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Public Spending, Enrolment, and Economic Growth: A Study of Higher Education in Nepal

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Abstract

Background: Higher education is a key component of human-capital formation and is widely viewed as a driver of long-run economic growth. In Nepal, however, empirical evidence on the macroeconomic contribution of higher education remains limited, particularly over an extended period marked by political transition, federal restructuring, and changing development priorities. This study examines whether public investment and enrolment expansion in higher education have translated into sustained economic growth, while accounting for persistent concerns related to skill mismatch and institutional effectiveness.

Methods: The study utilised annual time-series data for the period 1990-2024. Government expenditure on higher education (as a share of total education budget) and tertiary enrolment rates were employed as proxies for advanced human-capital investment. The Autoregressive Distributed Lag (ARDL) bounds-testing approach was applied to examine long-run relationships and short-run dynamics between higher education variables and real GDP growth. Standard diagnostic and stability tests were conducted to ensure model validity.

Results: The findings revealed a positive and statistically significant long-run relationship between higher education expenditure and economic growth. Tertiary enrolment also exhibited a positive association with growth, although its impact appeared conditional on institutional quality and labour-market alignment. Short-run effects were presented but comparatively weaker, reflecting the gradual nature of human capital accumulation.

Conclusion: The results indicate that enrolment expansion alone is insufficient to maximise higher education's growth contribution. Policy effectiveness depends on quality-enhancing investment, institutional efficiency, and improved alignment between graduate skills and economic demand.

Novelty: This study provides one of the longest ARDL-based analyses of higher education and economic growth in Nepal, integrating both expenditure and enrolment within a single dynamic framework and offering policy-relevant insights beyond access-focused approaches.

Keywords: Economic Growth, Higher Education, Nepal, Public Spending

Introduction

Higher education has increasingly been recognised as a critical catalyst for economic advancement within both academic scholarship and policy discourse. Rooted in human capital theory, education is conceptualised as an investment that enhances labour productivity, fosters innovation, and supports sustained economic development (Schultz, 1961; Becker, 1964; Lucas Jr, 1988; Romer, 1990). This theoretical foundation has significantly influenced development strategies in many countries, particularly developing economies that seek long-term growth through human capital formation. Empirical research across diverse contexts broadly supports a positive association between higher education, measured through enrolment expansion and public expenditure, and economic growth (Hanushek & Woessmann, 2020; Ahamed, 2021). However, the magnitude, durability, and transmission of these effects vary considerably across

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countries, reflecting differences in economic structure, labour-market dynamics, governance capacity, and the quality of educational investment.

Methodological advances in time-series econometrics have enabled a more refined examination of the education-growth nexus. In particular, the Autoregressive Distributed Lag (ARDL) framework allows researchers to capture both long-run equilibrium relationships and short-run dynamics between education-related variables and macroeconomic performance. Empirical applications of ARDL models demonstrate that education expenditure exerts a statistically significant and positive impact on GDP growth in South Asian economies, including India and Pakistan, over the long run (Hussaini, 2020). Comparable evidence from the Middle East indicates that sustained investment in education contributes positively to per capita GDP growth, reinforcing the argument that human capital accumulation yields lasting macroeconomic benefits when supported by a consistent policy commitment (Gheraia et al., 2021). These findings highlight the analytical value of dynamic modelling approaches in understanding the evolving relationship between education and economic growth.

Within this global discourse, Nepal presents a compelling yet relatively underexplored case. As a landlocked least developed country with limited industrialisation, Nepal faces persistent structural constraints to economic growth. At the same time, the country has demonstrated a sustained commitment to expanding its higher education system through public policy initiatives and the growth of public and community-based institutions. Nepal's tertiary education sector now comprises more than 1,400 campuses serving nearly 500,000 students, representing a substantial expansion since the early 1990s (University Grant Commission, 2024). This growth has been supported by donor-funded reform initiatives, including the Second Higher Education Project (SHEP) and the ongoing Higher Education Reforms Project (HERP), both of which aim to improve access, quality, and institutional relevance across the sector.

Despite these quantitative gains, concerns persist regarding the effectiveness of public investment in higher education. Evidence suggests that while enrolment and institutional coverage have expanded, real per-student funding has stagnated, raising questions about sustainability, equity, and educational quality (Aryal, 2020). Although Nepal allocates approximately four percent of its GDP to education, only a modest proportion of this spending is directed toward the tertiary level, limiting the sector's capacity to deliver high-quality outcomes (UNESCO, 2022a). Moreover, high rates of youth outmigration for employment and further study complicate the assessment of domestic economic returns to higher education, particularly in the absence of sufficient high-skill employment opportunities within the country.

Recent empirical studies reflect this complexity in Nepal's education-growth relationship. Evidence of a long-run cointegrated relationship between tertiary enrolment and economic growth suggests that higher education plays an important role in shaping macroeconomic performance over time (Dangal & Gajurel, 2019). At the same time, other analyses report that the impact of education expenditure on real GDP is negative but statistically insignificant, indicating weaknesses in expenditure targeting and inefficiencies in

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resource utilisation (Duwal & Suwal, 2024). These mixed findings underscore the need for a more nuanced and dynamic examination of how public expenditure and enrolment in higher education interact to influence economic outcomes in Nepal.

Research Objective

To examine the long-run and short-run relationship between Nepal's real GDP growth and two key higher-education inputs, government expenditure on higher education and the tertiary enrolment rate, over the study period.

