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Relationship between Capital and Recurrent Expenditure with GDP Growth in Nepal: An Autoregressive Distributed Lag (ARDL) Approach

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Abstract

This study examines the relationship between Capital and Recurrent Expenditure with GDP Growth in Nepal. Employing a multivariate autoregressive distributed lag (ARDL) approach to the data from 1974 to 2020, the empirical findings reveal a strong long-run relationship between recurrent and capital expenditure with the nominal GDP. Interestingly, the impact of recurrent expenditure is higher than that of capital expenditure on GDP in the long run. However, the analysis highlights no clear short-run relationship. The weak short-term relationship observed may be due to the leakage of multipliers and the concentration of a major portion of expenses towards the end of the year. Consequently, the study calls for reforms in the implementation of the government budget, ensuring the even distribution of expenses throughout the fiscal year. Also, the government can increase the efficacy of its spending in the short run by pursuing policies that plug in the leakages of the spending multiplier. The outcomes of this research contribute to the broader discourse on the optimal allocation and implementation process of government resources and provide valuable insights for policymakers in Nepal seeking to bolster economic growth and development.

Keywords: Capital expenditure, Revenue expenditure, Gross Domestic Product, An Autoregressive Distributed Lag (ARDL), Government of Nepal.

1. Background

Nepal's fifteenth periodic plan (2019/20-2023/24) aims to achieve economic growth through efficient, equitable, and result-oriented management of public expenditure. It focuses on allocation and spending efficiency while managing resources. The plan states that the objectives of public expenditure shall be met by enhancing good governance through more transparency, efficiency, accountability, and results orientation of the spending system. The plan also envisages directing the

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public expenses toward human and social capital formation that have an important bearing on the expansion of output.

In Nepal, government spending can be broadly classified into three categories: finance, capital, and recurrent. Recurrent expenditure encompasses payments for employee compensation, social security, office materials and services, maintenance of capital items, interest, and monitoring expenses. These expenses are for running day-to-day administration and generally the benefits expire within a year. Capital expenditure is incurred for the acquisition of fixed assets, infrastructure construction, major improvements in assets, and research and development, with benefits expected to remain for a long period. Financial provisions relate to investment, borrowing, and their redemptions.

The government of Nepal has implemented various policy reforms to enhance the effective management of public spending. A planned development approach through detailed planning of the economic activities by the government has been followed for the last seven decades. The planning document identifies priority areas for expenditure, particularly for capital investments. The Medium-Term Expenditure Framework (MTEF) serves as a crucial link, aligning the annual budget with long-term plans and facilitating multi-year budget allocation for high-priority projects. Expenditures are categorized into priorities based on indicators such as their contribution to growth, employment generation, regional balance, and strategic importance. This classification enables comprehensive evaluation and decision-making.

Additionally, a participative approach, bottom-up planning strategy, and measures to control non-budgetary expenses have been adopted. The government has also introduced mechanisms such as an expenditure tracking system, prevention of capital fund diversion, strengthened audit systems, and real-time project monitoring through the action room. These efforts collectively aim to enhance the effectiveness and transparency of the expenditure management system in Nepal.

Despite continuous reforms and technical assistance from the developing partner countries, the yield of the expenses remains below the expectation. The performance never equals the objectives even in terms of the allocated monetary targets let alone the physical progress[§§§]. The government statistics over the last twenty years show that only seventy-three percent of the total allocation is actually spent[****]. The qualitative aspects of the spending such as long-term outcome, sustainability, and return from the investment do not receive adequate priority in the plan and budget evaluation. In this context, this article tries to explore how the recurrent and capital expenditure are associated with the nominal GDP in Nepal.

2. Objective of the Study

This research attempts to investigate the short- and long-term relationships of capital and recurring expenditures with Nepal's economic performance as measured by GDP. To achieve this objective, an

[§§§] Annual Economic Surveys by Ministry of Finance Nepal

[****] Author's calculation from last 20 year's estimated and actual budget of Government of Nepal

empirical approach is adopted, utilizing data spanning from 1974 to 2020. The data availability for the period prompted the choice of the study period for this research, taking into consideration any changes in the expenditure classification system over this period. Using time series econometric techniques, this study aims to examine how expenditures correlate with the economic performance of the nation.

