@ CEDA/TU, 2019, US Library of Congress, Catalog Card No.: 79-915209, ISSN: 2091-0339
The Journal of Development and Administrative Studies (JODAS), Vol. 27 (1-2), pp. 23-30.

Public Financing in Education and Economic Growth of Nepal

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Cite this paper

Dangal, D.N., & Gajurel, R.P. (2019). Public financing in education and economic growth of Nepal. *The Journal of Development and Administrative Studies, 27*(1-2), 23-30.

https://doi.org/10.3126/jodas.v27i1-2.60569

Abstract

Education serves as the foundation of human capital, enhancing productivity and innovation, and ultimately driving economic growth. This study aims to assess the relationship between public financing in education and Nepal's economic growth. Utilizing the ARDL error correction model with data spanning from 1982 to 2018, the findings indicate that public funding for education in Nepal negatively impacts long-term economic growth. In the short term, the enrollment of technical students at various institutions under Tribhuvan University also exhibits a negative association with Nepal's economic growth. The short-term setbacks may be attributed to the drain of technical expertise or insufficient investment in technical education, potentially impeding economic growth. Consequently, policymakers and stakeholders should prioritize technical education and domestic employability to foster sustainable economic growth in Nepal.

Keywords: Public financing, Education, Economic growth, ARDL

1. Introduction

Education is widely recognized as a pivotal determinant of a nation's economic progress and social development (Becker, 2009; Lucas, 1988). Its role in shaping the human capital landscape and fostering innovation and productivity cannot be overstated. In the context of Nepal, a country grappling with the dual challenges of economic growth and educational advancement, the relationship between public financing on education and overall economic development becomes a subject of paramount importance.

The investment made by the government in education constitutes social or public cost. The Government invests because it is the human right of an individual and also the duty of the government to provide education to its citizens. By nature, education falls under the category of public or merit goods in which the government makes subsidies so that weaker section of society could also consume such a good. Another reason for the subsidization of education is externality if left entirely to individuals there would be under-investment in education (Gauden, 1987). Human capital formation is inevitable to all nations' development and hence financing in education facilitates accomplishing these needs.

The socio-economic condition of Nepal demands excessive investment in the social sector, particularly in education in order to meet changing development goals and the overall economic development of any nation. Growing financing in the education sector is essential because it is not only a mean of reduction of poverty by increasing productivity in other sectors, but also a powerful means of acquiring knowledge and skills to make a competent labor force. In addition, it is also a source of socio-cultural value and a technique for developing human resource capital. On the other hand, it is not only a producer and consumer good but also a public and merit good that an individual can appropriate and use for private profit. Even as a consumer good, it is more of a durable nature than an ordinary consumption good which may be demanded both for its socio-cultural and economic use (Prakash & Chaudhari, 1997).

The government has significantly increased its investments in education, aiming to enhance access, quality, and equity across various educational levels. However, the outcomes of these investments in terms of economic growth remain a topic of debate and inquiry. This study delves into the complex interplay between public financing in education and the economic growth trajectory of Nepal. It seeks to shed light on whether increased allocations to

education indeed translate into sustainable economic advancement. The examination of this relationship is not only essential for policymakers but also contributes to the global discourse on the significance of education as a catalyst for development in emerging economies. To achieve this objective, our analysis draws upon a comprehensive time series dataset spanning from 1982 to 2018. The findings of this paper are poised to inform evidence-based decisions regarding public financing in education, ultimately contributing to the nation's pursuit of sustainable development.

2. Literature Review

The relationship between education and economic growth has long been a subject of academic investigation. Human Capital Theory, pioneered by Becker (2009), asserts that investments in education and skills development contribute significantly to an individual's productivity and, by extension, to a nation's overall economic growth. Lucas (1988) and Romer (1990) argued that human capital, which includes education and skills, is a critical determinant of economic development. Numerous cross-country analyses (Barro, 2001; Hanushek & Woessmann, 2008) have further reinforced the idea that nations with higher levels of education tend to experience higher rates of economic growth.

