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The effect of household income on higher education in Lesotho

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Abstract

Given the small sample size and the mixed order of integration among the variables, the Autoregressive Distributed Lag Error Correction (ARDL-ECM) model is used to examine both short-run and long-run relationships of the effect of household income on higher education in Lesotho in the period of 1993-2018. The model was employed to estimate the relationship between these two variables while also considering the interaction with government expenditure. The findings showed that government expenditure on education does not appear to have a statistically significant impact on tertiary enrolment and that household consumption levels negatively correlate with tertiary enrolment, indicating that higher consumption may divert resources away from education, aligning with the substitution effect described in previous studies. The study suggests that the government should thoroughly review how education spending is allocated across different educational levels to help ensure that funds are effectively used to promote equitable access to education.

Keywords: autoregressive distributed lag-error correction model (ARDL-ECM), expenditure, gross enrolment rate, income, Lesotho.

[†]The author contributed equally to this work.



Introduction

Higher education has recently regained global prominence, particularly after a period focused on achieving universal primary schooling under the Millennium Development Goals (MDGs) (Ilie & Rose, 2018). This renewed attention highlights the critical role of higher education in driving individual advancement and societal development. In regions such as Africa, specifically Lesotho, higher education is increasingly seen as essential for economic transformation (Oluwatobi et al., 2020). With its limited natural resources, Lesotho relies heavily on the skills and productivity of its population for economic advancement (The World Bank, 2019).

A key issue in discussions about higher education is equitable access, particularly in relation to household income. While education is often hailed as a tool for breaking down socioeconomic barriers, significant disparities persist. Globally, access to higher education is often contingent on financial resources, perpetuating inequalities in opportunities and outcomes. These disparities are evident within and between nations, further widening generational gaps and hindering socioeconomic mobility. As a result, achieving equitable access to higher education has become a central goal of the United Nations' Sustainable Development Goals (SDGs), particularly Target 4.3, which aims to ensure the availability of "affordable, quality technical, vocational, and tertiary education, including university"³. Education spending in Lesotho shows a notable bias towards more affluent segments of society. For every 100 Maloti allocated per student in primary education, the government spends M165 for each student in secondary education and a substantial M326 for each student in tertiary education (The World Bank, 2019). This disparity highlights the regressive and unequal nature of education spending, especially given the relatively low proportion of students progressing to tertiary education. Out of every 100 students who complete primary education, only 36 advance to secondary education, and a mere five continue to tertiary education, favouring the wealthiest quintiles (The World Bank, 2019). The Lesotho Demographic and Health Survey further underscores this disparity, revealing a stark contrast in the net attendance ratio between the poorest and richest quintiles. Among the poorest quintile, only 15 per cent of 13–17-year-olds attend secondary education, compared to 72 per cent among the richest quintile (Government of Lesotho & ICF International, 2016). This underscores income's critical role in determining access to higher education opportunities.

The disparity between Lesotho's income levels and those of its peer countries, as indicated by its lower Gross National Income (GNI) per capita, has significant implications for various socio-economic indicators, including education. With a GNI per capita of \$1,200 in 2022, compared to regional and income group averages of \$2,300 and \$2,700, respectively, Lesotho's lower income levels contribute to challenges in accessing education, particularly tertiary education, which often requires significant financial resources (United States Agency for International Development, 2023). As a result, the number of students enrolling in institutions in Lesotho may be lower compared to countries with higher income levels. The Gross Enrolment Ratio for tertiary education in Lesotho was 10.2 per cent in 2018, while the regional and income group averages were 10.67 per cent and 21.26 per cent, respectively (United States Agency for International Development, 2023).

³ [4 Quality Education](#)



Just like many other African countries, Lesotho faces a learning crisis. Learning levels in Lesotho are concerning and have deteriorated during the past decade. Organisations such as the World Bank, UNESCO, and many other international ones estimate that 97% of the pupils at the age of 10 years for Basotho cannot read and understand⁴. In addition to the learning poverty, Lesotho also faces an increasing school dropout rate. Learning poverty is among the contributing factors to low educational attainment in Lesotho. Statistics by the World Bank and UNESCO Institute of Statistics reveal that Lesotho's primary completion rate for boys and girls stood at 85% and 96%, respectively, in 2019 and 66% and 76%, respectively, in 2023. This shows a decrease in the primary completion rate between 2019 and 2023. Even lower secondary completion rates for boys and girls dropped from 39% and 56% in 2019 to 34% and 50% in 2023, respectively. These low statistics in education for Lesotho result in low human capital. This has serious negative ramifications for the country's growth and development since a country's wealth consists of produced capital, human capital and natural capital, of which human capital depends on educational attainment. According to The World Bank (2021a), Lesotho's human capital accounts for more than 60% of its national wealth.

The relationship between household income and access to higher education in Lesotho underscores a critical issue with far-reaching consequences. Despite government efforts to improve access to education, significant inequalities persist, particularly for disadvantaged populations. The substantial government expenditure on education disproportionately benefits higher education, exacerbating access disparities. Additionally, the existing bursary scheme for tertiary education is both ineffective and unsustainable, with a low repayment rate that essentially makes it a grant scheme (The World Bank, 2019). This situation calls for introducing more equitable and sustainable financing mechanisms, such as proxy means testing for the bursary program (The World Bank, 2021b). Furthermore, the Higher Education Policy aims to devise an equitable and sustainable approach to financing higher education by increasing financial contributions from students and their families (Council on Higher Education, 2023).

To address these issues, this study uses the Autoregressive Distributed Lag Error Correction (ARDL-ECM), employing secondary time series data for Lesotho from 1993 to 2018, to investigate the relationship between household income and access to higher education in Lesotho and how government expenditure on education influences this relationship. The purpose is to identify the potential policy implications for addressing inequalities in access to higher education and promoting socioeconomic mobility in Lesotho. By examining the relationship between household income and access to higher education, the study aims to shed light on the underlying factors contributing to educational inequalities and barriers to socioeconomic mobility. Understanding these dynamics is crucial for informing evidence-based policy formulation and interventions to promote educational equity and foster inclusive growth in Lesotho.

Despite the growing recognition of the importance of higher education in driving economic development, there remains a gap in understanding the specific mechanisms through which household income influences access to higher education in Lesotho.