Review of Literature

Global Evidence on Tertiary Education Investment and Economic Growth

The theoretical foundation for analysing the growth effects of education is rooted in human capital theory, which posits that investments in education enhance productivity, innovation, and long-run economic performance (Schultz, 1961; Romer, 1990; Becker, 1994). While these classical insights remain central, recent empirical studies reveal that the influence of higher education on economic growth is highly dependent on the quality of educational systems, institutional strength, and alignment with labour-market needs. Contemporary evidence confirms that tertiary education contributes significantly to economic expansion when it is supported by targeted investment and coherent governance frameworks.

Recent global studies demonstrate that higher-education expenditure and tertiary enrolment exert substantial long-run effects on GDP growth in developing and emerging economies (Ahamed, 2021). These findings suggest that countries capable of effectively converting educational investment into productive skills experience stronger growth trajectories, highlighting the importance of strategic allocation of public resources. Further evidence from the ASEAN-5 region shows that the contribution of tertiary education intensifies once enrolment surpasses a critical threshold and when higher-education systems are supported by research capacity and innovation ecosystems (Maneejuk & Yamaka, 2021). This emphasises that the scale and quality of tertiary education jointly determine its developmental impact rather than enrolment expansion alone.

Scholars increasingly caution, however, that the mere expansion of tertiary institutions does not automatically yield economic benefits. Cross-country reviews emphasise that educational quality, measured by cognitive skills, learning outcomes, and research productivity, has a more consistent and robust impact on economic performance than years of schooling or participation rates (Hanushek & Woessmann, 2020). This shift from quantity to quality signals that human capital accumulation is meaningful only when higher education equips graduates with transferable competencies and problem-solving abilities suited to modern labour markets. Recent international monitoring reports also document that weak governance, inefficient financing, and limited labour-market absorption capacities significantly reduce the returns to educational investment, especially in low-income economies (Arnhold & Bassett, 2021; UNESCO, 2022b; OECD, 2023). These global patterns collectively indicate that

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higher education contributes to economic growth most effectively when investment is complemented by institutional reform and quality assurance mechanisms.

Nepali Context: Investment in Higher Education

In Nepal, the relationship between higher education and economic growth has become increasingly salient as the country aspires to achieve middle-income status and strengthen its knowledge-based development trajectory. Earlier Nepal-focused studies highlight the positive contribution of higher education to long-term productivity and economic expansion (Duwal & Acharya, 2023). More recent analyses provide stronger empirical validation, showing that tertiary enrolment exerts a positive and significant effect on GDP growth, whereas lower levels of schooling demonstrate weaker or delayed impacts (Khanal, 2020). These patterns indicate that Nepal's structural transformation increasingly depends on higher-level skills rather than basic educational expansion alone.

The recent study demonstrated that tertiary education contributes more substantially to economic growth than primary and secondary levels, owing to its stronger linkages with productivity enhancement, innovation, and sectoral diversification. This reinforces the argument that Nepal's path to growth is increasingly tied to the strategic development of its higher-education system rather than enrolment expansion at the foundational levels. In broader comparative terms, Nepal's public expenditure on education, typically ranging between 3 to 5 percent of GDP, remains below UNESCO's recommended 6 percent norms, and internal inefficiencies often dilute the developmental impact of such investment (Khanal et al., 2025). This underscores the urgent need for stronger fiscal prioritisation and institutional reforms to ensure that public spending translates into measurable economic outcomes.

Recent South Asian research also supports the increasing importance of tertiary and vocational education for productivity enhancement, innovation readiness, and structural transformation (Hussaini, 2020; Uddin & Khan, 2024). These findings are particularly relevant for Nepal, where the labour market increasingly demands advanced skills, while domestic production structures remain constrained by limited technological capacity. Collectively, the emerging body of Nepal-specific and regional evidence highlights that higher education can play a pivotal role in sustaining long-run economic growth, provided that financial investment, governance reforms, and quality improvements move together in a coherent policy direction.

Overall, the contemporary literature establishes that higher education, through targeted public investment and expanded tertiary enrolment, can act as a catalyst for economic growth. Yet the growth effects materialise only under conditions of quality, institutional readiness, and labour-market alignment. While Nepal's recent studies affirm the positive impact of tertiary education on GDP, they do not jointly analyse the dynamic relationship between public expenditure and tertiary enrolment using an integrated time-series framework. This absence of a comprehensive empirical approach creates a gap in understanding how the financial and human-capital dimensions of higher education interact to influence Nepal's economic performance. The present study addresses this gap by employing longitudinal ARDL and ECM models to examine these relationships in a more systematic and policy-relevant manner.

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Methods

Economic growth is a long-run phenomenon and is the joint outcome of the productive capacity of a nation, influenced by factors such as capital accumulation, human capital formation, and technological advancement (Ahmad et al., 2020). The process of economic growth is inherently complex, with multiple interrelated drivers. As a result, the variables selected for modelling economic growth tend to vary across studies depending on the theoretical approach and research context. According to Schultz (1961) and Becker (1964), as reflected in the economic growth rate, is a purely human capital-driven phenomenon that is possible through high public investment, including the enrolment rate in tertiary education. Guided by this literature, the present study employs the variables consistent with the human capital theory and builds on recent empirical works. Specifically, this paper incorporates government expenditure in higher (tertiary) education and the tertiary enrolment rate as key explanatory variables influencing economic growth.

The ARDL specification was selected using the Akaike Information Criterion, which indicated this model as the most parsimonious and statistically appropriate. The ARDL framework is suitable for small samples and for variables integrated of different orders, allowing simultaneous estimation of short-run dynamics and long-run relationships (Pesaran et al., 2001).

