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EDUCATION EXPENDITURE AND ECONOMIC GROWTH IN SIERRA LEONE: EVIDENCE FROM DISAGGREGATED PUBLIC SPENDING BY LEVEL

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ABSTRACT

Public investment in education is now widely seen as key to building human capital, improving productivity, and supporting sustainable economic growth, especially in low-income countries where skill shortages are common (UNESCO, 2026; World Bank, 2024a). Sierra Leone has made education a top policy priority through the Free Quality School Education programme and other reforms, but the country still faces challenges in learning, funding, infrastructure, and the job market that may limit the benefits of education spending (Government of Sierra Leone, 2024; UNICEF, 2025a; World Bank, 2025a). This study looks at how government spending on primary, secondary, and tertiary education relates to economic growth in Sierra Leone. The analysis uses annual data from the World Development Indicators and the UNESCO Institute for Statistics for 2007 to 2018, the years with comparable data on education spending by level. GDP per capita growth is the main outcome, with spending shares for primary, secondary, and tertiary education as the main explanatory variables. The study includes gross fixed capital formation and population growth as controls. The study uses descriptive statistics, trend analysis, Pearson correlation, and three simple ordinary least-squares models. On average, 43.90% of public education spending went to primary education, 23.00% to secondary, and 30.39% to tertiary. GDP per capita growth averaged 2.29% but was very volatile, ranging from −9.99% to 11.88%. The regression results showed a positive but statistically insignificant link between primary spending and GDP per capita growth ($\beta = 0.100$, $p = .633$), a negative but insignificant link for secondary spending ($\beta = -0.300$, $p = .585$), and a small negative and insignificant link for tertiary spending ($\beta = -0.032$, $p = .836$). Gross fixed capital formation was positive in all three models. These findings suggest that simply increasing spending is not enough to ensure economic growth; efficiency, learning quality, relevant curricula, supporting investments, and job market absorption are also important. Since only 11 data points were available, the regression results should be seen as exploratory, not definitive.

KEYWORDS: Education Expenditure; Economic Growth; Primary Education; Secondary Education; Tertiary Education; Human Capital; Sierra Leone.

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1.0 BACKGROUND OF THE STUDY

Education plays a central role in modern development because it increases knowledge, cognitive capability, technical competence, and workers' capacity to adopt new technologies, while also supporting broader social and institutional development (Contreras et al., 2025; UNESCO, 2026). Recent empirical studies continue to demonstrate that the relationship between education expenditure and economic growth is not determined solely by the amount governments spend, but also by expenditure composition, learning outcomes, complementary capital and the capacity of the economy to productively employ educated workers (Bayır, 2024; Coman et al., 2023; Trinh et al., 2025).

The issue is particularly important for low-income countries because they face substantially tighter fiscal constraints than higher-income economies. UNESCO estimates that low- and lower-middle-income countries face an annual financing gap of approximately US$97 billion to attain their national SDG 4 education targets by 2030, while spending per learner in low-income countries remains dramatically below that of high-income countries (UNESCO, 2026). These constraints imply that greater attention must be paid not only to mobilising additional financing but also to ensuring that available resources generate measurable learning and economic returns (UNESCO & World Bank, 2024; Kwon et al., 2025).

Sierra Leone represents an important case for analysing this relationship. Human-capital development has remained a core component of national development policy, and the Medium-Term National Development Plan 2024–2030 continues to identify human-capital development as a major strategic priority (Government of Sierra Leone, 2024; World Bank, 2024a). Education policy has been strongly influenced by the Free Quality School Education programme, under which public expenditure has supported tuition-free schooling, teaching and learning materials, examinations, teacher development, school feeding and related interventions (Ministry of Finance, 2023; Ministry of Finance, 2025).

Government commitment has been substantial even in the context of limited fiscal space. The 2024 national budget stated that the Government continued financing the Free Quality School Education programme alongside infrastructure and other national priorities despite significant fiscal constraints (Ministry of Finance, 2023). World Bank analysis further indicates that real public expenditure on education in Sierra Leone increased at an average annual rate of approximately 7% between 2018 and 2023, illustrating the substantial fiscal priority attached to the sector (World Bank, 2023a).

Expansion in financial commitment has been accompanied by considerable increases in access to education. World Bank programme reporting indicates that approximately 1.8 million pupils and about 56,000 teachers in roughly 7,900 primary and secondary schools have benefited from the Free Education Project and associated financing (World Bank, 2025b). UNICEF similarly reported that more than 1.4 million children had access to foundational numeracy and literacy interventions during the 2020–2024 programme period (UNICEF, 2025a).

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Nevertheless, expansion in enrolment and expenditure does not necessarily translate proportionately into improved human capital. Recent assessments show that Sierra Leone continues to experience challenges in foundational learning, inclusion and school participation, particularly among vulnerable children and children with disabilities (UNICEF, 2024a; UNICEF, 2025b). UNICEF reported persistent difficulties in learning outcomes in its 2024 annual assessment, while recent inclusive-education assessments show that substantial numbers of children remain outside formal schooling (UNICEF, 2025a; UNICEF, 2025b).

A World Bank assessment in 2024 similarly highlighted the seriousness of the foundational-learning challenge, reporting that only a small proportion of Sierra Leonean children could read a simple age-appropriate text by age ten (World Bank, 2024b). This suggests that increases in public spending must increasingly be assessed against learning, teacher performance, completion, skills development and employability rather than expenditure levels alone (UNICEF, 2025a; World Bank, 2025a).