⁴ <https://www.iicba.unesco.org/en/lesotho>



Additionally, limited research has been conducted on the effectiveness and sustainability of existing bursary schemes for tertiary education in Lesotho, where most tertiary students are sponsored by the government. Addressing these gaps is essential for developing targeted strategies to enhance access to higher education and promote socioeconomic development in Lesotho.

This study contributes to the existing literature by providing empirical evidence on the relationship between household income and access to higher education in Lesotho, thereby expanding our understanding of the socioeconomic determinants of educational opportunities. Furthermore, the study offers insights into the effectiveness of government expenditure on education and the implications for educational equity and socioeconomic mobility. The findings of this paper also act as part of the huge efforts by the Ministry of Education and Training, Lesotho in addressing the learning crisis and building human capital in the country and the region at large. There has been increasing support by the international community in collaboration with the Government of Lesotho in improving human capital outcomes in Lesotho through educating, capacitating and equipping young people with skills that are the bedrock of economic transformation and increased prosperity for all. Thus, this paper also helps in identifying factors that are important in the relationship between education and economic development. By filling these gaps in the literature, the study aims to inform policy debates and interventions to promote inclusive growth and development in Lesotho.

Literature Review

The relationship between household income and higher education access is a complex and multifaceted issue, particularly in the context of Lesotho. This review delved into the theoretical underpinnings and empirical findings that shed light on how household income influences decisions related to higher education. The discussion is anchored on two main theoretical frameworks: Human Capital Theory and Rational Choice Theory.

Human Capital Theory posits that investments in education are crucial for enhancing workers' productivity and economic growth (Becker, 1962; Psacharopoulos & Woodhall, 1985). The study of human capital has proven to be an exceptionally fruitful vein of research that offers insights on topics as diverse as discrimination, inequality, unemployment, fertility, marriage markets, immigration, and productivity. According to Eide and Showalter (2010), it is the basis for the field of economics of education.

The decision to invest in education is seen as a rational economic choice where individuals or households weigh the costs of education, such as tuition fees, opportunity costs of delayed employment, and other direct expenses, against the anticipated future benefits. In the context of Lesotho, where economic opportunities are limited and educational resources are scarce, the decision to invest in education is even more critical.

Rational Choice Theory suggests that individuals make choices based on maximising personal utility, balancing benefits and costs to achieve the most favourable outcome (Nickerson, 2023). Applied to education, this theory indicates that students and their families assess various factors, such as education costs, the perceived quality of available institutions, and the expected returns on educational investment, before making enrolment decisions. It highlights the importance of socioeconomic status in



shaping these decisions. For instance, students from lower-income households may be more sensitive to education costs and perceive the benefits as less attainable, reducing their likelihood of pursuing higher education. In contrast, students from wealthier families might view the costs as manageable and the benefits as more certain, leading to higher enrolment rates.

Broad theoretical frameworks strongly support the empirical literature on this relationship. Studies consistently show that financial constraints are a significant barrier to higher education, particularly in developing countries like Lesotho. The under-representation of students from socially disadvantaged backgrounds in higher education is a well-documented issue. Asplund et al. (2008) argue that the imbalances in higher education participation across socioeconomic classes often originate in the earlier stages of the education system. In Lesotho, where many parents struggle to afford secondary school tuition, the barriers to higher education are even more pronounced. Additionally, students from disadvantaged backgrounds may exhibit greater risk aversion, deterred by the high costs of tuition, extended program durations, and uncertainties regarding their success in university studies and subsequent job prospects. The relationship between household income and higher education access is also significant in developed countries. However, the dynamics may differ due to higher average income levels and more extensive financial aid systems. Anders (2012) explored this relationship in England, revealing that students from low-income households are less inclined to apply to university. The study emphasises the importance of policies to narrow the substantial application gap between poorer and wealthier students. The findings suggest that disparities in university attendance rates are not solely due to income increases but are also influenced by income distribution. This indicates that even in high-income countries, economic inequality is crucial in determining access to higher education. In India, Sarkar (2017) examined the determinants of household expenditure on higher education. The study highlighted the pivotal roles of parental education, household income, and caste groups in shaping educational expenditure patterns. The research found that households from backward caste groups tend to allocate fewer resources to education than general category households. This suggests that socioeconomic status and cultural factors play a significant role in determining educational investments in India, similar to the patterns observed in Lesotho. In Sudan, Ebaidalla (2017) examined the factors influencing households' expenditure on education using data from the National Baseline Household Survey (NBHS, 2009) across national, urban, and rural levels. The results indicate a positive and significant relationship between total household income and education spending. The effect of household income is found to be positive and significant in the highest income quintile, indicating greater expenditure among wealthy households compared to poorer ones.

Unemployment plays a crucial role in the slowing economic growth in Lesotho, mainly because a bigger percentage is parental unemployment. Lindemann and Gangl (2020) explored the impact of parental unemployment on children's transition to post-secondary education across various institutional contexts. Their study revealed that parental unemployment significantly reduces household income, directly affecting the budget allocated for education. Children of unemployed parents are less likely to continue into post-secondary education, even after controlling for income. This finding underscores the importance of stable household income in ensuring continuous



educational attainment, a particularly relevant challenge in Lesotho's economically volatile environment. Ilie et al. (2021) explored the link between early schooling opportunities, socioeconomic characteristics, and progression into higher education across Ethiopia, Peru, Vietnam, and India. They found that students from economically disadvantaged backgrounds, even those with high initial levels of early learning, tend to lag in terms of educational attainment. This finding underscores the importance of financial resources in determining educational outcomes. In Lesotho, despite the implementation of free primary education, low enrolment rates at the tertiary level persist, reflecting the continuing barriers posed by financial constraints. These low enrolment rates exacerbate the skill shortage in the country, as many students cannot afford the costs associated with higher education. Walker et al. (2022) conducted a study focusing on the challenges faced by low-income students in South Africa regarding access to higher education. Their research highlighted financial constraints as a major obstacle, with many students lacking the necessary funds for university education. The study revealed that financial difficulties deterred students from applying to university and influenced their choice of degree programs. Some students even faced hardships like food insecurity due to financial limitations. These findings resonate with the struggles experienced by students in Lesotho, where economic barriers often hinder access to higher education and impact academic decisions. However, a study by Ihugba et al. (2022) investigated the effect of household income and expenditure on tertiary education in Nigeria from 1970 to 2020 had contradicting findings. The results indicated that household income has a negative relationship on tertiary education. To a great extent, this investigation clearly expatiated that if the income of households increases, the demand for public tertiary institutions will decrease. The negative results corroborate prior findings suggesting that surveys do not accurately reveal household income. However, it concluded that household expenditure, which measures the standard of living, has a positive relationship with tertiary school enrolment and is a key determinant of students' participation in tertiary schools.