Model, Variables, and Data

This study adopts Human Capital Theory as its foundational framework to examine the dynamics of economic growth. Entrenched in the works of Schultz (1971) and Becker (1992), the theory posits that sustained economic development is largely driven by the accumulation and effective utilization of human capital. In this context, investment in higher education, both in terms of public spending and expanded access, is viewed as a central mechanism through which nations can enhance their productive capacities. Specifically, government expenditure on higher education is conceptualized as a catalyst for innovation and technological advancement, aligning with the notion that education is not merely a social good but also a strategic economic lever (Wu & Liu, 2021). Complementing this, the tertiary enrolment rate is used as an indicator of the breadth and depth of human capital formation, reflecting a country's commitment to equipping its population with advanced knowledge and skills. Together, these variables serve as critical inputs in modelling the relationship between higher education and economic growth within the human capital framework.

The dependent variable is the real GDP growth rate (GDPGR), measured in percentage terms annually. The explanatory variables are government expenditure in tertiary education (GETE), and the enrolment rate in tertiary education (ERTE), both expressed in percentages. The benchmark model is thus specified as:

$$GDPGR_t = \alpha + \beta_1 GETE_t + \beta_2 ERTE_t + \varepsilon_t \quad \ldots\ldots(1)$$

The GDPGR is Gross Domestic Product Growth Rate in percentage, GETE is the share of government expenditure in tertiary education (percentage of total government expenditure

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in tertiary education), and ERTE is the enrolment rate in tertiary education in percentage, α is a constant term, β_1 and β_2 are coefficients of the explanatory variables, and ε is the error term.

Based on theoretical expectations and empirical literature, both independent variables are expected to be positively associated with GDP growth. Annual time series data covering the period from 1990 to 2024 were sourced from the World Development Indicators (World Bank, 2025).

Unit Root Test

Unit root tests are conducted to assess whether the time series variables used in the model are stationary, that is, whether their statistical properties, such as mean and variance, remain constant over time (Altinay & Karagol, 2004). If a variable is non-stationary, it could lead to spurious regression results, undermining the reliability of the analysis. Given that all variables in this study are time series, it is essential to determine their order of integration prior to conducting the ARDL bounds testing procedure (Said, 1991).

To verify stationarity, we apply the Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF), and Phillips-Perron (PP) tests. These are conventional tests used to assess whether a variable contains a unit root (non-stationary) under the null hypothesis (H_0) versus being stationary under the alternative hypothesis (H_1) (Chang & Park, 2002).

The test statistics are interpreted in comparison with McKinnon's critical values. If the calculated test statistic is greater (in absolute value) than the critical value, the null hypothesis is rejected, indicating that the variable is stationary (Fedorová, 2016). The most flexible specification, including both an intercept and time trend, is used, and the general form of the ADF test is given by:

$$\Delta Z_1 = \alpha_1 + \alpha_{2t} + \gamma Z_{t\text{-}1} + \sum_{j=1}^{K} B_j Z_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

The DF test is estimated without augmented terms (i.e., without lagged differences), while the ADF test includes these terms to account for autocorrelation. The optimal lag length was chosen using the SIC by starting with a maximum lag of 4 and reducing iteratively. The results of all three forms of unit root tests are summarized in Table 1 and guide the decision on the integration level of each variable. This, in turn, determines the appropriateness of using the ARDL bounds testing approach to assess both long-run and short-run relationships between the variables.

Table 1

Unit Root Test Result

Unit root test at the level	Test with constants			Test with constants & trends		
Variables	DF	ADF	PP	DF	ADF	PP
GDPGR	-4.84***	-6.05***	-6.21***	-6.53***	-6.46***	-9.34***
GETE	0.92	-0.03	-0.03	-1.97	-2.17	-2.15
ERTE	-1.03	-1.02	-1.05	-1.54	-3.35	-3.03

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Critical value @ 5%	-1.85	-2.75	-2.84	-3.29	-3.35	-3.46
Unit root test at first difference	Test with constants			Test with constant and intercept		
	DF	ADF	PP	DF	ADF	PP
GETE	-5.40***	-5.34***	-5.34***	-5.41***	-5.31***	-5.31***
ERTE	-0.80	-5.40**	-5.50**	-0.82	-6.23***	-7.88***
Critical value @ 5%	-1.95	-2.96	-2.85	-3.19	-3.56	-3.55

Table 1 presents the results of the unit root tests, expressed in terms of t-statistics, for all variables used in the study. According to Kapetanios (2005), a variable is said to be integrated of order zero, I(0), if it is stationary in its level form. Conversely, a variable that becomes stationary only after first differencing is considered integrated of order one, I(1). The test results show that the GDPGR variable is stationary at the level, indicating it is I(0). On the other hand, both GETE and ERTE are found to be stationary only at their first differences, suggesting that they are I(1). All three variables are statistically significant at the 1 percent level. These results confirm that the dataset contains a mix of integration orders, with GDPGR integrated at the level and the other two variables integrated at first difference. Therefore, the order of integration is not uniform. This combination of I(0) and I(1) variables supports the appropriateness of applying the ARDL bounds testing approach for further analysis, as it is specifically designed to accommodate such mixed orders of integration (Afriyie et al., 2020).

Optimal Lag Selection

To determine the optimal lag length for the ARDL model, lag-order selection criteria based on an unrestricted VAR framework were employed. The VAR was used solely as a preliminary device for identifying the appropriate lag structure rather than for inference. Table 2 presents the information-criterion results (AIC, SC, and HQ) that guided the selection of lags for the ARDL specification.