Adam Smith, for the first time in the history of economic thought in 1776 expressed the view that growth was primarily an effect of the division of labour. Introducing the concept of wage differential, Smith said that the means through which people develop skills were *habit, custom, and education* because, for the most part, individual talents are nurtured rather than natural (Benson, 1963 & Carnoy, 1963). Smith spoke for the need for compulsory education at the primary level and believed in the local education control system (Burrup, Brimley & Garfield, 1996). However, the economic significance of education was largely ignored until about the middle of the twentieth century almost keeping inactive for a century and half (Benson, 1963). Marshall (1907) presented a similar opinion on education and invention. Marx was in favor of free public education that trains in the value system of government, controlled and financed by centralized government (Burrup, Brimley & Garfield, 1996). Friedman (1963) argued that the market economy should be extended while financing basic and secondary education.

In most countries, education is mainly financed out of general revenue. Although the responsibility to provide education falls between the family (or student) and the state, the latter's role is crucial for a number of reasons. First, education consists of externality benefits. Second, the limited access to financial markets does not meet the need of students to cover the schooling costs. Third, even to reduce poverty, human capital formation is the principal strategy of the government (Jimenez, 1995). Education is considered an agent of change because education in a border sense improves the capabilities of individuals and capacities of the institutions, also this becomes a catalyst for closely interrelated social, cultural and demographic change defined as national development. Thus, education has been the core element for the development of a country and for this reason; educational expenditure has been increasing over the years around the world (Paudel, 2008). Government intervention plays a crucial role in education expenses and funding. An evaluation of future sectoral development priorities should commence by considering the existing choices in these domains (World Bank, 1992).

Empirical findings from research in similar contexts further underscore the relevance of this study. For instance, a study by Jeyhoon Tabar et al. (2017) in the context of Iran demonstrated that investments in education contributed significantly to the country's economic development. Many studies (Qi, 2016; Wolff, 2015; Kouton, 2018; Mercan & Sezer, 2014; Idrees & Siddiqi, 2013; Mallick et al., 2016) confirmed the positive association between education expenditure on the economic growth of the country. While budgetary allocations are essential, the quality of education also plays a crucial role. A study by Patrinos and Psacharopoulos (2018) emphasized the importance of not only increasing education spending but also ensuring that it results in improved educational outcomes, which, in turn, have a positive impact on economic growth.

In a nutshell, while international literature consistently supports the positive association between education and economic growth, this study recognizes the need for context-specific analysis. Nepal's unique socio-economic landscape necessitates an in-depth investigation to inform evidence-based policy decisions regarding public financing in education, ultimately contributing to the nation's pursuit of sustainable development.

3. Methodology

3.1 Data and variables

This study explores the relationship between public financing in education and the economic growth of Nepal. To achieve this objective, we analyze a time series dataset spanning from 1982 to 2018. Economic growth, represented

by real GDP growth, serves as the dependent variable, while public financing in education is expressed as a percentage of GDP is taken as regressor.

Additionally, control variables include the number of students enrolled in general and technical programs at Tribhuvan University and gross fixed capital formation as a measure of physical capital. The data for this study were collected from the Nepal Rastra Bank (NRB), the central bank of Nepal, and the World Development Indicators (WDI).

3.2 Model specification

To facilitate meaningful analysis and ensure the stationarity of the time series data, all variables are transformed into logarithmic form. This transformation is employed to stabilize the variance and reduce the impact of outliers. The general model specification of the relationship can be expressed in the following form

$$\ln economic\_growth_t = \varepsilon_0 + \varepsilon_1 \ln edu\_exp_t + \varepsilon_2 \ln tec\_student_t + \varepsilon_2 \ln general\_student_t + \varepsilon_3 \ln GFCF_t + \varepsilon_t$$

For the very first, to select the appropriate model, the unit root test is necessary. Unit root tests are employed to confirm the stationarity properties of the time series data. In this paper, both the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test are employed to assess stationarity. Notably, the PP tests do not take into account any serial correlation in the test regression, whereas the ADF tests utilize parametric autoregressions to estimate the ARMA structure of the errors

The central objective of this study is to assess the impact of public financing in education on economic growth in Nepal. To achieve this, we adopt the ARDL approach, which is particularly suitable for analyzing relationships in a time series setting with mixed order of integration. The ARDL model is estimated to assess both short-run and long-run relationships between the variables. The ARDL (p,q) model developed by Pesaran et al. (2001) is specified as follows:

$$\begin{aligned}\Delta \ln economic\_growth_t = {} & \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta \ln economic\_growth_{t-i} + \sum_{i=1}^{q} \beta_{2i} \Delta \ln edu\_exp_{t-i} \\ & + \sum_{i=1}^{q} \beta_{3i} \Delta \ln tec\_student_{t-i} + \sum_{i=1}^{q} \beta_{4i} \Delta \ln general\_student_{t-i} + \sum_{i=1}^{q} \beta_{5i} \Delta \ln gfcf_{t-i} \\ & + \beta_6 \ln economic\_growth_{t-1} + \beta_7 \ln edu\_exp_{t-1} + \beta_8 \ln tec\_student_{t-1} + \beta_9 \ln general\_student_{t-1} \\ & + \beta_{10} \ln gfcf_{t-1} + \varepsilon_t\end{aligned}$$