Recurrent expenditure and capital expenditure have different characteristics and thus have different kinds of relationships with GDP. Recurrent expenditure has an immediate impact in the short run, while capital expenditure influences GDP over a more extended period. By comparing the relative effects of these two types of expenditures, the study aims to determine their respective contributions to economic growth. The deeper analysis of expenditure dynamics will help the government make informed decisions regarding spending plans and better understand how changes in expenditures can shape the overall economy. Ultimately, the study aims to offer valuable insights into how government spending influences economic performance in Nepal.

The remaining part of this paper follows the following structure. Section 3 provides a literature review categorized into three subtopics: theoretical perspectives, empirical perspective, and Nepalese context. Section 4 describes the econometric methods used for the analysis, specifically focusing on the Autoregressive Distributed Lag (ARDL) method. In Section 5, the data and its descriptive characteristics are presented. Section 6 presents the econometric analysis, including unit root tests, ARDL analysis, and diagnostic checking. Finally, Section 7 summarizes the study's findings and offers policy implications based on the results.

3. Literature Review & Theoretical Background

3.1 Theoretical perspectives:

The Keynesian approach to macroeconomics puts much emphasis on government spending as it is viewed as a growth-propelling intervention. Keynes (1936) showed the importance of government interference in lifting aggregate demand, especially in the times of recession. However, Classical and neoclassical economic perspectives regard government spending as essentially transferring resources from the more efficient private sector to the less efficient public sector. According to them, high taxation and borrowing aimed at strengthening the government's spending capability create inefficiencies that harm economic growth. Therefore, government involvement should be kept at a minimum, focusing primarily on basic public goods such as defense, justice, and administration. Neo-classical models however do not disapprove of the influence of government spending on the level of income in the short-run. What they doubt is the impact on the long-run growth.

Solow (1956) argued that the increase in per capita GDP hinges on three fundamental elements: the accumulation of capital, the availability of labor, and technological advancement. Public expenditure plays a significant role in enhancing output through all three channels. Investments made in areas such as the salary of teachers and doctors, free medicines, health insurance, immunization programs,

skill development programs, and social assistance effectively improve the quality of the labor pool, which is a vital input to the production process. By prioritizing these areas, governments can positively impact the overall productivity and efficiency of their workforce.

Furthermore, public investment in infrastructure development, including roads, bridges, hydropower stations, drinking water facilities, public housing, and machinery, not only adds to the physical capital stock available in the country but also enhances the quality of private investment. Governments can foster a conducive atmosphere for business growth by establishing and maintaining dependable infrastructure, attracting both domestic and foreign investment. This, in turn, contributes to increased economic growth and development (World Development Report 1994, 1994; Foster et. al, 2022).

Moreover, the government plays a vital role in maintaining law and order, enforcing contracts, and safeguarding property rights, functions crucial for effective governance. By upholding the rule of law and providing a stable and secure environment for businesses and individuals, governments lay the groundwork for economic growth. This encourages private investment, stimulates innovation, and fosters entrepreneurship (Acemoglu & Johnson, 2005; Dam,2007; Davis et al, 2008; Haggard & Tiede 2011; Eicher &Newiak, 2013)

Additionally, providing subsidies for the adoption of new technology and allocating resources towards research and development can greatly influence overall factor productivity. (Habib et al., 2019; Beugelsdijk et al, 2018). By supporting the development and adoption of cutting-edge technologies, governments can fuel innovation and drive productivity gains across various sectors of the economy. This, in turn, leads to increased efficiency, competitiveness, and overall economic growth.

Expenditures impact on growth also channels through the correction of market failures (López & Islam, 2008). Markets fail to produce an efficient level of goods having positive externalities as their private benefits fall short of the social benefit. Government spending can correct this market failure by provisioning funding through subsidies. These functions of the government help promote growth in the short and long run.

Many argue that an increment in consumption expenditures by the government doesn't lead to an increase in consumption regardless of the sources of funding used by the government. If government finances through tax, then the citizens will have an equivalent less amount at hand to spend for. If financing is made by way of debt, citizens' expectation of more taxes in the future motivates them to save more in the current period. Therefore, the government's effort is neutralized, and hence no multiplier effect (Bernheim, 1989; Barro, 1990; Barro, 1989; Cunningham and Vilasuso, 1994).

AD-AS model

An increase in any of the variables comprising the GDP computation identity Y = C + I + G + (X - M) leads to a rightward shift in the aggregate demand (AD) curve when the increase stems from factors other than price. The government's decision to increase consumption or capital expenditure increases the G shifting the demand curve to the right and settling the economy in a new equilibrium with a higher level of output. Capital expenditure doesn't just influence the short-run aggregate supply (AS) curve through factors like increasing firm productivity but also extends its impact to the long-run by shifting the supply curve to the right, thereby enhancing the overall potential of the economy. Therefore, both recurrent and capital expenditures energize the economy to march toward full employment (Fields & Hart, 1996).