Table 2

Result of Optimum Lag Selection for All Variables

Variables	LogL	LR	FPE	AIC	SIC	HQ
GDPGR	-70.23	NA*	5.40*	4.52*	3.57*	3.54*
GETE	30.77	123.67*	0.02*	-1.04*	-0.96*	-1.01*
ERTE	-59.04	13.65*	1.64*	3.39*	3.45*	3.32*

* Indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SIC: Schwarz information criterion HQ: Hannan-Quinn information criterion

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Table 2 shows that the best lag length for the GDPGR variable is zero, indicating that no lagged values are needed to explain its current behaviour in the model. Conversely, the optimal lag for both GETE and ERTE is one, suggesting that including one lag for each of these variables provides the best fit according to the selection criteria. These lag structures form the basis for specifying the ARDL model in the next analysis.

Bound Test

The ARDL bounds test was conducted to determine whether a long-run relationship exists among the variables under investigation. The bound test is a necessary prerequisite for applying the ARDL model to time series data. The results are presented in Table 3.

Table 3

Result of the Bound Test

F-Bound Test	Null Hypothesis: No long-run relationships exist			
Test Statistics	Value	Significance Level	I(0)	I(1)
F-Statistics	19.32	10%	2.72	3.77
K	3	5%	3.23	4.35
		2.5%	3.69	4.89
		1%	4.29	5.61
Actual Sample Size (n)= 34				

According to the bounds testing procedure, cointegration is confirmed when the calculated F-statistic exceeds the upper critical values at standard significance levels such as 1%, 2.5%, 5%, or 10% (Asteriou & Hall, 2007). In this study, the computed F-statistic is 19.32, which is well above the upper bound at all significance levels, thereby providing strong evidence of a long-run equilibrium relationship when per capita income growth is the dependent variable. This confirms the presence of cointegration among the variables, justifying the use of the ARDL approach. Moreover, it suggests that public expenditure in higher education and the tertiary enrolment rate are jointly and significantly associated with long-term economic growth. It is also important to note that the identification of a long-run relationship can be sensitive to the choice of lag length in the model specification (Bahmani-Oskooee & Nasir, 2004). For this reason, the Akaike Information Criterion (AIC) was employed to select the optimal lag structure for the ARDL model.

Diagnostic Test

To ensure the robustness and reliability of the ARDL model, several diagnostic tests were conducted to evaluate the validity of the model and the behavior of the variables included in the bounds testing approach. Specifically, tests for serial correlation, heteroscedasticity, multicollinearity, and normality were applied to assess the underlying assumptions of the model. The outcomes of these diagnostic checks are summarized in Table 4.

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Table 4
Diagnostic Tests Results

Diagnostic tests	Test statistic	P-value
Serial correlation	1.74	0.12
Heteroscedasticity	0.77	0.43
Normality	0.07	0.72
Autocorrelation (Durbin-Watson stat.)	1.74	
Multicollinearity (VIF)	Variables	Value of VIF
	GETE	7.21
	ERTE	2.01

Table 4 presents the results of diagnostic tests conducted to ensure the statistical validity and robustness of the ARDL model. The test for serial correlation yielded a statistic of 1.74 with a p-value of 0.12, indicating that there is no evidence of serial correlation in the residuals. Similarly, the heteroscedasticity test returned a statistic of 0.77 with a p-value of 0.43, suggesting the absence of heteroscedasticity. The normality test result, with a statistic of 0.07 and a p-value of 0.72, confirms that the residuals are normally distributed. The Durbin-Watson statistic of 1.74 further supports the conclusion that autocorrelation is not present in the model. In terms of multicollinearity, the variance inflation factor (VIF) values for the explanatory variables GETE (7.41), and ERTE (2.01) all fall below the conventional threshold of concern, indicating that multicollinearity is not an issue. Taken together, these diagnostic results suggest that the model meets the key assumptions of linear regression and is therefore statistically sound for estimating the relationship among the variables under study.

Results

The Trend of Economic Growth, Government Expenditure, and Enrolment Rate in Tertiary Education

Trend analysis of time series data is essential before presenting the results of descriptive and inferential statistics (Khadka & Khanal, 2025). During the period from 1990 to 2024, Nepal witnessed noticeable variations in its economic growth rate, government expenditure on higher education, and tertiary enrolment rate. The trend analysis reveals a generally upward trajectory in tertiary enrolment, reflecting increased access and institutional expansion driven by national reforms and donor-supported projects. Government expenditure in higher education, though positive in nominal terms, has shown volatility and modest growth relative to the total education budget, raising concerns about funding adequacy and sustainability. The GDP growth rate, while fluctuating due to external shocks and structural constraints, displays periods of consistent improvement that coincide with education sector investment peaks. These trends, illustrated in the figure below through smoothed time series lines, provide contextual grounding for the subsequent econometric analysis, enabling a clearer understanding of the dynamic

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interactions explored through the ARDL and ECM models. The trend of the examined variable is illustrated in the figure 1.