The equation represents the short run and long run parameters. βji is the short run and βi is long run parameters (where, i = 1, 2….). Moreover, εt is the error term and p and q refer to the lagged period for the targeted variable and regressors respectively. To confirm the long run cointegration, bound test for cointegration is applied with the null hypothesis of no level relationship, Ho : β6 =β7 = β8= 9 = β10 = 0.

The results of bout test statistic, F statistic > lower bound {I(0)} and upper bound {I(1)} (rejecting null hypothesis) indicates that there is level or long run relationship among the variables of interest. The error correction model (ECM) based on ARDL is estimated to evaluate the short run dynamics based on the following equation:

$$\begin{aligned}\Delta \ln economic\_growth_t = {} & \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta \ln economic\_growth_{t-i} + \sum_{i=1}^{q} \beta_{2i} \Delta \ln edu\_exp_{t-i} \\ & + \sum_{i=1}^{q} \beta_{3i} \Delta \ln tec\_student_{t-i} + \sum_{i=1}^{q} \beta_{4i} \Delta \ln general\_student_{t-i} + \sum_{i=1}^{q} \beta_{5i} \Delta \ln gfcf_{t-i} + ECT_{t-1} + t\end{aligned}$$

The ECTt-I is the error correction term. Statistically significant and negative value of implies the speed at which deviations from a long-run equilibrium relationship between variables are corrected in a model, facilitating the return to that equilibrium.

4. Results and Discussion

4.1 Descriptive summary

In Table 1, summary statistics are presented. These statistics provide an overview of the central tendency, spread, and shape of the distribution for each variable. The skewness and kurtosis values provide insights into the symmetry and peakedness of the distributions. It's worth investigating outliers or the specific context of these variables for a more detailed analysis.

Table 1: Summary statistics

	Mean	max	min	Std. Dev.	iqr	kurtosis	skewness	N
Ln(economic growth)	1.347	2.306	-2.119	.871	.547	9.423	-2.49	38
Ln (expenditure on education)	.876	1.283	-0.405	.345	.495	6.177	-1.432	38
Ln(technical student)	9.869	10.819	9.007	.414	.435	3.521	.758	38
Ln (general student)	11.617	13.236	10.319	.663	.494	3.099	.292	38
Ln(gross fixed capital formation)	3.05	3.479	2.756	.16	.146	3.645	.804	38

Note. max = maximum, min = minimum, Std. Dev. = standard deviation, iqr = interquartile range, N = number of observation

The summary statistics provide insights into several variables. "lneconomic growth" has a positive mean of 1.347, but its wide range, high kurtosis (9.423), and negative skew (-2.49) suggest possible outliers and a skewed distribution. "lnedu exp" shows a positive average expenditure (mean: 0.876) but also exhibits a skewed distribution with a negative skew of -1.432. "lntec student" has a narrower range and slightly positive skew (0.758). "lngeneral student" has a higher mean and moderate positive skew (0.292). Finally, "lngfcf" has a mean of 3.05 and positive skew (0.804) with a narrow range. These statistics offer initial insights into the characteristics of these variables, but further analysis should consider outliers and the specific context for meaningful conclusions.

4.2 Stationarity of time-series

The unit root test results indicate the stationarity properties of the variables in the analysis. The t-statistic values are used to assess whether each variable is stationary or has a unit root. Stationarity implies that a time series data is stable over time and does not exhibit a trend or systematic patterns. To test the stationarity of the time series ADF and PP tests are employed. The results of these tests are presented in Table 2 and Table 3.