The macroeconomic context makes expenditure efficiency especially important. Statistics Sierra Leone reports that real GDP growth stood at approximately 4.4% in 2024, indicating continued economic expansion but within an economy that remains vulnerable to external shocks, commodity movements and domestic structural constraints (Statistics Sierra Leone, 2026). The IMF has similarly observed that Sierra Leone's medium-term development prospects depend upon maintaining macroeconomic stability, strengthening revenue mobilisation, controlling expenditure pressures and improving productive capacity (IMF, 2024a, 2024b).

Sierra Leone's economy has historically experienced significant volatility. The Ebola epidemic, fluctuations in mining production, the COVID-19 pandemic, food and fuel price shocks, and domestic fiscal pressures have affected output and per capita growth at different periods (Statistics Sierra Leone, 2023; World Bank, 2023b). World Bank estimates show that growth slowed from approximately 4.1% in 2021 to about 3.5% in 2022 amid overlapping domestic and external shocks (World Bank, 2023b).

Education expenditure therefore operates within a broader macroeconomic environment. An educated workforce may have limited influence on aggregate productivity where complementary physical infrastructure, electricity, technology, financial services and employment opportunities are inadequate (World Bank, 2025c; IMF, 2024a). Similarly, expanding secondary and tertiary education without improving labour-market relevance can increase the supply of graduates without generating corresponding growth in productive employment (Contreras et al., 2025; OECD, 2025).
The distribution of expenditure across educational levels is consequently important. Primary education develops foundational literacy, numeracy, and cognitive competence; secondary education supports intermediate, scientific, and technical skills; and tertiary education contributes specialised professional expertise, innovation, and advanced knowledge creation (OECD, 2025; UNESCO, 2026). The economic effects of expenditure at these levels may therefore differ in magnitude, timing and transmission channels (Contreras et al., 2025).

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The original empirical debate is often based on aggregate government education expenditure. Such aggregation may conceal important differences between levels of education because each level has different costs, beneficiaries, gestation periods and labour-market pathways (Contreras et al., 2025; Duwal, 2024). Recent international evidence therefore supports analysing education expenditure in a disaggregated manner where reliable data permit such estimation (Trinh et al., 2025).

Against this background, the study investigates the relationship between disaggregated government expenditure on primary, secondary and tertiary education and economic growth in Sierra Leone. Specifically, the study examines whether government expenditure on primary education is associated with economic growth, determines the relationship between secondary education expenditure and economic growth, and assesses the effect of tertiary education expenditure on economic growth while controlling for selected macroeconomic factors. Accordingly, the study tests three null hypotheses: that government expenditure on primary education has no statistically significant relationship with economic growth in Sierra Leone; that government expenditure on secondary education has no statistically significant relationship with economic growth in Sierra Leone; and that government expenditure on tertiary education has no statistically significant relationship with economic growth in Sierra Leone.

2.0 LITERATURE REVIEW

2.1 Education Expenditure, Human Capital and Economic Growth

Contemporary human-capital literature conceptualises public education expenditure as an investment that can increase workers' productive competencies and support long-term growth, although the magnitude of the return depends strongly on educational quality and labour-market utilisation (Coman et al., 2023; Sorto-Bueso et al., 2026). Recent evidence suggests that human capital affects growth through productivity, technology absorption, entrepreneurship, innovation and improved institutional capability rather than through years of schooling alone (Contreras et al., 2025; World Bank, 2024c).

This distinction is important because countries may increase education expenditure without proportionately improving skills. Recent studies therefore argue that education expenditure and economic growth may show positive, negative, or insignificant associations depending on expenditure efficiency, institutional quality, and the structure of national economies (Bayır, 2024; Zogjani, 2024). Public spending becomes economically productive when it produces actual knowledge and skills that can be employed in productive activity (Coman et al., 2023).

2.2 Public Education Expenditure and Economic Growth

Recent empirical studies provide mixed evidence regarding the relationship between education expenditure and economic growth. Coman et al. (2023), analysing European economies, found that the contribution of public educational spending depended substantially upon institutional and structural conditions. Duwal (2024) used an ARDL-ECM approach and reported evidence of dynamic relationships among government education spending, education and economic growth in

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Nepal. Contreras et al. (2025), using a global panel of 107 countries, demonstrated that aggregate and disaggregated educational expenditure can produce different short- and long-run growth effects. Bayır (2024) similarly concluded that education expenditure affects human-capital formation and convergence, while Zogjani (2024) reported heterogeneous growth effects between developing and advanced economies. These findings reinforce the view that country-specific analysis remains necessary.

2.3 Primary Education Expenditure and Growth

Primary education provides foundational literacy, numeracy, communication and problem-solving skills upon which subsequent human-capital development depends (UNESCO, 2026; OECD, 2025). In developing economies, foundational skills can improve productivity even among workers in agriculture, informal trade, and small-scale enterprise because literacy and numeracy facilitate record-keeping, financial decision-making, technology adoption, and access to market information (World Bank, 2024c).

This mechanism is particularly relevant for Sierra Leone because a substantial proportion of economic activity remains connected to agriculture and informal employment. Strengthening foundational education can therefore have productivity effects that extend beyond formal wage employment (Government of Sierra Leone, 2024; World Bank, 2025c).

However, expenditure must translate into actual learning. Sierra Leone's continuing foundational-learning difficulties demonstrate that financial expansion alone cannot guarantee human-capital accumulation (UNICEF, 2025a; World Bank, 2024b). Teacher quality, instructional time, availability of learning materials, school leadership and student attendance therefore remain important intermediating factors (UNICEF, 2025a; World Bank, 2025b).

2.4 Secondary Education Expenditure and Growth

Secondary education can strengthen economic transformation by developing intermediate cognitive, scientific, vocational, digital and technical capabilities required in modern labour markets (OECD, 2025; Contreras et al., 2025). Such capabilities are particularly important where countries seek to move from subsistence and low-productivity activity towards manufacturing, commercial agriculture, digital services, construction and other higher-productivity sectors (World Bank, 2025c).