Figure 1

Trend of Economic Growth, Enrolment Rate, and Government Expenditure in Tertiary Education in Nepal

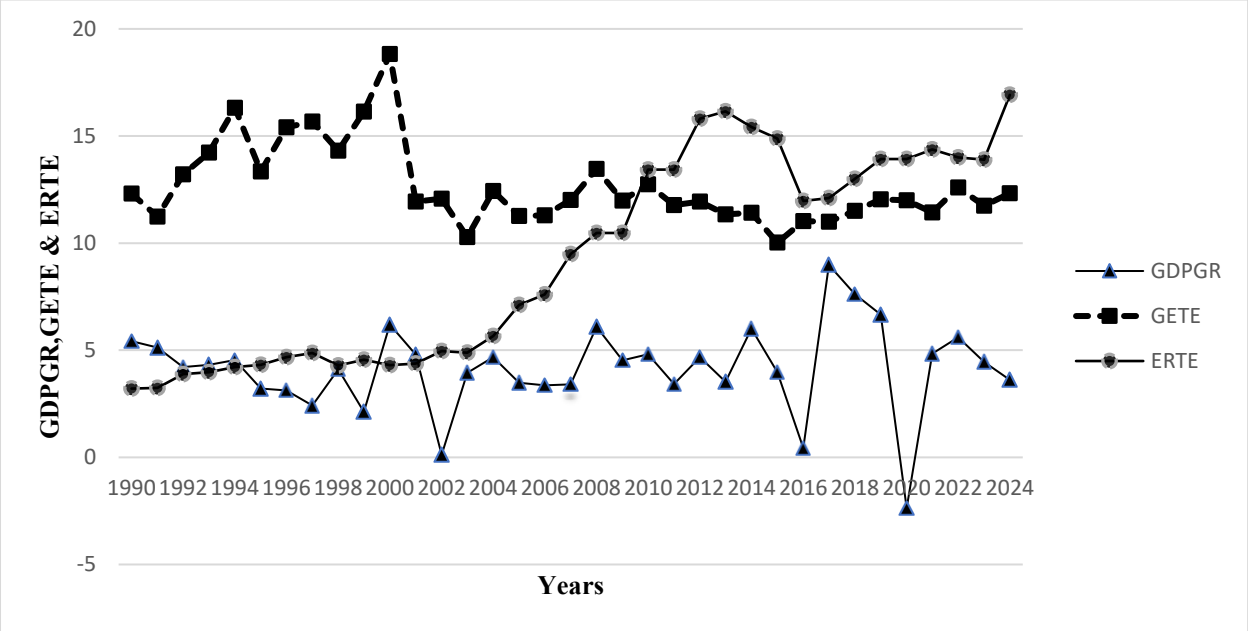

Figure 1 shows how Nepal's GDP growth, government spending on higher education, and enrolment in tertiary education have shifted over time from 1990 to 2024. The enrolment rate has generally moved upward, especially after 2005, likely reflecting broader access to universities and the impact of education reforms. Government spending on tertiary education, however, has been quite uneven, rising in some years but lacking a consistent upward trend, which raises questions about long-term investment priorities. Meanwhile, the GDP growth rate has been fairly erratic, with some sharp dips around 2002 and 2020, likely linked to political instability and global crises due to the COVID-19 pandemic. Together, these trends highlight how economic shifts, public funding, and access to education in Nepal are interconnected, but not always in sync with one another.

Autoregressive Distributed Lag (ARDL) Model and Long-Run Cointegration

This section presents the results of the econometric estimation based on the ARDL approach. Table 5 summarizes the long-run relationships identified by the model, including coefficient estimates under various lag structures as indicated in the column headings. Given the relatively limited size of the dataset, the Schwartz-Bayesian Criterion (SBC) was chosen as the primary model selection tool due to its more conservative nature, favoring simpler models with fewer lags. Since the dataset is composed of annual observations, the maximum lag was set to one, in line with the recommendation of Pearson and Pesaran (1997), as referenced in Kong et al. (2021). While both the SBC and the Akaike Information Criterion (AIC) are widely used for model selection, the SBC tends to favor more parsimonious specifications, whereas

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the AIC often selects models with more complex lag structures. Based on this framework, the ARDL test was employed to explore the long-run dynamics and interactions among the variables.

Table 5

Long Run Coefficients of ARDL (0,1, 1) Model

Dependent variable: GDP growth rate (%)	Coefficient	Standard Error	t-statistics
GETE	2.041**	1.029	2.173
ERTE	0.602**	0.199	4.342
Number of observations	34		
Log-likelihood	-40.56		
R-squared	0.76		

Note: *, **, and *** 10%, 5%, and 1% significance levels.

The ARDL long-run estimation presented in Table 5 reveals that both government expenditure on tertiary education (GETE) and enrolment in tertiary education (ERTE) have statistically significant and positive impacts on Nepal's GDP growth rate. Specifically, the coefficient for GETE is 2.041 with a t-statistic of 2.173, indicating that a 1% increase in government spending on tertiary education is associated with a 2.041% increase in economic growth, holding other factors constant. This implies a highly elastic and growth-inducing effect of public investment in higher education, highlighting its strategic importance for national development. Similarly, the coefficient for ERTE is 0.602 with a t-statistic of 4.342, suggesting that a 1% increase in tertiary enrolment leads to a 0.602% rise in real GDP growth. The statistical significance and strength of these coefficients underscore the robust relationship between higher education and long-term economic performance. Additionally, the model's R-squared value of 0.76 indicates that 76% of the variation in GDP growth is explained by these two predictors, affirming the model's explanatory power. Collectively, these results empirically validate the long-standing theoretical claim that both the enrolment and public investment in tertiary education are crucial determinants of economic growth in Nepal.

Error Correction Version of the ARDL Model

The Error Correction Model (ECM), derived from the ARDL approach, helps us understand how variables interact in the short run. Table 6 illustrates how changes in predictor variables, such as government spending on tertiary education and enrolment rates, influence the outcome variable (GDP growth) in the short term, while also indicating how the system adjusts back toward long-term equilibrium.