The new growth theory by Paul Romer (1994) advocated a new dimension in the economic growth model. Continuous improvement in productivity and hence growth is possible through ideas and knowledge. The role of government becomes prominent in employing the resources for research and development that contribute to the creation of ideas and knowledge. Also, governments can invest to diffuse and propagate knowledge and ideas.

It is evident that recurrent expenditure helps growth by raising the aggregate demand and maintaining capital goods, upholding the rule of law and property rights and provisioning public goods. Capital expenditure increases the stock of infrastructure, technology and stock of physical capital that promotes growth.

3.2 Empirical perspectives

Past studies demonstrated varied results. The government's size is inversely proportional to the performance of the economy in the USA (Mitchell, D. J. 2005). Fouladi, M. (2010) applied the Computable General Equilibrium (CGE) model to simulate the response of the Iranian economy to the change in government expenditure with different scenarios. The response of the economy was negative not only to the consumption expenditure but also to the investment expenditures barring investment in oil and service sectors. Consumption expenses also reduce the level of employment and investment.

Some researchers have attributed the quality of spending and economic growth relationship to the effectiveness of governance. Keefer and Knack (2007) opined that the quantum of public spending should not be linked with productivity as the quality of the government is instrumental to the relationship between public spending and growth. Efficient governments despite relatively less spending can make more growth-oriented impacts. Butkiewicz and Yanikkaya (2011) found that in developed countries, there exists a negative correlation between total expenditure and growth. Additionally, they concluded that in developing nations, despite governance challenges, capital expenditure can positively impact economic growth.

Mazorodze, B. T. (2018) suggests that both consumption and investment expenditures contribute positively to economic growth. Therefore, recommendations from the International Monetary Fund (IMF) to reduce expenses could potentially harm the Zimbabwean economy.

3.3 Nepalese Context

Studies on Nepal's experience have discovered a positive association between expenditure and growth. According to Shrestha (2009), investment in physical infrastructure is productive. However, the share of contribution to the growth is declining. Nepal has gone through fundamental shifts in its economic landscape since then necessitating a fresh study appending the period after 2009.

Rasaili and Paudel (2019) utilized the Johansen cointegration test and VECM approach to examine the interrelationship between national income and government expenditure in Nepal. While VECM showed a positive and significant long-run causality running from the capital and recurrent expenditure to national income, the Granger causality test showed no short-run causality between income and expenditure. The government introduced a new expenditure classification method in the fiscal year 2002/03 causing a structural break in that year. This study has not taken this reality into account.

Adhikari and Kharel (2021) concluded that public spending responds positively to economic growth in Nepal. They further classified the spending into regular, capital, health, education, and miscellaneous groups and found that while regular and education expenditures have a positive association, capital expenditure has a negative association with the real GDP. However, their model is misspecified as the analysis is based on the ordinary least square method (OLS) of I (1) variables. OLS is likely to produce a spurious relationship in the presence of unit roots.

Overall, experimental findings have as much variation in the conclusions as there is in the theoretical analysis. Therefore, the effect of public spending on growth seems quite contextual and country-specific and should be tested with the evidence from the country under study.

4. Methodology:

This study utilizes the widely employed neoclassical Cobb-Douglas production function as its basis, with slight variations in the representations of capital and technology. This functional form serves as the foundation for various neoclassical growth theories, including the Solow-Swan Model (Solow, 1956; Swan, 1956), Endogenous Growth Theory (Romer, 1990), Ramsey-Cass-Koopmans Model (Stokey, 1989), AK Model (Romer, 1986), and Overlapping Generations Model. The role of population in economic development has long been recognized (Malthus, 1798), thus the population is used as a proxy for labour since data on the employed labour force is not available for the study period. To address the objectives of the study, recurrent expenditure and capital expenditure are utilized as substitutes for capital and technology, respectively. Recurrent expenditure helps to maintain, if not increase, the productive capacity of capital, while capital expenditures primarily aim

to augment the stock of physical capital. Given these considerations, the following functional form is proposed for this study.