The contribution of secondary expenditure nevertheless depends upon curriculum relevance and the availability of complementary employment opportunities. Where secondary-school graduates possess qualifications poorly matched to productive-sector requirements, expenditure may generate limited macroeconomic returns despite improvements in access (Trinh et al., 2025; Contreras et al., 2025).

Sierra Leone has therefore increasingly emphasised curriculum reform, technical competencies and inclusion as part of education transformation (UNESCO, 2024a; Government of Sierra Leone, 2024). UNESCO notes that national education frameworks increasingly emphasise community

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participation and inclusion, including implementation of the Basic and Senior Secondary Education Act 2023 (UNESCO, 2024a).

2.5 Tertiary Education Expenditure and Growth

Tertiary education is expected to support economic development by producing professionals, researchers, administrators, scientists, teachers, health workers, engineers and entrepreneurs whose specialised skills can increase national productive capacity (OECD, 2025; Sorto-Bueso et al., 2026). Higher education can also contribute to technological innovation and research where universities maintain effective connections with industry and productive sectors (Diakodimitriou et al., 2025).
However, greater tertiary expenditure does not automatically produce higher growth. The economic return may be weakened by graduate unemployment, skills mismatch, insufficient research financing or poor university-industry linkages (Contreras et al., 2025). These conditions are particularly important in low-income economies where formal labour-market absorption is restricted.

The policy implication for Sierra Leone is that tertiary financing should increasingly be linked with employability, research, entrepreneurship, STEM fields, health workforce development, agriculture, mining technology and other national development priorities (Government of Sierra Leone, 2024; World Bank, 2025c).

2.6 Education Financing in Sierra Leone

Sierra Leone has demonstrated substantial political commitment to education financing, with FQSE remaining one of the major public programmes supported through the national budget (Ministry of Finance, 2023, 2025). Public expenditure has increased considerably since the programme's introduction, although the country continues to operate under significant fiscal constraints (World Bank, 2023a; IMF, 2024a).

The financing challenge therefore involves both sufficiency and efficiency. Growing school populations increase recurrent costs for teachers, learning materials, examinations, infrastructure and school administration, while limited government revenue constrains fiscal space (IMF, 2024a; UNESCO & World Bank, 2024).

Recent international education-financing research increasingly emphasises that allocation quality may be as important as aggregate expenditure (Kwon et al., 2025; UNESCO, 2026). This provides a strong rationale for examining expenditure by educational level.

2.7 Research Gap

Recent Sierra Leone education research has focused extensively on access, FQSE implementation, learning outcomes, inclusion, teacher deployment and education-system management (UNICEF, 2024a; World Bank, 2025a, 2025b). Comparatively little empirical research has examined whether the allocation of public education expenditure across primary, secondary and tertiary education has different relationships with national economic growth.

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Furthermore, the limited historical availability of disaggregated education-finance observations has often encouraged use of total education expenditure. The present study therefore contributes by using available comparable expenditure shares to examine differences among primary, secondary and tertiary financing, while explicitly recognising the statistical limitations of the short series.

3. MATERIALS AND METHODS

3.1 Study Design

The study employed a quantitative longitudinal secondary-data design. Annual macroeconomic and education-finance indicators for Sierra Leone were compiled from the World Development Indicators, which draw the education-expenditure indicators from the UNESCO Institute for Statistics (World Bank, 2026a; UNESCO Institute for Statistics, 2026).

The World Bank defines expenditure on primary, secondary and tertiary education as the respective level's expenditure expressed as a percentage of total general-government education expenditure (World Bank, 2026a).

3.2 Study Period

Although macroeconomic indicators for Sierra Leone extend over several decades, disaggregated expenditure data were jointly available for 2007–2018, with no observation for 2015. Consequently, 11 complete annual observations were available for analysis.

The restricted period is an important methodological limitation. An autoregressive distributed lag model containing several explanatory variables would consume an unacceptable proportion of the available degrees of freedom and could generate unstable estimates. Recent ARDL research emphasises the importance of adequate sample information and parsimonious lag structures when estimating dynamic models (Duwal, 2024; Contreras et al., 2025).

The study therefore used descriptive statistics, graphical trend analysis, Pearson correlation and parsimonious exploratory OLS regressions.

3.3 Variables and Measurement

Table 1. Definition and Measurement of Variables

Variable	Symbol	Measurement	Expected relationship
Economic growth	GDPG	GDP per capita growth, annual %	Dependent
Primary education expenditure	PRI	Primary expenditure as % of total government education expenditure	Positive
Secondary education expenditure	SEC	Secondary expenditure as % of total government education expenditure	Positive
Tertiary education	TER	Tertiary expenditure as % of total	Positive/conditional

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expenditure		government education expenditure	
Gross fixed capital formation	GFCF	Gross fixed capital formation as % of GDP	Positive
Trade openness	TRD	Exports plus imports as % of GDP	Positive/conditional
Foreign direct investment	FDI	Net FDI inflows as % of GDP	Positive
Population growth	POP	Annual population growth, %	Positive/negative

Source: World Development Indicators/UNESCO Institute for Statistics (World Bank, 2026a).

Table 1 operationalises education expenditure at three levels rather than using a single aggregate measure. This distinction matters because recent empirical evidence shows that spending at primary, secondary, and tertiary levels can have different short- and long-term economic effects (Contreras et al., 2025). Primary expenditure is expected to influence foundational human capital, while secondary expenditure is more closely connected with intermediate and technical competencies, and tertiary expenditure is linked with specialised skills and innovation (OECD, 2025). Gross fixed capital formation is included because physical and human capital are complementary in production, while population growth captures demographic pressures on per capita output (IMF, 2024a; World Bank, 2025c). Trade and FDI are reported descriptively because they influence Sierra Leone's external economic environment, although the small sample prevented the simultaneous inclusion of all controls.