Methodology

This section outlines the methodology employed to analyse the impact of household income on tertiary education and describes the data used, data sources, and descriptive statistics. It begins by looking at the data, its sources and descriptive statistics, and the theoretical framework, then explains the empirical methodology and presents some pre-estimation tests.

Theoretical Framework

The study's theoretical framework is based on the utility maximisation of a parent subject to a budget constraint suggested by Ihugba et al. (2022). It adds a second constraint, which is completing secondary school based on the reviewed literature by Walker et al. (2022). Ihugba et al. (2022) assume that parents derive utility from their consumption of goods (*HHC*) as well as from sending their children to tertiary institutions (*TR*).

$$U = (HHC, TR) \quad (1)$$



There are two constraints in this model, the first will be the budget constraint, which will depend on income, household consumption and any spending towards education from the government, and the second will be the constraint due to the fact that a child will only go to a tertiary institute if they have completed their secondary education (Walker et al., 2022). The two constraints are combined and presented below.

$$\text{Income} + \text{GovExp} = \text{Cost}(\text{TR}) + \text{Cost}(\text{HHC}) \quad (2)$$

$$\text{TR} = \text{TR}(\text{SecComp}) \quad (3)$$

Where **Income** is the household income, **GovExp** government expenditure towards the child's education, **Cost(TR)** is the cost of going to a tertiary institute and **Cost(HHC)** is the cost of household consumption, and lastly **SecComp** represents secondary completion, whether the child has completed secondary school or not.

This renders the demand for sending their child to a tertiary institute a function of household income, government contribution to that child's education, and whether or not the child completed secondary school.

$$\text{TR}^* = \text{TR}(\text{SecComp}, \text{Income}, \text{GovExp}, \text{HHC}) \quad (4)$$

It is upon this theoretical framework just presented that this paper is based, bearing reference to Ihugba et al. (2022) previous work.

Model Specification

To examine the effect of household income on tertiary education in Lesotho, the present study adapts and modifies the basic model specification that was suggested by Ihugba et al. (2022). The model is modified primarily to enable this study to account for the problem of omitted variable bias by including a relevant variable based on the reviewed literature.

$$\text{TR}_t = \beta_0 + \beta_1 \text{SecComp}_t + \beta_2 \text{Income}_t + \beta_3 \text{HHC}_t + \beta_4 \text{GovExp}_t + \varepsilon_t \quad (5)$$

Where **HHC** is the Household Consumption, **TR** is Tertiary Education, **Income** is the household income, **GovExp** is the Government Expenditure towards the child's education, **SecComp** is the Secondary Education Completion, and ε_t is the error term.

Description of Variables and Data Sources

The paper follows and adds to the methodological framework of defining the variables and their proxies.

Dependent variable

Tertiary Education: is the dependent variable which is proxied by the tertiary enrolment ratio. The tertiary enrolment ratio is the proportion of total enrolment, regardless of age, to the population of the age group corresponding to the education level shown. Whether to an advanced research qualification or not, tertiary education usually requires successful completion of secondary education as a minimum condition of admission (Ihugba et al., 2022).



Independent Variables

Income: This is the main independent variable and is proxied by the GDP per capita. GDP per capita is gross domestic product divided by population. GDP used in the calculation of GDP per capita is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for the depreciation of fabricated assets or for the depletion and degradation of natural resources. The income data is in constant Maloti (The World Bank, 2024).

Completion of Secondary: This variable is proxied by the completion rate of upper secondary education. The completion rate of upper secondary education is the percentage of a cohort of children or young people aged 3-5 years above the intended age for the last secondary grade who have completed the final secondary grade.

Household consumption: This variable is proxied by Households NPISHs final consumption expenditure. Household consumption or spending is the amount of final consumption made by resident households to meet their everyday needs, such as food, clothes, healthcare costs, leisure and more.

Government expenditure on Education: This is proxied by Government expenditure on education as a percentage of GDP. The percentage of General government expenditure on education (current, capital, and transfers) is expressed as a percentage of GDP. It includes expenditures funded by transfers from international sources to the government. General government usually refers to local, regional and central governments (The World Bank, 2024).

Data Sources

Due to the availability of the key variables, the study employs secondary time series data for Lesotho from 1993 to 2018. The World Bank's WDI and the UNESCO Institute for Statistics are data sources for all these variables.

Table 1 below shows all the variables used in the study, their proxies and data sources. The variable GDP per capita and household consumption shall be represented in natural logarithms.



Table 1: Variables

Variable	Proxy	Source
Household Income	GDP per Capita	World Development Indicators (WDI)
Household Consumption	Households and NPISHs Final consumption expenditure	WDI
Government Expenditure on Education	Government expenditure on education as a percentage of GDP	WDI
Secondary Education Completion	Completion rate, upper secondary education	UNESCO Institute for Statistics
Tertiary Education	Tertiary school enrolment ratio	UNESCO Institute for Statistics

Source: authors' computations

Econometric Approach

In order to decide on the empirical model to be used in this study, it is required that the variables be tested for stationarity or their order of integration. The primary aim of testing for stationarity is to avoid wrong inferences brought on by spurious regressions (Nkoro & Uko, 2016). Testing the order of integration of a time series is crucial because non-stationary time series often violate the fundamental assumptions of Ordinary Least Squares (OLS) regression, such as constant mean and variance, leading to unreliable and misleading statistical diagnostics like R^2 , Fisher's Ratio, Durbin-Watson statistic, and t-statistics. Non-stationary series, which require differencing to become stationary, lose long-term equilibrium information in the process. This information is essential for understanding the true relationship between variables. Without knowing the order of integration, using OLS can produce spurious results with high R^2 and significant t-statistics, even when no meaningful relationship exists (Nkoro & Uko, 2016). Cointegration techniques, such as the Autoregressive Distributed Lag (ARDL) approach, are beneficial because they can handle variables with different orders of integration, retaining long-run equilibrium information while capturing short-run dynamics. Although ARDL does not require pre-testing for unit roots, it is prudent to conduct such tests to prevent model issues with the $I(2)$ series. Thus, testing for the order of integration ensures the accuracy and reliability of econometric models, leading to realistic forecasts and sound policy decisions (Nkoro & Uko, 2016).