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Table 6

Coefficient in Short-Run Relationship in the ARDL (0, 1,1) ECM Form

Dependent variable: ΔGDPGR	Coefficient	Std. Error	t-Statistic
GETE(-1))	3.011***	0.994	2.134
ERTE(-1))	1.134**	0.897	3.125
ECM(-1)	-1.223***	-1.254***	1.023

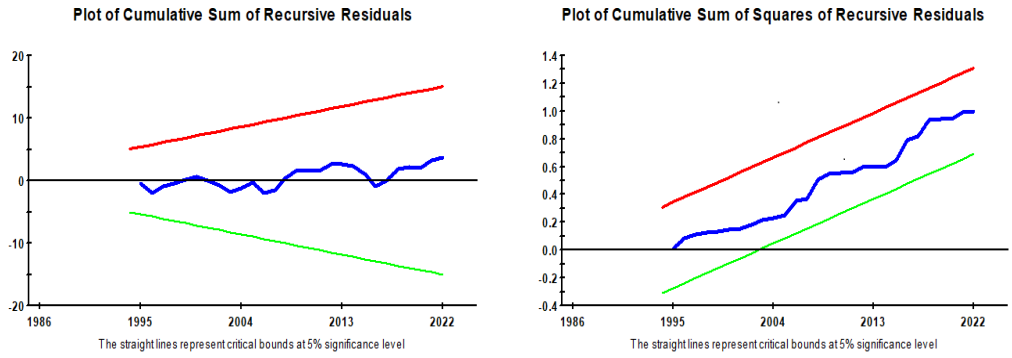
Note: *, **, and *** 10%, 5%, and 1% significance levels.

Table 6 presents the short-run results of the ARDL Error Correction Model, showing how GDP growth rate (ΔGDPGR) responds to changes in tertiary education variables. The lagged government expenditure on tertiary education (GETE (-1)) has a positive and statistically significant effect on GDP growth (coefficient = 3.011), suggesting that a 1% increase in expenditure leads to a 3.01% rise in GDP growth in the short run. Similarly, the lagged enrolment rate in tertiary education (ERTE (-1)) also positively affects GDP growth (coefficient = 1.134), and is significant at the 5% level. The error correction term (ECM(-1)) is negative (-1.223) and significant at the 1% level, confirming that deviations from long-run equilibrium are corrected over time, with about 122% of the disequilibrium adjusted in each period, indicating a strong tendency to return to long-run stability.

In the final stage of applying the ARDL approach, CUSUM and CUSUMSQ tests are conducted to assess the structural stability of the estimated model over time. Figures 2 illustrate the results of these stability tests.

Figure 2

CUSUM and CUSUMSQ Plotted Against the Critical Bounds of 5% Level of Significance



The results of the stability tests, specifically the CUSUM and CUSUMSQ plots, remain well within the 5 percent significance bounds, as shown in Figure 2. This suggests that the model maintains structural stability over the entire estimation period. The fact that the test statistics do not cross the critical boundaries indicates that the model is appropriately specified, with no evidence of structural breaks or instability in the underlying econometric relationships.

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Discussion

Grounded in Human Capital Theory, this study provides empirical support for the view that higher education plays a meaningful role in promoting economic growth in Nepal. The positive and statistically significant effects of tertiary enrolment and public expenditure on higher education indicate that investment in advanced human capital enhances productivity and contributes to sustained economic performance (Schultz, 1961; Becker, 1992). These findings suggest that Nepal has reached a developmental stage where higher-level skills are increasingly relevant to economic activity, rather than education functioning solely as a long-term social investment.

The results are consistent with recent international evidence demonstrating that higher education contributes to economic growth when supported by sustained investment and institutional capacity. Empirical studies from developing and emerging economies show that tertiary education becomes growth-enhancing when enrolment expansion is accompanied by adequate financing and policy coherence (Ahamed, 2021; Maneejuk & Yamaka, 2021). The Nepalese case examined here aligns with this pattern, indicating that higher education is gradually integrating into the country's growth process despite persistent structural constraints.

At the same time, the findings reflect the global shift from quantity-based to quality-oriented interpretations of the education–growth nexus. Cross-country analyses emphasise that educational quality, relevance, and labour-market alignment are more important than enrolment expansion alone in generating economic returns (Hanushek & Woessmann, 2020; OECD, 2023). The positive effects observed in this study suggest that the recent expansion of tertiary education in Nepal may be yielding returns because it coincides with rising demand for advanced skills, particularly in services, administration, and knowledge-intensive activities. This indicates that higher education is beginning to function as an economic asset rather than a purely demographic outcome.

Importantly, this study engages directly with contradictory evidence reported in the Nepali context. While some studies find negative or statistically insignificant effects of education expenditure on economic growth (Duwal & Suwal, 2024), the present findings suggest that such outcomes may reflect periods of weak expenditure targeting or misalignment between education outputs and productive opportunities. The positive relationship identified here implies that education expenditure becomes growth-enhancing when it operates in tandem with expanded tertiary enrolment, highlighting the complementary nature of financial and human-capital channels. This helps reconcile earlier mixed results by showing that public spending alone does not guarantee growth unless it supports effective human capital formation.