3.4 Model Specification

Given the limited number of complete observations, three exploratory models were estimated separately:

Model 1: Primary Education Expenditure

$$GDPG_t = \beta_0 + \beta_1 PRI_t + \beta_2 GFCF_t + \beta_3 POP_t + \varepsilon_t$$

Where:

$GDPG_t$ = GDP per capita growth at time t
β_0 = Constant/intercept
β_1 = Coefficient of primary education expenditure
PRI_t = Primary education expenditure
β_2 = Coefficient of gross fixed capital formation
$GFCF_t$ = Gross fixed capital formation
β_3 = Coefficient of population growth
POP_t = Population growth
ε_t = Error term

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Model 2: Secondary Education Expenditure
$GDPG_t = \beta_0 + \beta_1 SEC_t + \beta_2 GFCF_t + \beta_3 POP_t + \varepsilon_t$

Where:
$GDPG_t$ = GDP per capita growth at time t
β_0 = Constant/intercept
β_1 = Coefficient of secondary education expenditure
SEC_t = Secondary education expenditure
β_2 = Coefficient of gross fixed capital formation
$GFCF_t$ = Gross fixed capital formation
β_3 = Coefficient of population growth
POP_t = Population growth
ε_t = Error term

Model 3: Tertiary Education Expenditure
$GDPG_t = \beta_0 + \beta_1 TER_t + \beta_2 GFCF_t + \beta_3 POP_t + \varepsilon_t$

Where:
$GDPG_t$ = GDP per capita growth at time t
β_0 = Constant/intercept
β_1 = Coefficient of tertiary education expenditure
TER_t = Tertiary education expenditure
β_2 = Coefficient of gross fixed capital formation
$GFCF_t$ = Gross fixed capital formation
β_3 = Coefficient of population growth
POP_t = Population growth
ε_t = Error term

Separate equations were used because primary, secondary and tertiary expenditure shares are strongly related components of the same education budget. Estimating all simultaneously in an 11-observation sample would increase multicollinearity and substantially reduce statistical power.

3.5 Data Analysis

The data were analysed using descriptive statistics, graphical trend analysis, Pearson correlation and OLS regression. Statistical significance was assessed at conventional 1%, 5% and 10% levels; however, coefficient size and direction were given greater interpretive emphasis because of the restricted sample.

Residual normality and Durbin-Watson statistics were examined as basic diagnostic indicators. Given the limited sample, all inferential results were treated as exploratory.

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4.0 RESULTS

4.1 Descriptive Statistics

Table 2. Descriptive Statistics of Study Variables, 2007–2018

Variable	N	Mean	SD	Minimum	Maximum
GDP per capita growth (%)	11	2.293	5.533	−9.991	11.880
Primary expenditure (%)	11	43.903	10.467	20.387	52.557
Secondary expenditure (%)	11	23.004	4.417	11.989	28.350
Tertiary expenditure (%)	11	30.388	14.936	17.930	59.020
Gross fixed capital formation (% GDP)	11	20.531	11.442	9.959	46.332
Trade openness (% GDP)	11	37.973	12.581	21.257	53.381
FDI inflows (% GDP)	11	6.053	5.358	1.277	19.551
Population growth (%)	11	2.471	0.160	2.196	2.722

Source: Authors' calculations from World Development Indicators/UIS data (World Bank, 2026a).

Table 2 shows that both economic growth and education funding allocation varied widely during the study period. GDP per capita growth averaged 2.29%, but the high standard deviation of 5.53 percentage points and a range from −9.99% to 11.88% reflect significant economic ups and downs. This aligns with Sierra Leone's history of health crises, changes in commodity prices, and shifts in mining activity (Statistics Sierra Leone, 2023; World Bank, 2023b). Primary education accounted for the largest average share of public education spending (43.90%), though this amount varied widely over time. Tertiary education spending averaged 30.39% and showed the most variation, rising sharply in the later years. Secondary education spending was more stable by comparison. These numbers highlight why it is important to look at how spending is divided among education levels, not just the total amount spent. Shifts in government priorities at different levels can affect human capital development and economic outcomes (Contreras et al., 2025).

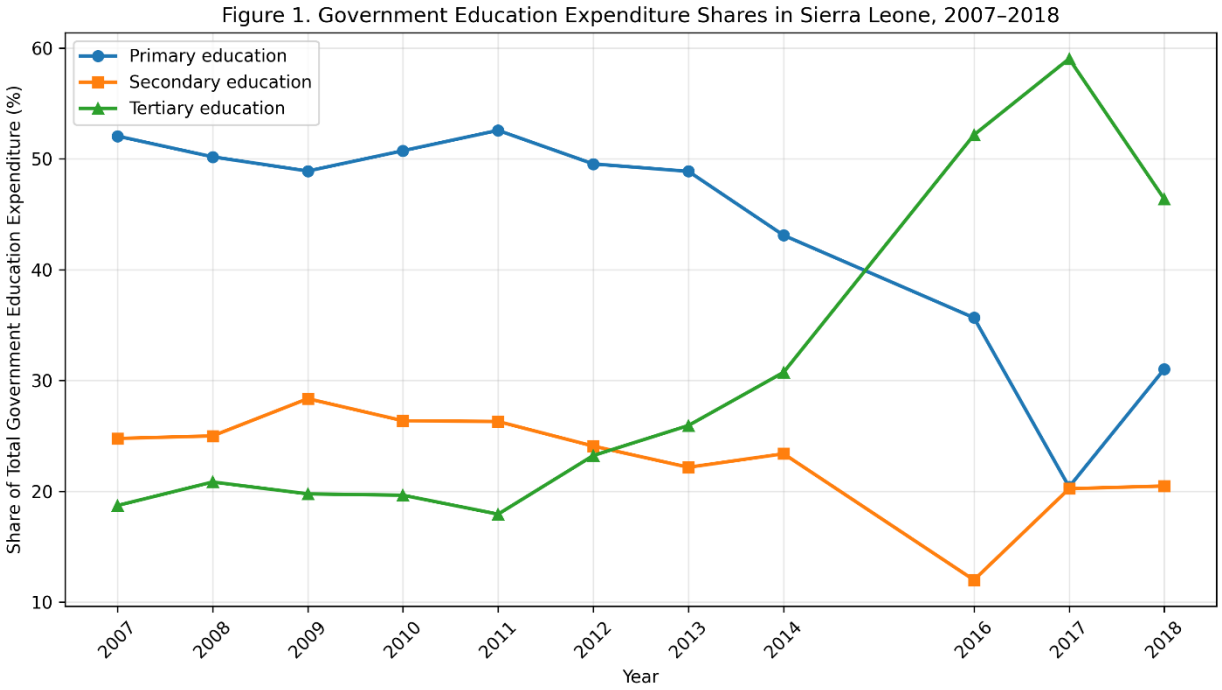
4.2 Distribution of Education Expenditure by Level