GDP = f (capital expenditure, recurrent expenditure, population)

Not only does the spending cause the output to grow, but the other way around is also possible as the growth in GDP leads to a higher amount of money available for spending through increased taxation. When the economy grows, tax revenues generated from increased economic activity also tend to rise. This provides governments with more funds that can be used for various purposes, including additional spending or investment. So, there is the possibility of a two-way relationship between GDP and spending.

Several regression methods are available for the analysis of intricacies among the time series. Multivariate models such as VAR, VAR in difference, VECM, and ARDL are some of them. However, the selection of a particular method rests on the purpose of the study and the nature of the variables' relationship.

We start by considering the VAR model (Sims 1980) at the outset. A VAR (Vector Autoregressive) model is a type of multivariate model in which all variables are interrelated and determined together within the system. VAR captures the true relationship when the variables are stationary. Utilizing VAR necessitates that all variables are stationary at level.

The ARDL model, introduced by Pearson et al. (1999), is a multivariate time series model that allows for a combination of I (0) and I (1) variables. It has become widely popular in econometrics for estimating and testing the long-term relationships between variables. With the ARDL bounds testing approach, we can estimate the model by examining both short-term fluctuations and long-term equilibrium relationships. Then, we conduct a bounds test to see if certain values are significant, which helps us determine if there is a long-term relationship among the variables. If the variables are found to be cointegrated from the bound test result, both short-run ARDL and long-run ECM can be estimated whereas only the short-run (ARDL) model is estimated should the variables are found to be not cointegrated.

In this analysis, variables such as Log_gdp, log_capital, and log_recurrent are found to be non-stationary at the level but change into stationary after first differencing. On the other hand, Log_pop remains stationary at the level, featuring both a trend and an intercept. This allows us to use the ARDL model.Three different sets of tests namely Augmented Dickey Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) are utilized to test check the stationarity of the variables. The ADF test (Dickey & Fuller, 1979) is widely used to ascertain the existence of a unit root in a time series. Its null hypothesis posits that the series possesses a unit root. The PP test (Phillips & Perron, 1988) considers autocorrelation and heteroscedasticity in the error term, providing a robust analysis of stationarity. The KPSS test (Kwiatkowski et al., 1992) specifically focuses on testing trend stationarity in the time series.

Since the variables are of mixed order of I (0) and I (1) and none of them are integrated of order 2, ARDL method is chosen as the appropriate approach for further analysis. The generalised equation for ARD(p,q) is given by;

$$Y_t = \alpha + \sum_{i=1}^{p} \beta_i Y_{t-i} + \sum_{i=0}^{q} \delta_i X_{t-i} + \varepsilon_t \quad \ldots\ldots (1)$$

where Y is the dependent variable X is the vector of independent variables. α is constant and β and

δ are coefficients of dependent and independent variables respectively. ε is the error term. p and q are the optimal lags. ARDL with log_gdp, log_capital , log_recurrent and log_pop takes the following form;

$$log\_gdp_t = \alpha + \sum_{i=1}^{p} \beta_i \text{log\_gdp}_{t-i} + \sum_{i=0}^{q1} \delta_{1,i}\, log\_capital_{t-i} + \sum_{i=0}^{q2} \delta_{2,i} \text{log\_reurrent}_{t-i} + \sum_{i=0}^{q3} \delta_{3,i} \text{log\_pop}_{t-i} + \varepsilon_t \quad \ldots\ldots (2)$$