The most widely used test for stationarity is the Augmented Dickey-Fuller (ADF) test for stationarity. The null hypothesis under the ADF test is that there is a presence of a unit root versus the alternative hypothesis, such that there is no unit root. If the p-value is less than the significance level, the null hypothesis of the presence of a unit root is rejected (Wooldridge, 2016). Other common methods for determining a variable's stationary state include the Phillips and Perron test (Ihugba et al., 2022). The test is similar to the ADF test but with a few changes to account for autocorrelated residuals. Both tests will be used in our research. In order to test the order of integration, the ADF and the Phillips and Perron tests shall be performed on the variables as they are.

If they are stationary at level, that would mean they are $I(0)$, and if the variables are not stationary at levels, stationarity is tested for when they have been differenced. If they are stationary at first difference, the variables will be $I(1)$. If they are not stationary at the first difference, they will be differenced again, increasing the order of integration (Wooldridge, 2016). Hence, the order of integration of a variable is how many times it has to be different for it to be stationary (Wooldridge, 2016).

Due to the results of the ADF and the Phillips-Perron test the study has performed, there is enough evidence that the variables are integrated in mixed order. Therefore, to examine the short and long-run relationship between the variables of interest, the study uses an ARDL since the study has a small sample size and the variables are of mixed order (Nkoro & Uko, 2016).

The ARDL Model Specification

ARDL cointegration technique is preferable when dealing with variables that are integrated of different order $I(0)$, $I(1)$ or a combination of both (crashes in the presence of integrated stochastic trend of $I(2)$) and robust when there is a single long-run relationship between the underlying variables in a small sample size. The long-run relationship of the underlying variables is detected through the F-statistic (Wald test) (Nkoro & Uko, 2016).

The ARDL form of the model is specified as:

$$\Delta TR_t = \beta_0 + \beta_1 SecComp_{t-i} + \beta_2 Income_{t-i} + \beta_3 HHC_{t-i} + \beta_4 GovExp_{t-i} + \beta_5 TR_{t-i} + \sum_{i=1}^q \beta_{i1} \Delta TR_{t-i} + \sum_{i=1}^p \beta_{i2} \Delta Income_{t-i} + \sum_{i=1}^p \beta_{i3} \Delta HHC_{t-i} + \sum_{i=1}^p \beta_{i4} \Delta SecComp_{t-i} + \sum_{i=1}^p \beta_{i5} \Delta GovExp_{t-i} + \mu_t \quad (6)$$

The next step is to examine if the model ARDL error correction model (ECM) should be estimated. This is done by testing whether or not there is a presence of steady-state equilibrium between variables.

Bounds Test for Cointegration

To examine if the model ARDL error correction model should be estimated, we use Pesaran, Shin and Smith's ARDL Bounds Test (Pesaran et al., 2001). This test is based on the joint F-test, and its null hypothesis is that there is no cointegration.

$(H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0)$ against the alternative hypothesis that there is at least one cointegrating relationship $(H_1: \beta_1 \neq 0 \text{ or } \beta_2 \neq 0 \text{ or } \beta_3 \neq 0 \text{ or } \beta_4 \neq 0 \text{ or } \beta_5 \neq 0)$.

The decision criterion is to reject the null hypothesis of no cointegration if the F-statistic is greater than the upper critical bounds. The null hypothesis fails to be rejected if the calculated F-statistic is less than the lower bounds of the critical values. Since the results of the bound test show that there is cointegration in the model, the study shall estimate the ARDL-ECM.



Empirical Model Specification

The ARDL-ECM to be used in this study shall be specified as follows:

$$\Delta TR_t = \beta_0 + \sum_{i=1}^q \beta_{i1} \Delta TR_{t-i} + \sum_{i=1}^p \beta_{i2} \Delta Income_{t-i} + \sum_{i=1}^p \beta_{i3} \Delta HHC_{t-i} + \sum_{i=1}^p \beta_{i4} \Delta SecComp_{t-i} + \sum_{i=1}^p \beta_{i5} \Delta GovExp_{t-i} + \lambda ECT_{t-1} + \mu_t \quad (7)$$

Where *HHC* is the Household Consumption, *TR* is Tertiary Education, *Income* is the household income, *GovExp* is the Government Assistance towards the child's education, *SecComp* will be Secondary Education Completion, *ECT* is the error correction term, and lastly μ_t is the error term.

Diagnostics Tests

Because the ARDL model seeks the best linear unbiased estimator (BLUE), diagnostic tests are required (Ihugba et al., 2022). Three tests were undertaken in this study to ensure the validity of the results.

Testing for serial correlation using the Durbin-Watson test for autocorrelation.

The null hypothesis is that there is no serial correlation, whereas the alternative hypothesis is that there is a serial correlation. The Durbin-Watson statistic uses the rule of thumb to make a decision. The Durbin-Watson statistic ranges between zero and four. When the statistic is a value near two, it indicates no serial correlation; a number closer to zero indicates a positive correlation; and a value nearer to four implies a negative correlation.

Testing for heteroskedasticity using the Breusch-Pagan test for heteroskedasticity.

The null of this test is of constant variance, and the null hypothesis of homoskedasticity fails to be rejected if the p-value is greater than the chosen significance level.

Testing for normality of the errors by using the Jarque-Bera test.

The null hypothesis under this test is that the errors are normally distributed. If the p-value is greater than the significance level, the study will fail to reject the null hypothesis of normality.

Results and Discussions

This section presents the descriptive and regression results and their analysis. The data analysis process begins with the calculation of summary statistics and an examination of the variable correlation. The section then proceeds by analysing and discussing the regression results in line with the study's objective.

Descriptive Statistics

Summary Statistics

To begin the data analysis, the summary statistics are presented in Table 2 to provide the overview and key characteristics of the dataset used.