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Figure 1. Government Education Expenditure Shares in Sierra Leone, 2007–2018



Source: Authors' calculations from World Development Indicators/UNESCO Institute for Statistics data.

Figure 1 shows that Sierra Leone's allocation of education spending changed significantly over the study period. From 2007 to 2013, primary education made up about half of government education spending, but this share dropped after 2014. In contrast, the share for tertiary education rose sharply in later years, exceeding 50% in 2016 and 2017 before falling to about 46% in 2018. Secondary education spending was usually lower than both primary and tertiary, and it dropped especially sharply in 2016. It's important to interpret these trends carefully, since the share of spending does not show how efficient or effective the spending was for each student. Still, the figure highlights a major shift in how the education budget was divided. Recent research points out that how spending is split among education levels can be just as important as the total amount spent, since each level has different costs and impacts on productivity (Kwon et al., 2025; Contreras et al., 2025).

4.3 Economic Growth Trend

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Figure 2. GDP Per Capita Growth in Sierra Leone during the Education-Expenditure Sample Period

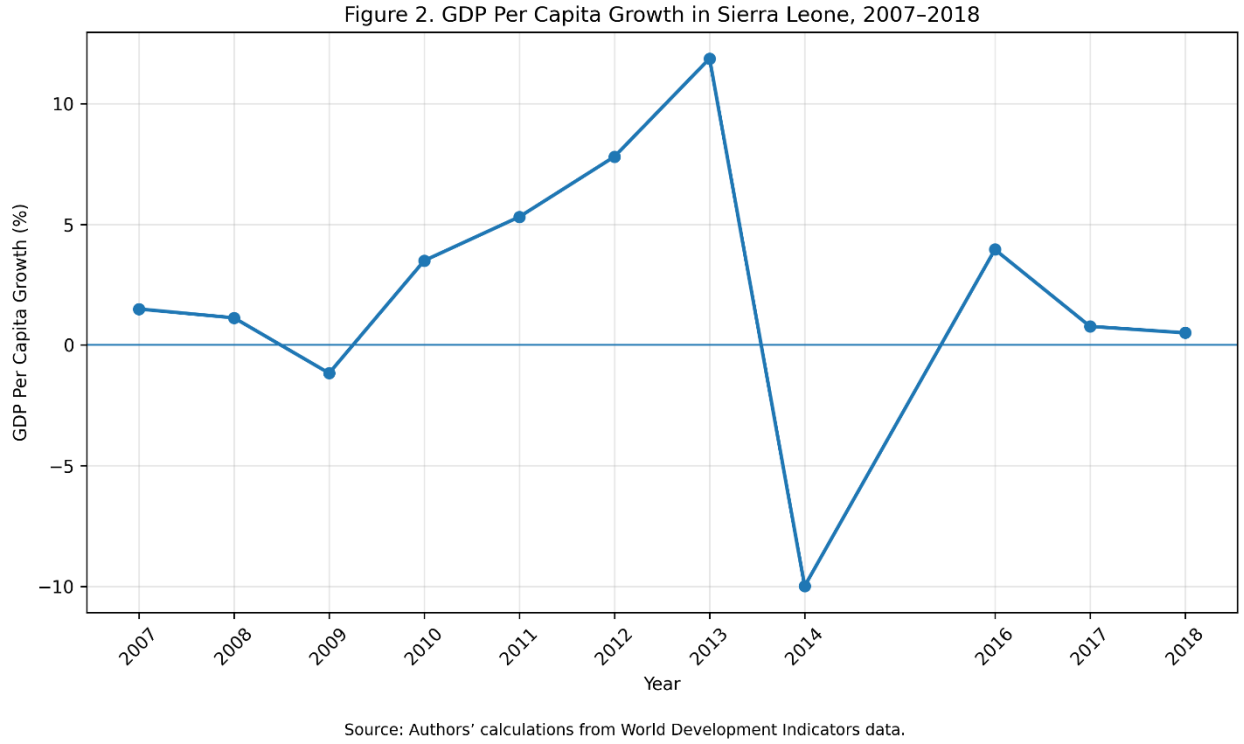


Figure 2 shows that Sierra Leone's GDP per capita growth was very unstable during the study period. Growth picked up from 2010 and peaked at 11.88% in 2013, mainly due to a mining boom before the Ebola crisis. The sharp drop to -9.99% in 2014 shows how vulnerable the country is to major shocks. Growth improved after the crisis but stayed relatively low in 2017 and 2018. This kind of volatility matters when looking at the link between education spending and growth, since short-term economic results in Sierra Leone are often driven by mining, commodity prices, health crises, and other immediate factors, rather than the slower benefits of education (Statistics Sierra Leone, 2023; World Bank, 2023b). As a result, short data periods may not fully capture the long-term benefits of investing in human capital.