5. Data Analysis and Interpretation

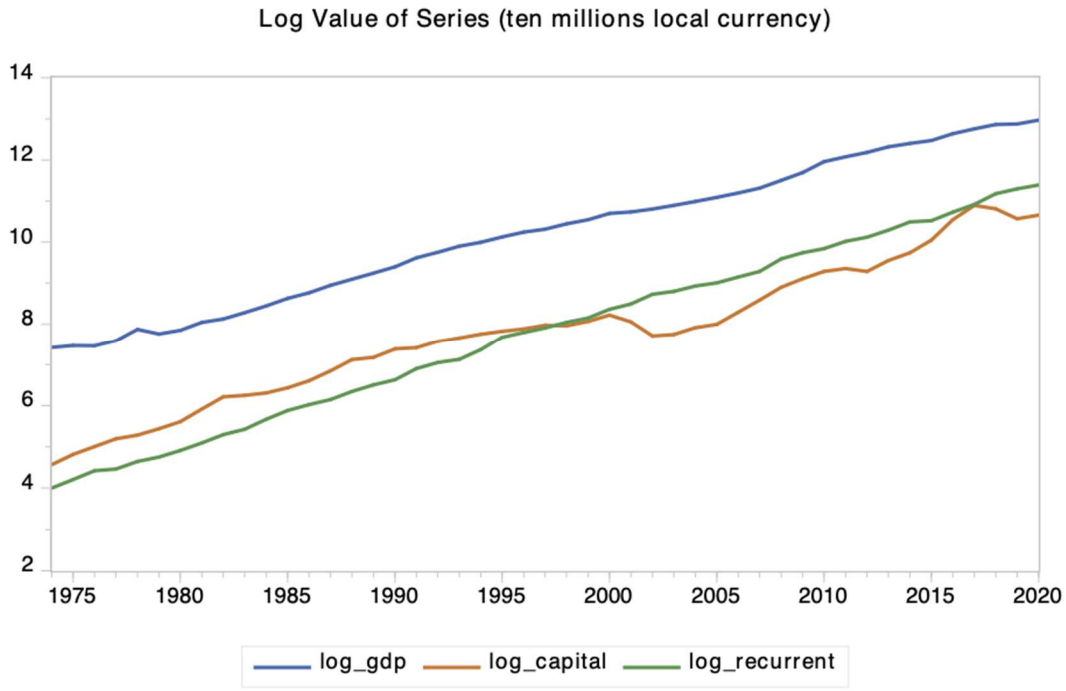
The GDP data is retrieved from the public finance section of the macroeconomic dashboard of the Ministry of Finance. The government's expenses data are extracted from the annual budget speech document of the government of Nepal. All the budget speech documents can be found on the website of the Ministry of Finance. The population data is sourced from the data repository of World Development Indicators.

The method of classification and compiling of government statistics has been changed in the fiscal years 2002/03 and 2010/11. The nature of the spending unit would determine the type of expenditure before 2002/03. Most of the expenses of development administration offices were classified as development expenditures even if the purpose of the expenses was for consumption. Likewise, expenses of general administration offices were coded as regular expenses. This categorization has been reformed with a new system GFSM 2001 framework developed by IMF that classified the expenses on the basis of their purpose regardless of the nature of the spending unit. Three categories namely recurrent, capital, and principal repayment would characterize the government expenses under the new system.

In 2010/11 again a new system GFSM 2014, an upgraded version of GFSM 2001 was implemented. The new system introduced a new category- financial provision- in addition to recurrent and capital

expenses repealing the previous repayment of the principal category. Subsequently, all the investments, redemption of investments, all kinds of debt be they domestic or foreign, and repayment of debts were separated from the group of capital expenditure and put in financial provision category.

Changes in 2002/03 rearranged the expenses heading in such a way that it is almost impossible to reengineer the series according to the old classification by simply looking at the details in the published documents. So, to account for this change in the policy, a dummy variable named dum_2002 is included in the model as an exogenous variable. Since the regular expenditure (before 2002/03) included debt servicing; both interest and principal repayment but recurrent expenditure after 2002/03 excluded principal repayment, the same should be added to the series of recurrent expenditures. Similarly, many expenditure items such as capital grants to the local level were classified as capital expenses before 2010/11. They should be deducted from the recurrent series and included in the capital series. Also, governments' share and loan investments, classified as a financial provision after 2010/11 are added to the capital expenditure.