Table 2: Summary Statistics

Variable	Obs.	Mean	Std. Dev	Min	Max
Gross Enrolment Ratio	26	5.597	3.681	1.897	11.03
Government Expenditure on Education (% GDP)	26	9.832	1.97	7.025	13.22
GDP per Capita (Maloti)	26	8039.301	1605.471	5586.038	10498.742
Completion Rate, Upper Secondary	26	15.444	4.726	10	31.866
Household Consumption (US Dollars)	26	1.165e+09	5.252e+08	3.151e+08	1.896e+09

The dataset for Lesotho from 1993 to 2018 includes five key variables: Gross Enrolment Ratio, Government Expenditure on Education (% of GDP), GDP per Capita (in Maloti), Completion Rate at Upper Secondary, and Household Consumption (in US Dollars). Analysing these variables provides valuable insights into Lesotho's socio-economic trends and educational developments over this period and shows how household income has been evolving along with tertiary enrolment.

Starting with the Gross Enrolment Ratio, an average value of approximately 5.6 is observed, with a standard deviation of 3.681. This high variability suggests significant fluctuations in enrolment ratios, ranging from a minimum of 1.897 to a maximum of 11.03. Such changes could be attributed to shifts in population demographics, policy adjustments, or varying levels of access to education over the years. This indicator highlights the dynamic nature of educational participation in Lesotho, with low and high enrolment periods. These figures are way below the global average, indicating a need for measures to improve it (The World Bank, 2024). The GDP per Capita in Maloti shows an average of 8039.301, with a standard deviation of 1605.471. The minimum and maximum values, 5586.038 and 10498.742, respectively, indicate a general upward trend in economic growth. This increase in GDP per capita suggests improved economic conditions over the years, likely contributing to higher household incomes and better living standards. The economic growth observed here could also have positive implications for other socio-economic indicators, including education and consumption.

Government Expenditure on Education, as a percentage of GDP, averages 9.832 with a standard deviation of 1.97. The expenditure ranges from 7.025 to 13.22, indicating moderate variability. This range reflects changes in government priorities, economic conditions, and possibly external funding influences. The consistency in maintaining the percentage of GDP for education suggests a sustained commitment to improving educational outcomes despite economic fluctuations. The Completion Rate for Upper Secondary education averages 15.444, with a standard deviation of 4.726. The completion rate ranges from 10 to 31.866, showing significant variability. This suggests that while there have been improvements in upper secondary completion rates, challenges remain that cause fluctuations. Household Consumption in US dollars averages approximately 1.165 billion, with a substantial standard deviation of 525.2 million. The range from 315.1 million to 1.896 billion indicates high variability in household consumption patterns. This variability could be influenced by changes in

disposable income, economic policies, inflation rates, and external economic shocks. High household consumption is generally a positive sign of economic health, suggesting that households have more to spend on goods and services.

To provide an even better picture of the variables and to provide a more comprehensive understanding of the socio-economic and educational landscape of Lesotho over the study period, the study plots the time series data for both the variables of interest, household income (GDP per Capita) and tertiary education (Tertiary Gross Enrolment ratio). Furthermore, correlation analysis is done to reveal relationships between variables.

Correlation Analysis

Figure 1 below plots the time series data for the tertiary enrolment ratio and that of GDP per capita. The graph shows a strong positive relationship between the two variables. GDP per Capita has been growing steadily during the investigation period, while the gross enrolment ratio grew quickly during the millennium's first decade. There is a decline in the gross enrolment ratio and GDP per capita during the second decade.

Figure 1: Graph of Tertiary Enrolment Ratio and GDP per Capita

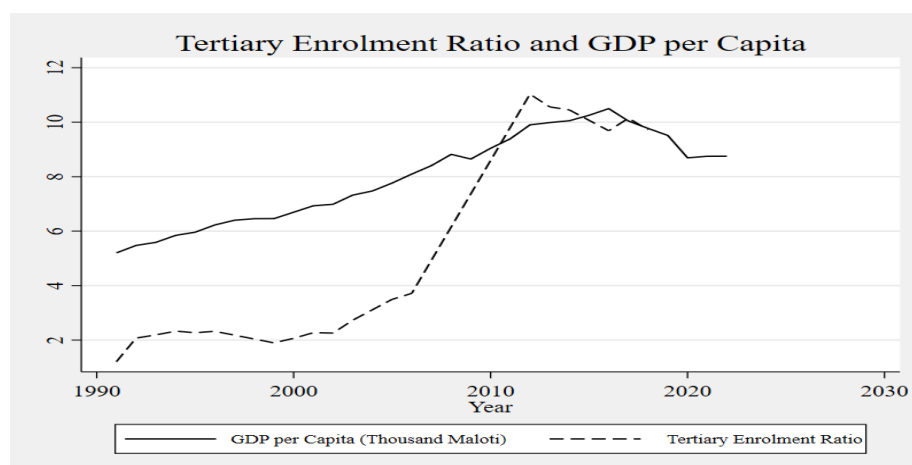


Table 3 below provides the correlation matrix between both the dependent and explanatory variables. The relationship between GDP per Capita and the GER in Lesotho from 1993 to 2018 is highlighted by a strong positive correlation of 0.943. This significant correlation ($p\text{-value} < 0.01$) suggests that the GER also rises as the GDP per Capita increases. This relationship implies that economic growth, reflected in higher GDP per Capita, enhances the capacity of households to invest in education, thus leading to higher enrolment rates in tertiary education (Donkoh & Amikuzuno, 2011).

Higher GDP per Capita indicates improved economic conditions, which generally translate into higher household incomes. With more disposable income, families are better positioned to afford the costs associated with education, such as tuition fees, books, and other educational materials (Ihugba et al., 2022). This financial capability allows more individuals to pursue tertiary education, thereby increasing the Gross Enrolment Ratio. The positive correlation between GDP per Capita and Household Consumption (0.976) further supports this notion, as increased household spending likely includes investments in education (Donkoh & Amikuzuno, 2011).