Table 2: Unit Root Test Table (PP)

	At Level		First difference		Order of integration
	With Constant	With Constant & Trend	With Constant	With Constant & Trend	
	t-Statistic	t-Statistic	t-Statistic	t-Statistic	
Lneconomic_growth	-7.464***	-7.378***	-23.705***	-26.808***	I(0)
Lnedu_exp	-3.066**	-4.415***	-8.780***	-10.222***	I(0)
Lngeneral_student	-1.523	-3.472*	-10.222***	-10.128***	I(1)
Lngfcf	-0.457	-2.008	-7.837***	-7.987***	I(1)
Lntec_student	-1.234	-3.696*	-10.007***	-10.432***	I(1)

Note. (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%

The results indicate that the "Lneconomic_growth" and "Lnedu_exp" variables are stationary at both the level and first difference, as indicated by the t-statistic values being significant at the 1% level with or without a constant or trend. This suggests these variables are I(0), meaning they are integrated of order 0 and are stationary. On the other hand, "Lngeneral_student," "Lngfcf," and "Lntec_student" are non-stationary at the level but become stationary at the first difference, with t-statistic values being significant at the 1% level. This implies these variables are I(1), integrated of order 1, and require differencing to achieve stationarity.

Table 3: Unit Root Test Table (ADF)

	At Level		First difference		Order of integration
	With Constant	With Constant & Trend	With Constant	With Constant & Trend	
	t-Statistic	t-Statistic	t-Statistic	t-Statistic	
Lneconomic_growth	-7.124***	-7.001***	-7.097***	-6.960***	I(0)
Lnedu_exp	-3.204**	-4.424***	-7.654***	-7.691***	I(0)
Lngeneral_student	-1.737	-3.405*	-6.413***	-6.311***	I(1)
Lngfcf	-0.626	-1.851	-4.454***	-7.893***	I(1)
Lntec_student	0.7198	-3.644**	-7.736***	-7.827***	I(0)

Note: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%

Table 3 indicates that "Lneconomic_growth" and "Lnedu_exp" are stationary at both the level and first difference, with t-Statistic values being significant at the 1% level with or without a constant or trend. This indicates that these

variables are I(0), meaning they are integrated of order 0 and are stationary. Conversely, "Lngeneral_student" and "Lngfcf" are non-stationary at the level but become stationary at the first difference, with t-statistic values significant at the 1% level. This implies they are I(1), integrated of order 1, and require differencing to achieve stationarity. "Lntec_student" is stationary both at the level and first difference, with t-statistic values significant at the 1% level, indicating it is I(0).

The stationarity of the time series, featuring a mixed order of integration but none exceeding I(1), confirms the suitability of the ARDL model for estimating the expected relationship between public financing on education and the economic growth of Nepal.

4.3 Selection of optimal lag

The determination of the optimal lag for an ARDL (p,q) model is crucial. In the case of annual time series data, lags are typically of a relatively small magnitude. The results of Lütkepohl (1993) based on the lag selection criteria, which are based on VAR methodology, are presented in Table 4.

Table 4: Optimal Lag Selection Criteria

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-20.8863			0.000	3.2 e-06	1.52272	1.59927	1.74719
1	38.12	118.01	25	0.000	4. 3e-07*	-0.47765	-.018353*	.869142*
2	52.6441	29.048	25	0.262	8.9 e-07	0.13858	0.980618	2.60769
3	93.7946	82.301	25	0.000	4.6 e-07	-0.81145	0.413337	2.77999
4	121.401	55.212 *	25	0.000	7.4 e-07	-.964739*	0.642788	3.74902

Note. * indicates lag order selected by the criterion. LL = log likelihood, LR: sequential modified LR test statistic *(each test at 5% level), df = degree of freedom, p = probability value, FPE: Final prediction error, AIC: Akaike information criterion, SBIC: Schwartz Bayesian Information Criterion, HQIC: Hannan-Quinn information criterion*

Table 4 presents the result for lag selection criteria in a time series analysis. The selected lag order varies depending on the criterion used. The results indicate that when using FPE, SBIC, and HQIC except AIC and LR, a lag order of 1 is selected, as indicated by the asterisk (*). This means that a lag of 1 is considered optimal according to these criteria.

4.4 Bound test for cointegration

Pesaran et al. (2001) proposed the bound test for cointegration which is applied to know the cointegration between variables of interest that confirms whether there is long-run relationship exists or not. After choosing the optimal level of lag, the ARDL (1,0,1,1,1) model is selected. Based on the estimated ARDL model, the result of the bound test is presented in Table 5.