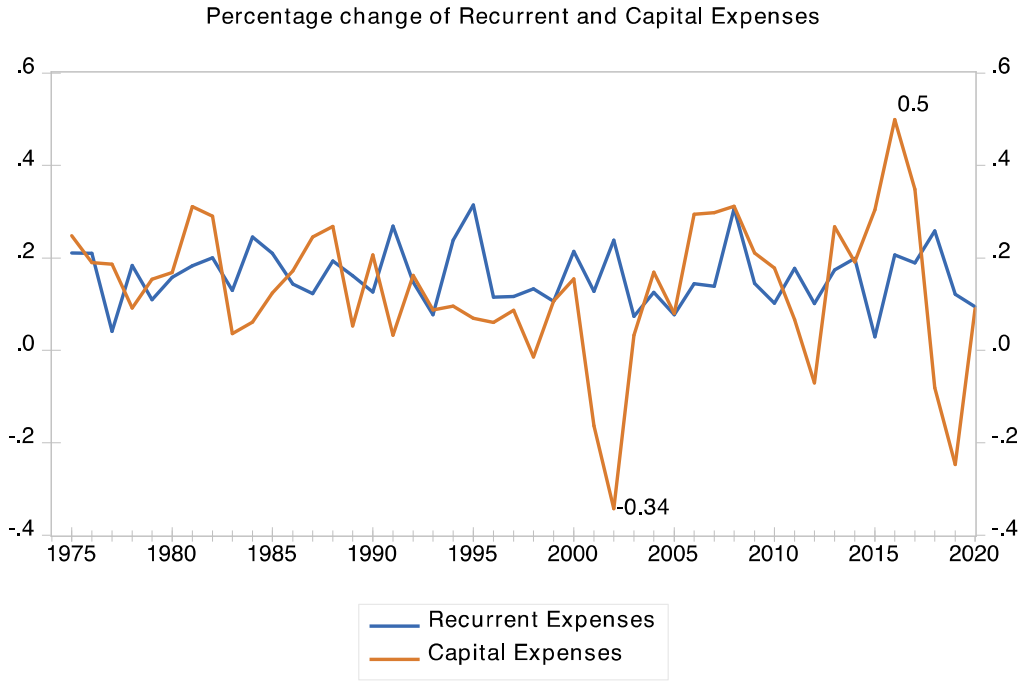
fig(a)

Fig(a) shows the series of logarithmic values of nominal GDP, capital expenditure, and recurrent expenditure expressed in ten million in local currency. The GDP series is increasing continuously except in the years 1976 and 1979. However, there are seemingly structural breaks in 1993, 2000,

2010, 2015, and 2018. Vibrations in the economy faded after the announcement of the midterm election in 1993 which entailed a period of instability with a series of formation and dissolution of governments almost every year. The civil war was more intensified after 2000 plunging the already beleaguered economy. The Gorkha earthquake and obstruction in the Indian border loosen the momentum of growth in 2015. 2019 brought yet another downward swing to the economy thanks to the Covid19. Although there are periods of ups and downs in income growth, some due to historical events and others due to the operation of trade cycles, no extreme value has crossed even 1.5 standard deviation from the mean.

Recurrent expenditure is ever increasing though the rate of growth is not uniform. However, that is not the case with regard to the Capital expenditure. The graph shows that it used to be above recurrent expenditure before being overtaken by recurrent expenditure in 1998.

Capital spending takes a reversal turn from 1997 albeit slowly until 2003. The principal responsible factor was the civil war that started in Feb 1996 necessitated more resource diversion toward security expenses of recurrent nature. Several breaks are conspicuous in the recurrent expenditure series. 1983, 1993, 1999, 2010, and 2017 are prominent among them.



Fig(b)

As shown in Fig(b), capital expenses decreased in 2002 by 34 percent due to a change in the expenditure classification method. A dummy is introduced to deal with this situation. Likewise,

capital expenditure shot up in 2016 because of massive expenses for the reconstruction of infrastructure destructed by the 2015 earthquake and remained in a high trajectory until the reconstruction is complete. Another dummy dum_2016 was used for the period 2016 to 2020.

Table 1. Summary Statistics of vairalbes

Summary statistics of variables				
	Δlog_gdp	Δlog_capital	Δlog_recurrent	Δlog_pop
Mean	0.1206	0.1322	0.1606	0.0166
Median	0.1187	0.1544	0.1464	0.0197
Standard Deviation	0.0668	0.1546	0.0646	0.0077
Minimum	-0.1123	-0.3422	0.0292	0.0018
Maximum	0.2810	0.4994	0.3144	0.0279
Range	0.3933	0.8416	0.2852	0.0261
Correlation				
Δlog_gdp	1			
Δlog_capital	0.2314	1		
Δlog_recurrent	0.1912	0.0190	1	
Δlog_pop	0.0125	-0.0980	0.1078	1

Although the correlation between spending and GDP is above 0.95 in raw data form and above 0.98 in logarithmically transformed form, the correlation between their growth is weak. The table shows that the correlation coefficient between GDP growth and capital expenditure growth is 0.2314 and that between GDP and recurrent expenditure is 0.191. The growth of the population exhibits weak correlations with the growth of other variables.

6. Empirical analysis

6.1 Unit root test

Table 2 shows the result of the unit root and stationary test of variables under ADF, PP and KPSS methods.