Table 3: Correlation Matrix

Variables	GER	Gov Expenditure	GDP per Capita	SecComp	HHC
Gross Enrollment Ratio	1.000				
Government Expenditure	-0.572* (0.002)	1.000			
GDP per Capita	0.943* (0.000)	-0.409* (0.038)	1.000		
Completion Rate; Upper Secondary	0.698* (0.000)	-0.306 (0.128)	0.742* (0.000)	1.000	
Household Consumption	0.902* (0.000)	-0.320 (0.112)	0.976* (0.000)	0.792* (0.000)	1.000
<i>p</i> <0.01, <i>p</i> <0.05, <i>p</i> <0.1					

Additionally, the Completion Rate at the Upper Secondary level, which is positively correlated with GDP per Capita (0.742), plays a critical role in tertiary enrolment. A higher completion rate at the secondary level expands the pool of students eligible for tertiary education. This suggests that economic growth not only boosts household financial capacity but also contributes to higher educational attainment at the secondary level, subsequently leading to higher tertiary enrolment rates (Asplund et al., 2008).

Conversely, Government Expenditure on Education (% of GDP) shows a significant negative correlation with both the Gross Enrolment Ratio (-0.572) and GDP per Capita (-0.409). This may indicate that during periods of economic growth, the relative share of GDP allocated to education decreases, potentially due to shifts in government spending priorities. However, the strong positive impact of GDP per capita on the gross enrolment ratio suggests that the overall effect of economic growth on education enrolment is positive, even if the government's share of expenditure decreases.

In summary, the strong positive correlation between GDP per Capita and Gross Enrolment Ratio underscores the crucial role of economic growth in enhancing educational participation. As Lesotho's economy grows and household incomes rise, more resources become available for investment in education, leading to higher enrolment rates in tertiary education.

Unit Root Results

The results of the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test for stationarity are presented in Table 4, indicating the order of integration for each variable.

Table 4: ADF Test for Stationarity Results

Variable	p-value: At Level		p-value: At First Difference		Order of Integration
	ADF	P-Perron	ADF	P-Perron	
Household Income	0.8218	0.6563	0.0000	0.0000	I (1)
Household Consumption	0.0002	0.0000	N/A	N/A	I (0)
Government Expenditure	0.0540	0.0562	0.0008	0.0003	I (1)
Secondary Education Completion	0.9664	0.3707	0.0001	0.0000	I (1)
Tertiary Education	0.7740	0.3162	0.0071	0.0794	I (1)

Note: The significance level used is the 5% level of significance

Household Income, Secondary Education Completion, Tertiary Education, and Government Expenditure all exhibit non-stationarity at level but become stationary after first differencing, suggesting they are integrated of order one, I(1). In contrast, household consumption is stationary at levels with highly significant p-values of 0.0002 and 0.0000, indicating it is integrated with order zero, I(0). These results confirm that most variables in the analysis require differencing to achieve stationarity, except for Household Consumption, which is inherently stationary. Hence, they are of mixed order, and there are no variables of order of integration of 2. This validates the use of the ARDL.

Cointegration Results

The Bound Test for Cointegration results in Table 5 indicate the presence of a long-run equilibrium relationship among the variables in the model. According to the Bound Test methodology, if the F-statistic exceeds the upper bound, the null hypothesis of no cointegration can be rejected.

Table 5: Bound Test for Cointegration

F-Statistic	Upper Bound (5%)	Lower Bound (5%)	Decision
8.866	4.01	2.86	There is cointegration

The F-statistic obtained from the test is 8.866, significantly higher than the upper bound (4.01) and the lower bound (2.86) at the 5% significance level. Therefore, since the F-statistic in this case is greater than the upper bound, the conclusion is that there is strong evidence of cointegration among the variables. Therefore, the study continues by estimating the ECM. Results in Table 5 present estimations of the effects of GDP per Capita and other macroeconomic conditions on Lesotho's Tertiary Gross Enrolment ratio from 1993 to 2018. These effects are estimated using the ARDL-ECM.

Lag Selection

In time series analysis, the lag length selection holds significant importance as it directly influences the accuracy of model results, particularly in small sample sizes. While multiple methods exist for lag selection, the Schwarz Information Criterion (SIC) stands out as a preferred choice due to its ability to provide slightly superior estimates compared to the Akaike Information Criterion (AIC) in small samples. Unlike AIC, which tends to overestimate the number of lags and can lead to overfitting, SIC strikes a balance by penalising model complexity, making it particularly suitable for small sample sizes where reducing the lag length preserves valuable observations (Ihugba et al., 2022). Lag selection was done by employing SIC, and the ARDL-ECM (3, 3, 0, 3, 0) was estimated.

Regression Results

Table 6: Regression Results

Gross Enrolment Ratio for Tertiary	Coefficient	Std Error	t-stat	P-value
Error Correction Term	-0.336	0.077	-4.360	0.001
Long-Run				
Log of GDP per Capita	35.076	4.402	7.970	0.000
Government Expenditure on Education	0.128	0.158	0.810	0.434
Completion Rate, Upper Secondary	-0.360	0.265	-1.360	0.199
Log of Household Consumption	-5.656	1.308	-4.330	0.001
Short-Run				
Gross Enrolment Ratio for Tertiary				
LD.	0.952	0.138	6.910	0.000
L2D.	0.237	0.179	1.330	0.209
Log of GDP per Capita				
D1.	-10.236	3.864	-2.650	0.021
LD.	-11.204	3.080	-3.640	0.003
L2D.	-7.052	3.187	-2.210	0.047
Completion Rate, Upper Secondary				
D1.	0.042	0.087	0.480	0.639
LD.	0.079	0.065	1.230	0.243
L2D.	0.076	0.039	1.920	0.079
Constant	-62.556	12.417	-5.040	0.000
R-squared = 0.9434; Adjusted R-squared = 0.8822; Prob. (F-statistic) = 0.000				

The coefficient of the error correction term in a model plays a pivotal role in assessing the adjustment dynamics toward long-run equilibrium. The negative sign and the statistical significance of the adjustment term are fundamental as they reflect the error correction concept, signifying that any deviation from the long-run equilibrium will be rectified over time (Pesaran et al., 2001). A positive adjustment term would contradict this notion, suggesting that deviations persist indefinitely, thus no correction towards long-run equilibrium (Pesaran et al., 2001). A statistically significant adjustment term implies a systematic and substantial response to deviations from long-run equilibrium, affirming the robustness of the model (Pesaran et al., 2001). In this context, the statistically significant adjustment term of -0.336 underscores the presence of an error correction mechanism in the model, signifying that those deviations from long-term equilibrium in the tertiary gross enrolment ratio are corrected at a rate of 0.336 units per time period.