The results are also consistent with recent Nepal-specific studies that underscore the growing importance of tertiary education relative to lower levels of schooling. Evidence indicates that tertiary enrolment contributes more strongly to GDP growth than primary or secondary education, reflecting the rising skill requirements of Nepal's evolving economy (Dangal & Gajurel, 2019; Khanal, 2020). By incorporating both enrolment and expenditure, this study provides a more integrated perspective on how higher education influences economic

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outcomes, reinforcing the argument that Nepal's development increasingly depends on strengthening advanced education.

Nevertheless, the positive findings should be interpreted with caution. Persistent challenges such as stagnant per-student funding, skill mismatches, and limited research capacity continue to characterise Nepal's higher education system and may constrain future growth impacts if not addressed (Aryal, 2020; UNESCO, 2022a). The results, therefore, point to a conditional relationship: higher education contributes to economic growth when expansion is accompanied by adequate financing, institutional quality, and relevance to domestic economic needs.

Conclusion and Recommendation

This study underscores that the economic relevance of higher education in Nepal lies not merely in its expansion, but in how effectively the system transforms enrolment growth into productive and employable skills. The evidence points to higher education as a conditional driver of growth, whose contribution depends on institutional quality, relevance, and alignment with labour-market needs rather than access alone. In a context characterised by structural constraints, youth outmigration, and evolving skill demands, the challenge facing Nepal is therefore not whether higher education matters, but how it is structured and governed to support long-term economic transformation. This perspective shifts the policy focus from quantitative expansion toward systemic effectiveness and outcome-oriented reform.

In light of this, policy efforts should prioritise addressing the persistent skill mismatch between tertiary graduates and domestic labour-market requirements. Reform initiatives such as the Higher Education Reforms Project (HERP) offer a critical opportunity to realign curricula with emerging sectors, strengthen outcome-based education, and enhance graduate employability through stronger university-industry linkages, internships, and applied research. Public financing should increasingly be channelled toward quality-enhancing investments, including faculty development, research capacity, and performance-based funding mechanisms that reward relevance and labour-market outcomes. At the same time, higher education policy must be coordinated with employment, industrial, and migration strategies to ensure that skill formation supports national development priorities rather than external labour markets. Such a quality-driven, integrated approach is essential for converting higher education into a sustained engine of economic growth in Nepal.

Author Contribution

Gehendra Prasad Dahal: Conceptualization and overall design of the research; initial drafting of the manuscript.

Basudeb Khanal: Data analysis, interpretation of findings, and substantial contribution to manuscript writing.

Damodhar Adhikari: Literature review and refinement of the theoretical framework.

Maheshwor Ghimire: Literature review and language editing of the manuscript.

Giriraj Luitel: Identification, collection, and organization of literature for review.

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Sudarshan Dhakal: Data collection, preliminary data analysis, and drafting the initial structure of the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article. The study is based exclusively on publicly available secondary data, and no financial, institutional, or personal factors influenced the research process, interpretation, or reporting of the findings.

References

Afriyie, J. K., Twumasi-Ankrah, S., Gyamfi, K. B., Arthur, D., & Pels, W. A. (2020). Evaluating the performance of unit root tests in single time series processes. *Mathematics and Statistics, 8*(6), 656-664. https://doi.org/10.13189/ms.2020.080605

Ahamed, F. (2021). Impact of public and private investments on economic growth of developing countries. *arXiv preprint arXiv:2105.14199*. https://doi.org/https://doi.org/10.48550/arXiv.2105.14199

Ahmad, M., Jiang, P., Majeed, A., Umar, M., Khan, Z., & Muhammad, S. (2020). The dynamic impact of natural resources, technological innovations and economic growth on ecological footprint: An advanced panel data estimation. *Resources Policy, 69*(2), 101817. https://doi.org/https://doi.org/10.1016/j.resourpol.2020.101817

Altinay, G., & Karagol, E. (2004). Structural break, unit root, and the causality between energy consumption and GDP in Turkey. *Energy Economics, 26*(6), 985-994. https://doi.org/https://doi.org/10.1016/j.eneco.2004.07.001

Arnhold, N., & Bassett, R. M. (2021). *Steering tertiary education: Toward resilient systems that deliver for all*. World Bank. https://files.eric.ed.gov/fulltext/ED619413.pdf

Aryal, B. P. (2020). Financing of technical and vocational education and training in Nepal. *Journal of Education and Research, 10*(1), 58-80. http://www.kusoed.edu.np/journal/index.php/je/article/view/448

Asteriou, D., & Hall, S. G. (2007). *Applied econometrics: A modern approach using E-views and Mirofit*. Palgrave Macmillan.

Bahmani-Oskooee, M., & Nasir, A. (2004). ARDL approach to test the productivity bias hypothesis. *Review of Development Economics, 8*(3), 483-488. https://doi.org/https://doi.org/10.1111/j.1467-9361.2004.00247.x

Becker, G. S. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education*. University of Chicago Press. http://digamo.free.fr/becker1993.pdf

Becker, G. S. (1992). Human capital and the economy. *Proceedings of the American Philosophical Society, 136*(1), 85-92. https://www.jstor.org/stable/986801

Becker, G. S. (1994). Human capital revisited. In *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education, Third Edition* (pp. 15-28). The University of Chicago Press. https://www.nber.org/system/files/chapters/c11229/c11229.pdf

Chang, Y., & Park, J. Y. (2002). On the asymptotics of ADF tests for unit roots. *Econometric Reviews, 21*(4), 431-447. https://doi.org/https://doi.org/10.1081/ETC-120015385

Nepal Journal of Multidisciplinary Research (NJMR)
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ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: 10.3126/njmr.v8i5.86850

