6 further show that other variables exhibit mixed effects. Urbanization shows a negative long-run coefficient but a marginally positive short-run effect at its second lag (10% significance), suggesting delayed or context-dependent benefits. Per capita income, though positively associated with enrollment, remains statistically insignificant in both periods, highlighting the limitations of income growth alone in driving educational outcomes. Population

size has a significant positive long-run relationship with enrollment, reflecting rising demand for education, but negative short-run coefficients indicate transient resource constraints. Finally, infant mortality rate exerts a persistent negative influence across all time horizons, underscoring the interdependence of health and educational progress.

Table 5: The Long-run ARDL co-integration model (1, 2, 1, 2, 0, 0, 0)

Dependent variable: NER				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
URB	-1.5318	2.5949	-0.5903	0.5713
PCI	0.3265	0.2012	1.6219	0.1435
POP	11.1759	4.9603	2.2531	0.0543
EDFINDUMMY	1.4864	0.4801	3.0966	0.0147
EDFIN	0.1406	0.4114	0.3416	0.7405
IMR	-0.0170	0.0055	-3.1015	0.0146
CONSTANT	-0.0147	0.0219	-0.6717	0.5207

Table 6: The ARDL Co-integrating Short-run Error Correction Model (1, 2, 1, 2, 0, 0, 0)

Dependent variable: NER				
Variable	**Coefficient**	**St. error**	**t-Statistics**	**Prob**
NER (-1)	-0.6664	0.1181	-5.6427	0.0005
URB (-1)	0.1211	0.7606	0.1592	0.8774
URB (-2)	1.1330	0.5559	2.0379	0.0759
PCI	0.2176	0.1306	1.6653	0.1344
PCI (-1)	-0.0442	0.0976	-0.4528	0.6627
POP (-1)	-0.4475	0.7503	-0.5964	0.5674
POP (-2)	-7.1847	1.4494	-4.9572	0.0011
EDFIN DUMMY	0.9905	0.3247	3.0511	0.0158
EDFIN	0.2237	0.6724	0.3327	0.7470
IMR	-0.0113	0.0037	-3.0139	0.0167
CONSTANT	-0.0098	0.0145	-0.6774	0.5172

4.0 Conclusion and Policy Implications

Urbanization exhibits a negative long-run coefficient but a marginally positive short-run effect, suggesting context-dependent benefits. Per capita income, while positively associated, remains statistically insignificant, highlighting the limitations of economic growth alone in driving enrollment. The young population aged 0-14 years demonstrates a significant positive long-run relationship, though transient resource constraints manifest in short-run negative coefficients. Infant mortality rate exerts a persistent negative influence, emphasizing the interdependence of health and educational outcomes. Diagnostic tests validate the ARDL model's robustness, with residuals normally distributed and no evidence of serial correlation or heteroskedasticity. Stability tests (CUSUM/CUSUMSQ) further confirm parameter consistency.

Policy implications advocate for increased education financing, proactive urban planning, and integrated health-education interventions. Limitations include the exclusion of qualitative factors and regional disparities, suggesting avenues for future research through subnational or panel data analyses. This study contributes to empirical literature by reinforcing the prioritization of education financing and offering actionable insights for sustainable educational development in Tanzania.

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