Table 5: ARDL Bounds Test Results

Test Statistic	Value	Significant	I(0)	I(1)
F-statistic	12.502	10%	2.54	3.52
K	4	5%	2.86	4.01
		2.5%	3.25	4.49
		1%	3.74	5.06

Note. H_o: No level relationship (or no cointegration), accept H_o if F < critical value for I(0) regressors and reject H_o if F > critical value for I(1) regressors

The table 5 presents ARDL bounds test results. The F-statistic is used to test for the presence of a cointegrating relationship between the variables in the model. If the F-statistic is greater than the critical value for upper bound I(1) regressors, then we would reject the null hypothesis (Ho), suggesting there is cointegration or level relationship. The result indicates that the F-statistic is 12.502 for this model, where the F-statistic exceeds the critical values for both lower bound I(0) and upper bound I(1) regressors, suggesting a cointegrating relationship may exist.

4.5 Short and long run dynamics: ARDL-ECM results

The bound test for cointegration indicates that there is a long-run relationship between the time series. Table 6 presents the results of an ARDL model with an error correction mechanism for the dependent variable

"lneconomic_growth" and several independent variables. The ARDL-ECM model is used to analyze the short-run and long-run dynamics of the relationship among these variables.

Table 6: Results of short-run and long-run dynamics

Dependent variable: lneconomic_growth	Coef.	Std.Err.	t	P>t	95% Conf.	Interval
Adjustment						
CointEq(-1)*	-1.204	0.164	-7.330	0.000	-1.540	-0.867
Long run dynamics						
lnedu_exp	-0.912	0.418	-2.180	0.038	-1.769	-0.056
lntec_student	0.569	1.310	0.430	0.667	-2.114	3.252
lngeneral_student	-0.006	0.656	-0.010	0.992	-1.351	1.338
lngfcf	0.145	1.679	0.090	0.932	-3.294	3.584
Short run dynamics						
D(lntec_student)	-2.932	1.222	-2.400	0.023	-5.435	-0.430
D(lngeneral_student)	1.172	0.695	1.690	0.103	-0.251	2.595
D(lngfcf)	-3.248	2.266	-1.430	0.163	-7.890	1.394
_cons	-4.522	4.685	-0.970	0.343	-14.119	5.074
R^2	0.728264		Durbin-Watson stat		2.015050	
Adjusted R^2	0.694297		Log likelihood		-38.65878	
F-statistic	21.44030		Prob (F-statistic)		0.000000	

The Error Correction Term (ECT) in these results, represented by the coefficient of -1.204, indicates that any deviations from the long-run equilibrium relationship between the variables will be corrected at a rate of approximately -1.204 units per period, helping to restore the long-term relationship between educational expenditure and economic growth. In the long run, the ARDL-ECM analysis reveals that higher levels of educational expenditure ("lnedu_exp") are significantly associated with a negative impact on "lneconomic_growth," suggesting that increased spending on education may hinder long-term economic growth. The coefficient of lnedu_exp is approximately -0.912. This suggests that a one percent increase in "lnedu_exp" is associated with a decrease of approximately 0.912 percent in "lneconomic_growth" in the long run. Educational expenditure may reduce economic growth in Nepal due to factors such as misallocation of resources, a mismatch between the quality of education and labor market demands, and the issue of brain drain, where highly skilled and technical individuals emigrate in search of better opportunities, further limiting the potential for economic growth. However, Devarajan et al. (1996) stated that if there is a negative correlation between education expenditure and growth, it doesn't necessarily indicate that education expenditure is ineffective. It might suggest that countries with slower growth rates invest more in education with the intention of achieving faster growth. However, other variables such as "lntec_student," "lngeneral_student," and "lngfcf" do not exhibit statistically significant long-run effects on economic growth.

In the short run, the model indicates that fluctuations in the number of technical students ("lntec_student") exert a substantial negative influence on "lneconomic_growth. The results reveal that a one-student increase in the previous year's "lntec_student" is associated with a decrease of approximately 2.932 percent in "lneconomic_growth." This is statistically significant at the 5% level (p-value is 0.023). It implies that abrupt changes in technical education enrollment can lead to short-term declines in economic growth. Abrupt changes in technical education enrollment in Nepal, often due to supply-demand imbalances and economic cycles, can result in short-term economic growth declines. Additionally, the phenomenon may exacerbate brain drain as graduates seek opportunities abroad due to limited domestic employment prospects. Additionally, "lngeneral_student" has a marginally significant ($p = 0.103$) positive impact, while "lngfcf" does not significantly affect short-term economic growth.