Dangal, D. N., & Gajurel, R. P. (2019). Public financing in education and economic growth of Nepal. *Journal of Development and Administrative Studies, 27*(1-2), 23-30. https://doi.org/https://doi.org/10.3126/jodas.v27i1-2.60569

Duwal, N., & Acharya, A. (2023). Education and economic growth in Nepal: An ARDL approach. *Economic Journal of Development Issues, 36*(1-2), 24-42. https://doi.org/https://doi.org/10.3126/ejdi.v36i1-2.63906

Duwal, N., & Suwal, S. (2024). Government expenditure on education, educational Index, and economic growth in Nepal: an ARDL-ECM approach. *Ekonomikalia Journal of Economics, 2*(2), 82-94. https://doi.org/https://doi.org/10.60084/eje.v2i2.205

Fedorová, D. (2016). Selection of unit root test on the basis of length of the time series and value of ar (1) parameter. *Statistika, 96*(3), 47-64. https://www.researchgate.net/profile/Marketa-Arltova

Gheraia, Z., Benmeriem, M., Abdelli, H. A., & Saadaoui, S. (2021). The effect of education expenditure on economic growth: The case of the Kingdom of Saudi Arabia. *Humanities and Social Sciences Letters, 9*(1), 14-23. https://doi.org/https://doi.org/10.18488/journal.73.2021.91.14.23

Hanushek, E. A., & Woessmann, L. (2020). *Education, knowledge capital, and economic growth*. https://doi.org/https://doi.org/10.1016/B978-0-12-815391-8.00014-8

Hussaini, N. (2020). Economic growth and higher education in South Asian Countries: Evidence from econometrics. *International Journal of Higher Education, 9*(2), 118-125. https://doi.org/https://eric.ed.gov/?id=EJ1240530

Kapetanios, G. (2005). Unit-root testing against the alternative hypothesis of up to m structural breaks. *Journal of Time Series Analysis, 26*(1), 123-133. https://doi.org/https://doi.org/10.1111/j.1467-9892.2005.00393.x

Khadka, S., & Khanal, B. (2025). Impact of targeted and total climate-relevant budgets on environmental sustainability: Analysis of per capita greenhouse gas emissions in Nepal. *Prgayaratna, 7*(1), 81-90. https://doi.org/https://doi.org/10.3126/pragyaratna.v7i1.84859

Khanal, B. (2020). Role of education in economic growth: The case of Nepal. *Journal of Tribhuvan University Teachers' Association, 1*, 7-13. https://shorturl.at/4JKqR

Khanal, B., Joshi, B. M., Ghimire, D. D., Koirala, P., & Acharya, M. R. (2025). The Trend Analysis of Public Education Expenditure: A Cross-Country Comparative Analysis with Focus on Nepal. *Nepal Journal of Multidisciplinary Research, 8*(4), 38-60. https://doi.org/https://doi.org/10.3126/njmr.v8i4.82071

Kong, Q., Peng, D., Ni, Y., Jiang, X., & Wang, Z. (2021). Trade openness and economic growth quality of China: Empirical analysis using ARDL model. *Finance Research Letters, 38*, 1-10. https://doi.org/https://doi.org/10.1016/j.frl.2020.101488

Lucas Jr, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics, 22*(1), 3-42. https://doi.org/https://doi.org/10.1016%2F0304-3932%2888%2990168-7

Maneejuk, P., & Yamaka, W. (2021). The impact of higher education on economic growth in ASEAN-5 countries. *Sustainability, 13*(2), 520-548. https://doi.org/https://doi.org/10.3390/su13020520

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ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: 10.3126/njmr.v8i5.86850

OECD. (2023). *Education at a glance 2022*. OECD Publication. https://shorturl.at/u94iN

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289-326. https://doi.org/https://doi.org/10.1002/jae.616

Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy, 98*(5,), S71-S102. https://doi.org/10.1086/261725

Said, S. E. (1991). Unit-roots test for time-series data with a linear time trend. *Journal of Econometrics, 47*(2-3), 285-303. https://doi.org/https://doi.org/10.1016/0304-4076(91)90104-L

Schultz, T. W. (1961). Investment in human capital. *The American Economic Review, 51*(1), 1-17. http://www.jstor.org/stable/1818907?origin=JSTOR-pdf

Schultz, T. W. (1971). *Education and productivity*. National Commission on Productivity. https://files.eric.ed.gov/fulltext/ED071152.pdf

Uddin, I., & Khan, Z. (2024). The role of higher education in economic growth: Evidence from south Asian countries. *Economic Alternatives*(3), 556-567. https://doi.org/https://doi.org/10.37075/EA.2024.3.06

UNESCO. (2022a). *Education 2030 Framework for Action: Financing benchmarks*. https://www.education-progress.org/en/articles/finance?utm_source=chatgpt.com

UNESCO. (2022b). *Global education monitoring report: South Asia- Non-state actors in education. Who chooses? Who loses?* https://unesdoc.unesco.org/ark:/48223/pf0000383550.locale=en

University Grant Commission. (2024). *Annual report 2080/81 (2023/24)*. https://www.ugcnepal.edu.np/uploads/publicationsAndReports/zhqFLU.pdf

World Bank. (2025). *World development indicators data bank*. https://databank.worldbank.org/source/world-development-indicators. Retrieved 14 Jun 2025 from

Wu, N., & Liu, Z. (2021). Higher education development, technological innovation and industrial structure upgrade. *Technological Forecasting and Social Change, 162*, 120-135. https://doi.org/https://doi.org/10.1016/j.techfore.2020.120400