4.4 Correlation Analysis

Table 3. Pearson Correlations with GDP Per Capita Growth

Variable	Correlation with GDP per capita growth
Primary education expenditure	0.236
Secondary education expenditure	-0.101
Tertiary education expenditure	-0.140
Gross fixed capital formation	0.366
Trade openness	0.237
Foreign direct investment	0.338
Population growth	0.171

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Additional correlations show that primary and tertiary expenditure were strongly inversely related (**r = - 0.966**), while secondary and tertiary spending were also negatively related (r = - 0.813).

Source: Authors' calculations from World Development Indicators/UIS data.

The correlation results show that primary education spending had a weak positive link with GDP per capita growth (r = 0.236), while secondary and tertiary spending had weak negative links (r =−.101 and r = - 0.140, respectively). Gross fixed capital formation had the strongest positive relationship with economic growth (r = 0.366), followed by foreign direct investment (r = 0.338). Notably, primary and tertiary spending shares were almost perfectly negatively correlated, which makes sense since increasing one means reducing the other in a fixed budget. This is why the study did not include all three education spending shares in the same regression with such a small sample. Recent research also highlights the need to look at how spending is divided, not just the total, when studying the link between education spending and growth (Contreras et al., 2025; Kwon et al., 2025).

4.5 Regression Analysis

Because only 11 complete observations were available, three separate parsimonious regression models were estimated. Each included one education-expenditure variable, along with gross fixed capital formation and population growth.

Table 4. Exploratory OLS Regression Results

Variable	Model 1: Primary β (p)	Model 2: Secondary β (p)	Model 3: Tertiary β (p)
Constant	3.133 (.928)	−4.544 (.898)	5.562 (.892)
Primary expenditure	0.100 (.633)	—	—
Secondary expenditure	—	−0.300 (.585)	—
Tertiary expenditure	—	—	−0.032 (.836)
Gross fixed capital formation	0.182 (.387)	0.170 (.418)	0.186 (.384)
Population growth	−3.628 (.816)	4.145 (.811)	−2.475 (.880)
R^2	0.164	0.173	0.140
Adjusted R^2	−0.194	−0.181	−0.229
F-test p-value	.720	.701	.771
Observations	11	11	11

Source: Authors' estimation from World Development Indicators/UIS data.

The exploratory regressions found no statistically significant evidence that changes in any single education spending share predicted GDP per capita growth during the study period. Primary education spending had a positive coefficient (β = .100), meaning a one-percentage-point increase

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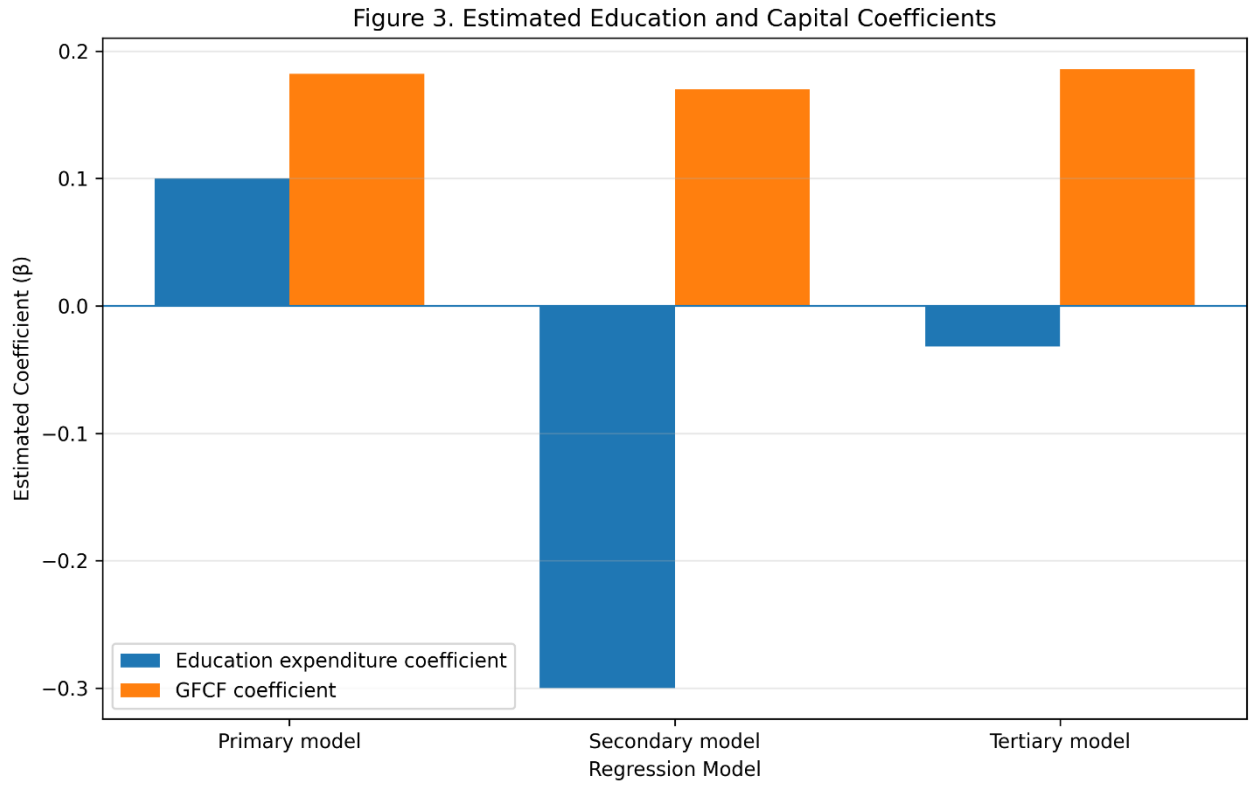
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in its share was linked to about 0.10 percentage points higher GDP per capita growth, after accounting for investment and population growth. However, this result was not statistically significant (p = .633). Secondary education spending had a negative coefficient (β = −.300, p = .585), and tertiary spending was also negative but very small (β = −.032, p = .836). These findings do not mean that secondary or tertiary education reduces growth. Instead, the small sample size, high economic volatility, and short time frame make it hard to estimate the long-term effects of education spending (Contreras et al., 2025).