The overall model fit is robust, with an R-squared value of 0.728, indicating that the model explains a significant portion of the variation in "lneconomic_growth" by 72.8%. The highly significant F-statistic ($p < 0.001$) underscores the model's overall statistical significance, while a Durbin-Watson statistic (2.015) close to 2 suggests no significant autocorrelation in the model's residuals, further supporting its reliability for analyzing the relationship between the specified variables and economic growth.

4.6 Diagnostics tests

Several diagnostics tests confirm the statistical robustness of the model employed in the study. Table 7 presents the different statistical diagnostic test results.

Table 7: Results of Various Residual and Stability Diagnostic Tests

Residual and Stability DiagnosticTest	Statistics	Prob.	Hypothesis
Breusch-GodfreySerialCorrelationLMTest (χ^2 statistic)	0.188	0.6649	No serial correlation
HeteroskedasticityTest:IM test (χ^2 statistic)	37.00	0.4226	No heteroskedasticity (at 5 % level of significance)
Ramsey RESET (F statistic)	0.18	0.9121	No functional form misspecification

The results of various residual and stability diagnostic tests suggest that there is no significant serial correlation, heteroskedasticity, or functional form misspecification in the model, indicating that the model's residuals are well-behaved and meet key assumptions, enhancing the model's reliability for analysis. Moreover, figure 1 shows the cumulative sum of recursive residuals (CUSUM) squared plot. The plot of CUSUM squared lies between the 0.05 level of critical boundaries that indicates the estimated ARDL mode is stable and its parameters predict the relationship accurately.

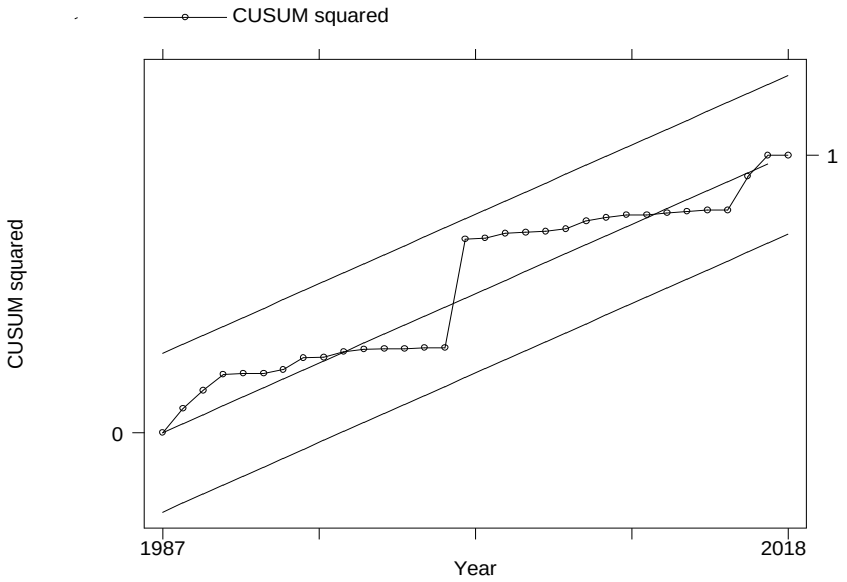

Figure 1: Plot of CUSUM squared

5. Conclusion and Implications

This study investigated the relationship between public financing in education and the economic growth of Nepal using a time series dataset spanning from 1982 to 2018. To estimate the relationship, ARDL error correction model was employed. The findings revealed several critical insights into this relationship. Firstly, the ARDL-ECM model established a long-run relationship between public financing in education and economic growth. Specifically, an increase in educational expenditure was found to have a significant negative impact on economic growth in the long run, suggesting that higher spending on education may hinder sustained economic expansion. In the short run, fluctuations in the number of technical students were identified as a key factor influencing economic growth. An increase in the number of technical students was associated with short-term declines in economic growth, emphasizing the need for a balanced approach to educational enrollment. Additionally, the presence of brain drain, where skilled individuals emigrate in search of better opportunities, emerged as a potential consequence of this phenomenon. These findings carry several implications for policymakers and stakeholders in Nepal. Firstly, a careful and well-planned allocation of resources within the education sector is essential to ensure that increased educational expenditure translates into productive economic growth. Balancing enrollment in technical programs is vital to avoid short-term disruptions in economic growth. Moreover, addressing the issue of brain drain by creating opportunities for skilled individuals within Nepal can help retain talent and contribute to the country's long-term economic development.

Conflicting Interest

Authors declare no any conflicting interest.

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