In the long run, the logarithm of GDP per capita emerges as a significant determinant with a coefficient of 35.076, implying that a 1% increase in GDP per capita leads to approximately a 35.076% increase in the tertiary gross enrolment ratio, highlighting the role of economic prosperity in facilitating access to higher education. This relationship suggests that wealthier economies can allocate more resources toward education, making it more accessible and affordable. Additionally, higher GDP per capita typically corresponds to higher household incomes, which can reduce financial barriers to tertiary education for individuals. Barro and Lee (2013) supported this finding and found that economic growth and higher income levels positively correlate with higher educational attainment across countries. They argue that as countries become wealthier, they can invest more in their educational infrastructure and systems, thereby increasing enrolment rates at all levels of education. Similarly, Psacharopoulos and Patrinos (2018) suggest that higher GDP per capita increases the demand for skilled labour, incentivising individuals to pursue higher education to improve their employment prospects and potential earnings.

The short-run effects of changes in GDP per capita and completion rate at the upper secondary level are statistically significant. For GDP per capita, the coefficient of -10.236 indicates that a 1% increase in GDP per capita leads to approximately a 10.236% decrease in the tertiary gross enrolment ratio in the short run, *ceteris paribus*. This counterintuitive relationship suggests that in the short term, individuals may have greater opportunities in the labour market or other pursuits as economic conditions improve. This leads to a temporary decrease in tertiary enrolment (De Vreyer & Roubaud, 2013; Oosterbeek & Patrinos, 2009). The opportunity cost of education increases during economic booms. As more job opportunities arise, individuals might opt to enter the labour market directly to capitalise on these opportunities, postponing or forgoing higher education. Second, improved economic conditions may lead to higher wages for jobs that do not require tertiary education, making pursuing further education less attractive than immediate financial gains from employment (De Vreyer & Roubaud, 2013; Oosterbeek & Patrinos, 2009).

On the other hand, the logarithm of household consumption emerges as a significant determinant in the long run, with a coefficient of -5.656, suggesting that higher levels of household consumption are associated with lower tertiary enrolment, possibly due to alternative uses of income or differing priorities among households. These results echo the sentiments of Ihugba et al. (2022), who suggest that there is a substitution



effect between household consumption and tertiary enrolment. Sending children to tertiary institutions necessitates a sacrifice of current consumption in order to invest in fees and school supplies (Ihugba et al., 2022).

The short-run coefficients in the regression model provide insights into the immediate effects of changes in explanatory variables on the tertiary gross enrolment ratio. In this model, the lagged values of the tertiary gross enrolment ratio demonstrate high significance, with a coefficient of 0.952, indicating strong persistence over time. This suggests that past tertiary enrolment levels substantially influence current enrolment levels, highlighting the inertia or momentum in enrolment patterns.

Conversely, government expenditure on education does not appear to have a statistically significant impact on tertiary enrolment, as indicated by its p-value of 0.434. This suggests that while government spending is important, its influence on tertiary enrolment might be less pronounced than other factors. These results align with the results of Ihugba et al. (2022) and Bergh and Fink (2006). Bergh and Fink (2006) suggest that the effect is insignificant because it is distributed between primary, secondary and tertiary education, suggesting that there would be more positive results if more allocation were towards primary and secondary. The situation is similar in Lesotho where educational spending by the government is mostly skewed towards higher education, hence the insignificant impact on tertiary enrolment (The World Bank, 2019).

Furthermore, the completion rate at the upper secondary level does not demonstrate statistical significance in both the short and long run, indicating that while secondary education completion is essential, its direct impact on tertiary enrolment might be limited within the context of this model. Only the second lag of the short-run completion rate at the upper secondary level demonstrates some small significance with a small coefficient of 0.076, suggesting that, on average and *ceteris paribus*, a 1 percentage point increase in the completion rate at the upper secondary level in this year results in a 0.076 percentage point increase in the tertiary gross enrolment ratio in the next two years. The issue here might be demand and supply, and lack of information. There may be too few schools per student (Council on Higher Education, 2023), or the delay is because people are unaware of higher learning opportunities that are available to them (Chesters & Cuervo, 2022).

Overall, the model exhibits a high level of explanatory power, with an R-squared value of 0.9434, indicating that the independent variables explain approximately 94.34% of the variation in the tertiary gross enrolment ratio. However, it is worth noting that while the model provides valuable insights, other unobserved factors influencing tertiary enrolment may not be captured in the analysis.

Diagnostics Tests

The diagnostic tests presented in Table 6 are crucial for validating the regression model's assumptions. These tests help ensure the reliability and robustness of the regression results by checking for issues such as serial correlation, heteroskedasticity, and non-normality of residuals.



Table 7: Results for Diagnostics Tests

Test	Test Statistic	p-value	Decision
Durbin-Watson Test: Serial correlation	1.764437	Closer to 2 than to 0	No Serial Correlation
Breusch-Pagan Test: Homoskedasticity	1.32	0.2503	No Heteroskedasticity
White's Test: Homoskedasticity	26.00	0.4076	No Heteroskedasticity
Jarque-Bera Test: Normality	2.711	.2578	Normal

The Durbin-Watson test is used to detect the presence of autocorrelation (serial correlation) in the residuals from a regression analysis. The test statistic is 1.764437. A value closer to 2 indicates that there is no significant serial correlation in the residuals. Since the test statistic is closer to 2 than to 0, it suggests that the residuals from the model are independent, which is a key assumption of ordinary least squares (OLS) regression.

The Breusch-Pagan test is used to test the presence of heteroskedasticity, which occurs when the variance of the residuals is not constant across observations. The results show that the test statistic is 1.32 with a p-value of 0.2503. A p-value greater than 0.05 indicates that the null hypothesis of homoskedasticity fails to be rejected. This implies that there is no evidence of heteroskedasticity in the model, suggesting that the variance of the residuals is constant, and the assumption of homoskedasticity holds.

White's test is another test for heteroskedasticity that also checks for model specification errors. The results show a test statistic of 26.00 and a p-value of 0.4076. Similar to the Breusch-Pagan test, a p-value greater than 0.05 means that the null hypothesis cannot be rejected for homoskedasticity. This confirms that there is no heteroskedasticity in the model, supporting the assumption that the variance of the residuals is constant.