4.6 Gross Fixed Capital Formation

Gross fixed capital formation was positive in all three models, with coefficients ranging from approximately 0.170 to 0.186.

Figure 3. Estimated Education and Capital Coefficients



Note: Coefficients are exploratory because N = 11.

Figure 3 shows that gross fixed capital formation had a consistently positive coefficient in all three education models. While none of these coefficients was statistically significant, they were always positive, no matter which education spending level was included. This suggests that building physical capital is an important part of supporting human capital development. Education alone may not boost productivity much if businesses and workers lack things like electricity, transport, digital infrastructure, machinery, and investment opportunities (World Bank, 2025c; IMF, 2024a). The figure also shows that education coefficients should not be taken at face value, since their size and direction change across levels, while investment stays positive. Recent research also points out

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that investment and structural factors play a big role in how much public education spending helps economic growth (Coman et al., 2023; Contreras et al., 2025).

4.7 BASIC REGRESSION DIAGNOSTICS

Table 5. Basic Diagnostic Statistics

Diagnostic	Primary Model	Secondary Model	Tertiary Model
Durbin-Watson	2.855	2.428	2.859
Jarque-Bera statistic	1.585	0.817	1.287
Jarque-Bera p-value	.453	.665	.525
R^2	.164	.173	.140
Adjusted R^2	−.194	−.181	−.229

The residual diagnostics did not show strong evidence of non-normality, since Jarque-Bera probabilities were above .05 in all three models. Durbin-Watson statistics ranged from about 2.43 to 2.86, so there was no clear sign of strong positive autocorrelation. Still, these results should be viewed with caution because there were only 11 data points. More importantly, the negative adjusted R^2 values mean that adding the chosen predictors did not improve the models much compared with using only an intercept. This is due to both the small sample size and Sierra Leone's very volatile economy. During the study period, GDP growth was heavily influenced by factors not included in the models, like mining cycles and major health crises (Statistics Sierra Leone, 2023; World Bank, 2023b). So, these models should be seen as exploratory, not as tools for forecasting or proving causality.

5.0 DISCUSSION

The results show that the link between education spending and economic growth in Sierra Leone is not as simple as assuming that more spending in every category will quickly lead to higher GDP growth. International studies also find that the effects of education spending on growth vary by country and depend on how efficiently money is used, the time frame, and broader economic conditions (Coman et al., 2023; Contreras et al., 2025; Trinh et al., 2025).

The positive coefficient obtained for primary education is economically plausible because foundational literacy and numeracy represent basic capabilities used across virtually all productive sectors. Sierra Leone's economy includes a large number of workers engaged in agriculture, informal commerce and self-employment; improvements in basic education may therefore increase productivity through improved numeracy, financial literacy, technology use and information processing (Government of Sierra Leone, 2024; World Bank, 2024c).

However, the result was statistically insignificant. One explanation is that education has long gestation periods. Expenditure made in a given year on primary-school pupils cannot reasonably be expected to produce its full labour-productivity return within the same year (Contreras et al., 2025).

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An appropriate long-run model would therefore require substantially more observations than are currently available in the disaggregated WDI/UIS series.

The negative secondary coefficient should likewise not be interpreted as evidence that secondary education damages economic growth. Secondary education can contribute to economic transformation by developing intermediate skills required for technical work and modern economic activity (OECD, 2025). A weak contemporaneous association may instead reflect curriculum-labour-market mismatch, low formal-sector absorption or the long delay between school expenditure and subsequent workforce participation (Trinh et al., 2025).

The insignificant tertiary result is also consistent with the possibility that higher education requires complementary structural conditions before its economic return becomes visible. University graduates contribute most strongly to growth where economies generate professional employment, innovation opportunities, technology-intensive firms and research-industry collaboration (Diakodimitriou et al., 2025). Expansion of tertiary education without complementary productive-sector development may weaken the immediately observable association between expenditure and GDP growth.

Gross fixed capital formation displayed a consistently positive coefficient, reinforcing the complementarity between human and physical capital. Sierra Leone requires investment in energy, roads, digital infrastructure, agricultural production, industrial equipment and private enterprise if education-generated skills are to be productively employed (World Bank, 2025c; IMF, 2024a).
The substantial historical volatility in Sierra Leone's GDP also complicates education-growth estimation. For example, rapid mining-led expansion can increase GDP without corresponding changes in education expenditure, while health crises can cause major economic contraction despite continued investment in human capital (Statistics Sierra Leone, 2023). Education therefore influences the economy's underlying productive capacity but may not dominate annual fluctuations in GDP.
Overall, the results suggest that it is more important to focus on how efficiently education funds are used and whether they lead to real learning, employable skills, and productivity, rather than on how much is spent. This finding aligns with recent international research on education financing (UNESCO & World Bank, 2024; Kwon et al., 2025).