Table 2: Unit root test

Specifications	Variables	ADF	PP	KPSS
At level: with intercept	log_gdp	-0.2376	-0.2389	0.8852***
	log_capital	-0.6831	-0.9042	0.8625***
	log_recurrent	-0.7098	-2.0151	0.8932***
	log_pop	-0.1747	-3.9004***	0.8630***
At level: with trend and intercept	log_gdp	-1.8842	-2.2891	0.0971
	log_capital	-2.5515	-1.9824	0.1065
	log_recurrent	-2.6445	-2.5689	0.1848**

	log_pop	-5.4938***	-0.1300	0.2241***
At 1st difference: with intercept	log_gdp	-6.3522***	-6.3493***	0.0971
	log_capital	-4.0734***	-3.8260***	0.1637
	log_recurrent	-7.6843***	-8.9027***	0.2474
	log_pop	-2.9358*	-1.1708	0.6437**
At 1st difference: with trend and intercept	log_gdp	-6.2913***	-6.2862***	0.0940
	log_capital	-4.0281**	-3.7750**	0.1450*
	log_recurrent	-7.6313***	-9.9902***	0.2836***
	log_pop	-1.1109	-1.1834	0.1166

*(Note: ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively).*

In the ADF and PP tests, the null hypothesis suggests that the variable possesses a unit root, whereas, in the KPSS test, the null hypothesis indicates that the variable is stationary. ADF and PP tests show consistent results for the variables log_gdp, log_capital and log_recurrent. They are non-stationary at their levels with intercept. Results are the same with trend and intercept as well. After first differencing, they become stationary at 1% level of significance for both the cases intercept and trend and intercept. KPSS test shows log_gdp, log_capital and log_recurrent trend stationary. For log_pop variable, the result varies with the types of the test. ADF test finds log_pop stationary at level with trend and intercept whereas the PP test shows the variable stationary at level with intercept only. KPSS test indicates the log_pop trend stationary, the same result as the other three variables.

6.2 Bounds tests for Cointegration

After estimating the ARDL model, bounds test for cointegration is conducted to see the long run relationship. Separate ARDL models and corresponding bound tests are performed allowing each variable in the model as the dependent variable.

Function	Lag applied	Lag selected(AIC)	F-statistics	Decision
F_{log_gdp}(log_gdp/log_capital,log_recurrent,log_pop)	3	(1,0,3,2)	7.9416***	Cointegrated
$F_{log\_capital}$(log_capital/log_gdp, log_recurrent,log_pop)	3	(2,0,3,2)	4.8649*	Not cointegration
$F_{log\_recurrent}$(log_recurrent/log_capital,log_gdp,log_pop)	3	(2,3,0,3)	15.2451***	Cointegrated
F_{log_pop}(log_pop/log_recurrent,log_capital,log_gdp)	3	(3,0,3,1)	1.2121	Not cointegrated

(Table 3)

(Note: ***, ** and * respectively indicates that the test statistic is above 1%, 5% and 10% upper critical value of the Pesaran *et al.*(2001))

Table 3 shows the results of the bound test for cointegration which shows that long run relationship exists only in two instances first when the log_gdp is the dependent variable and the second when log_recurrent is the dependent variable. This study is concerned with how government expenditures are related to the GDP. Therefore, we proceed to analyze solely the first cointegrating relationship, which involves GDP alongside capital expenditure, recurrent expenditure, and population.

6.3 Long-run relationship

The long-term relationship with log_gdp as a dependent variable can be estimated because the associated ARDL system is cointegrated as shown in Table 3. The results depict that changes in capital expenditure and recurrent expenditure have significant positive long-term impacts on the growth of the GDP.

Dependent Variable: log_gdp		
Regressor	Coefficient	P-value
log_capital	0.2756	0.0113
log_recurrent	1.5542	0.0003
log_pop	-0.5251	0.4679

(Table 4)

As shown in Table 4, a one percentage increase in capital expenditure is associated with a 0.27 percentage increase in GDP, while recurrent expenditure exhibits a higher impact of 1.55 percentage. The finding of recurrent expenditure having a greater long-term effect on GDP than capital expenditure might appear contrary to common assumptions about their nature. However, this could be attributed to the relatively higher weight of recurrent expenditure in the overall spending mix. Another plausible explanation is that recurrent expenditure encompasses salaries for teachers and healthcare workers, as well as investments in training and development. Although categorized as recurrent, these expenses contribute to the development of human capital, thereby benefitting the economy for many years to come. It is possible that the returns on investing in human capital outweigh those of investing in infrastructure and machinery in Nepal. The growth of population is negatively associated with the GDP but the outcome is not significant.