The Jarque-Bera test is used to check whether the residuals are normally distributed, another OLS regression assumption. The results of the test show that the test statistic is 2.711 with a p-value of 0.2578. A p-value greater than 0.05 suggests that the null hypothesis of normality cannot be rejected. This indicates that the residuals are normally distributed, satisfying the normality assumption.

The results from the diagnostic tests suggest that the regression model meets the key assumptions of OLS regression. Specifically, the Durbin-Watson test indicates no significant autocorrelation in the residuals, ensuring that they are independent. The Breusch-Pagan and White's tests show no evidence of heteroskedasticity, suggesting that the variance of the residuals is constant. Lastly, the Jarque-Bera test confirms that the residuals are normally distributed. These findings enhance the credibility of the regression results, indicating that the estimated coefficients are reliable and that the inferences drawn from the model are valid.

In the short run, an increase in GDP per capita is associated with a decrease in tertiary enrolment. This counterintuitive result may be due to improved economic conditions



offering more immediate job opportunities, leading individuals to forgo further education for employment. As De Vreyer and Roubaud (2013) and Oosterbeek and Patrinos (2009) suggest, the opportunity cost of education rises during economic booms. As more job opportunities arise, individuals might opt to enter the labour market directly to capitalise on these opportunities, postponing or forgoing higher education. Additionally, improved economic conditions may lead to higher wages for jobs that do not require tertiary education, making pursuing further education less attractive than immediate financial gains from employment.

Household consumption levels negatively correlate with tertiary enrolment, indicating that higher consumption may divert resources away from education, aligning with the substitution effect described in previous studies. Ihugba et al. (2022) emphasise that sending children to tertiary institutions necessitates sacrificing current consumption to invest in fees and school supplies. This finding underscores the importance of financial planning and household prioritisation to support higher education investments.

Despite the importance of government expenditure on education, its impact on tertiary enrolment is not statistically significant, possibly due to the distribution of spending across different educational levels. Bergh and Fink (2006) and Ihugba et al. (2022) suggest that the effect of government expenditure might not be significant due to its allocation between primary, secondary, and tertiary education. In Lesotho, educational spending by the government is predominantly skewed towards higher education, which might not directly increase tertiary enrolment rates. The current spending patterns exacerbate access disparities, particularly for underprivileged populations who struggle to complete secondary education (The World Bank, 2019).

Additionally, the completion rate at the upper secondary level shows limited direct impact on tertiary enrolment, although it does demonstrate some delayed effect. Only the second lag of the short-run completion rate at the upper secondary level shows a small but significant coefficient, suggesting that an increase in secondary education completion rates positively influences tertiary enrolment after a delay. This could be due to the time students need to transition from secondary to tertiary education. However, barriers such as limited school availability and lack of awareness about higher education opportunities might impede this transition, indicating a need for policies that improve the link between secondary and tertiary education (Council on Higher Education, 2023).

Conclusion and Recommendations

Conclusion

The study investigated the relationship between household income and access to higher education in Lesotho, focusing on how socio-economic factors and government expenditure influence educational opportunities. The study employed secondary time series data for Lesotho from 1993 to 2018, leveraging the availability of key variables over this period. Given the small sample size and the mixed order of integration among the variables, the ARDL-ECM model examines short- and long-run relationships. The ARDL approach is particularly suited for this study as it allows for the inclusion of variables that are integrated of different orders, $I(0)$ and $I(1)$, and provides reliable estimates even with small sample sizes (Nkoro & Uko, 2016).

This highlights the need for Lesotho to focus on improving the enrolment of upper secondary education to enable a large cohort of freshmen in higher education



institutions. Additionally, this study examined the relationship between household income and access to higher education in Lesotho and how government expenditure on education influences it. This study aimed to shed light on the underlying factors contributing to educational inequalities.

The analysis shows that each variable played a significant role but had a varying impact on higher education. The tests confirmed the model's stability; they ensured the reliability and robustness of the findings and produced confidence in the results obtained. It also reveals that GDP per capita significantly enhances tertiary gross enrolment ratios in the long run, highlighting the positive role of economic prosperity in facilitating access to higher education. In summary, this paper contributes to the existing literature, suggesting that wealthier economies can invest more in educational infrastructure, thereby increasing enrolment rates. For instance, some researchers found that as countries become wealthier, they can allocate more resources to education, improving accessibility and quality, and some argue that higher GDP per capita increases the demand for skilled labour, incentivising individuals to pursue higher education to enhance their employment prospects and potential earnings.

Recommendations

For government contribution towards tertiary, the government should implement more effective and equitable financial support mechanisms, such as means-tested bursaries, to ensure that students from low-income households can afford higher education. Improving the current bursary scheme's sustainability and effectiveness is crucial. Also, the government should increase its investment in secondary education to boost tertiary enrolment and subsidise secondary education for most of the population to help more and more students meet the requirements for tertiary education.

Policymakers should consider economic policies that encourage the pursuit of higher education even during times of economic growth. This could involve creating incentives for employers to support further education or offering part-time study options that allow students to work while pursuing their degrees. Enhancing awareness about higher education opportunities and the long-term benefits of tertiary education is essential. Information campaigns can help students and families make informed decisions about investing in higher education.

Conducting a thorough review of how education spending is allocated across different educational levels can help ensure that funds are effectively used to promote equitable access to education. Increasing funding for primary and secondary education could create a stronger foundation for higher education. As for overcoming income and consumption disparities in different households, implementing programs that provide academic assistance and mentoring can help students from disadvantaged backgrounds succeed in secondary school and progress to tertiary education.

By addressing both financial and academic barriers to higher education, Lesotho can work towards achieving more equitable access to higher education, fostering socio-economic mobility, and supporting sustainable development goals. This comprehensive approach will help build a skilled workforce, drive economic growth, and reduce inequalities within the education system.



Limitations and Areas for Future Research

Future research should explore additional factors influencing higher education access in Lesotho, such as cultural attitudes towards education, primary and secondary education quality, and regional disparities within the country. Investigating the impact of digital learning technologies and remote education could also provide insights into new avenues for expanding access to higher education. Moreover, longitudinal studies tracking students' educational journeys from primary through tertiary levels could offer a deeper understanding of the barriers and enablers of educational progression in Lesotho.

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