6.0 SUMMARY

This study examined the relationship between public expenditure on primary, secondary and tertiary education and economic growth in Sierra Leone using available data from the World Bank and UNESCO Institute for Statistics. The findings showed that primary education received an average of 43.90% of total public education expenditure during the period examined, while secondary education accounted for an average of 23.00%. Tertiary education received an average share of 30.39%, although its proportion increased substantially during the later years of the study. Economic performance was characterised by considerable volatility, with GDP per capita growth averaging 2.29% and ranging from approximately −9.99% to 11.88%.

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The correlation analysis showed that primary education expenditure had a weak positive relationship with GDP per capita growth, with a correlation coefficient of r= 0.236. In contrast, secondary education expenditure recorded a weak negative correlation with GDP per capita growth (r= - 0.101), while tertiary education expenditure also exhibited a weak negative relationship (r = - 0.140). Among the macroeconomic variables examined, gross fixed capital formation showed the strongest positive correlation with GDP per capita growth (r= 0.366), suggesting the importance of complementary physical capital investment in supporting economic performance.

The exploratory regression analysis further showed that primary education expenditure had a positive coefficient (β=.100), although the relationship was not statistically significant (p= 0.633). Secondary education expenditure produced a negative coefficient (β= -0.300) and was also statistically insignificant (p=.585). Similarly, tertiary education expenditure recorded a small negative coefficient (β= - 0.032) that was statistically insignificant (p= 0.836). Gross fixed capital formation, however, maintained a positive coefficient across all three exploratory regression models, indicating a relatively consistent positive association with economic growth. Overall, the findings suggest that the economic effects of education expenditure in Sierra Leone cannot be explained by expenditure levels alone, but likely depend on expenditure efficiency, learning quality, labour-market relevance, and complementary productive investment. Given that the available disaggregated education expenditure series contained only 11 complete observations, the regression findings should be interpreted as exploratory associations rather than evidence of a definitive causal relationship.

7.0 CONCLUSION

The study concludes that public education spending is still a key part of Sierra Leone's long-term strategy for building human capital and development. However, the current evidence does not show that changes in yearly spending shares automatically lead to immediate changes in GDP per capita growth.

Primary education spending showed a positive but statistically insignificant link with growth, while secondary and tertiary spending showed weak negative and insignificant links. These results should be seen as a sign of how complex and slow the relationship between education spending and growth can be, not as a reason to doubt the value of investing in education.

The consistent positive gross fixed capital formation coefficient indicates that education should be viewed as part of a broader development system. Human capital requires physical capital, technology, infrastructure, investment and productive employment if educational competencies are to generate measurable increases in national output (World Bank, 2025c).

Sierra Leone's main policy challenge is not just to spend more on education, but to make sure that education funding leads to basic learning, technical skills, employability, research ability, and

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productivity. Achieving this will require better coordination among education policy, economic development, industrial policy, and job-market planning.

The study further concludes that a conventional multi-variable ARDL analysis using the available Sierra Leone disaggregated expenditure data would presently be statistically weak because the World Bank/UIS dataset contains only 11 complete observations. Any manuscript claiming several decades of Sierra Leone primary, secondary, and tertiary expenditure observations from these series, without an additional national administrative dataset, would therefore require independent verification.

8.0 RECOMMENDATIONS

1. Protect and Improve the Efficiency of Foundational Education Financing: Government should continue protecting primary and foundational education financing while placing greater emphasis on measurable literacy, numeracy, attendance, completion and teacher-performance outcomes. Sierra Leone's continuing foundational-learning challenges demonstrate that financial allocations must be judged partly by the learning they generate (UNICEF, 2025a; World Bank, 2024b).
2. Strengthen Labour-Market Orientation of Secondary Education: Secondary education financing should increasingly support STEM, digital skills, technical education, entrepreneurship and practical competencies linked to agriculture, mining, construction, health, tourism, manufacturing and emerging service industries. Stronger labour-market relevance would increase the probability that secondary education contributes to productivity rather than merely increasing certification (Government of Sierra Leone, 2024; OECD, 2025).
3. Link Tertiary Financing to Employability, Research and Innovation**:** Higher-education financing should prioritise programmes aligned with national development needs and establish stronger partnerships between universities, industry, government and the private sector. Funding mechanisms should encourage applied research, entrepreneurship, internships and technology transfer (World Bank, 2025a; Diakodimitriou et al., 2025).
4. Coordinate Human-Capital and Physical-Capital Investment: Government should integrate education expenditure with infrastructure, electricity, digital connectivity, agriculture, industry and private-sector development. The consistently positive coefficient of gross fixed capital formation suggests that education-generated skills require complementary productive investment.
5. Institutionalise Education Expenditure Tracking by Level: The Ministry of Finance, Ministry of Basic and Senior Secondary Education, Ministry of Technical and Higher Education and Statistics Sierra Leone should maintain a harmonised annual database showing expenditure on primary, secondary, TVET and tertiary education. Consistent publication would significantly improve future economic evaluation.
6. Introduce Expenditure-to-Outcome Performance Indicators: Education budget analysis should move beyond allocation and execution rates to include cost per learner, learning gain per Leone spent, completion rates, graduate employment, teacher productivity and equity indicators. Outcomes-based financing approaches already being tested internationally demonstrate the growing emphasis on results rather than expenditure alone (Education Outcomes Fund, 2023; Kwon et al., 2025).
7. Future Research: Future research should construct a longer historical Sierra Leone education-finance dataset from Ministry of Finance appropriation accounts, annual budgets, MBSSE

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administrative records, Ministry of Technical and Higher Education records and UNESCO data. A sufficiently long dataset would permit robust ARDL bounds testing, structural-break models and causality analysis. Future studies should also examine whether education quality and graduate employment mediate the relationship between expenditure and economic growth.

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