6.4 Short-run relationship

The results from Error Correction Form are presented in Table 5.

Dependent Variable: Δlog_gdp		
Regressor	Coefficient	P-value
Δlog_recurrent	0.4815	0.0003
Δlog_recurrent (-1)	-0.5136	0.0005
Δlog_capital	-	-

Δlog_pop	-3.8390	0.5516
Δlog_pop(-1)	21.1813	0.0855
Δlog_pop(-2)	-21.9846	0.0092
dum_2002	0.0254	0.5048
dum_2016	-0.1510	0.0012
trend	-0.0840	0.0000
ECM	-0.5654	0.0000

(Table 5)

Capital expenditure doesn't appear in the model, suggesting its limited impact in the immediate term. On the other hand, On the other hand, recurrent expenditure exhibits a notable and statistically significant relationship. However, drawing a definitive conclusion is challenging due to the conflicting nature of the impact observed in the differenced and first-lagged differenced forms.

The population variable demonstrates a mixed effect on GDP, indicating that its relationship with economic output is not straightforward. Additionally, the coefficient of dum_2002, the dummy representing the time when a different method of recognizing government expenses was adopted, shows a positive relationship although the anticipated relationship was negative because many expense headings under the capital block were moved to the recurrent block after 2002. Similarly, the dum_2016, a dummy variable introduced to capture the introduction of the federal system of governance, displays the negative short-term impact on GDP. This period coincides with the aftermath of the devastating Gorkha Earthquake in 2015 and the subsequent disruptions caused by the six-month-long Nepal-India border blockade. These events resulted in negative growth in economic output.

6. 5 Diagnostic checking

6.5.1 Serial correlation LM test

The null hypothesis indicating no serial correlation is not rejected even up to 10 lags. The test indicates no autocorrelation of residuals. The result is presented in Annex 1.

6.5.2 Normality test

Jarqua-Bera normality test of residuals fails to reject the null hypothesis implying the residuals are multivariate normal with Jarqa-Bera statistics 2.9292 with probability 0.2311. The result is presented in Annex 2.

6.5.3 Heteroscedasticity

This test examines the variability of residuals with respect to time. Tests such as Breusch-Pagan-Godfrey, Harvey, and Arch are applied. The result from all of these tests shows homoscedasticity. The result is presented in Annex 3.

6.5.4 Stability

Recursive estimation with CUSUM and squares of CUSUM tests are applied. These tests assess the stability of coefficients over time and help detect any structural changes or shifts in the relationship between variables by examining the cumulative sum of the estimated coefficients. Both tests confirm the model is stable as coefficients fall within the 5% level of significance. The graphs are presented in Annex 4.

6.5.5 Ramsey RESET Test

This test examines whether the model specification has omitted important nonlinear terms in the model. The result shows that the model is free from specification errors. The result is presented in Annex 5.

The model confirms all the diagnostic checks.

7. Conclusion and policy recommendation

For developing economies like Nepal, government spending plays a vital role in driving growth by facilitating public infrastructure development and enhancing the productivity of private sector investments. On the demand side, increased government spending injects money into the hands of individuals and firms, boosting their purchasing power and stimulating aggregate demand. Consequently, this leads to a rise in GDP. Similarly, investments in sectors such as healthcare, education, skills development, and physical infrastructure enable firms to increase aggregate supply, thereby boosting overall production and GDP. However, it is important to acknowledge that some of the positive effects of government spending may be offset by the crowding-out effect when the funding for expenses comes from the private sector, which is typically more productive than the public sector. Empirical findings on the impact of government spending on GDP growth have yielded mixed results, highlighting the importance of conducting further research to obtain context-specific conclusions.

This study conducted an ARDL analysis using the time series data of nominal GDP, capital expenditure, recurrent expenditure and. population. The ADF and PP test indicated that all variables are integrated of order one, except population which was integrated of order zero with intercept only according to the ADF test and integrated of order zero with trend and intercept according to the PP test. KPSS test suggested that all variables are trend stationary. Given the mixed order of integration, the ARDL model was selected as appropriate. The bounds test of cointegration showed the significant long-term relationship between capital and recurrent expenditure with the GDP. However, in the short run, capital expenditure did not exhibit a noticeable impact on GDP. The short-run effects of recurrent expenditure yielded inconclusive results, warranting further research on the subject.

The effectiveness of using government expenditure as an instant tool to boost economic activity is constrained by the limited impact observed in the short run. Policymakers need to identify the possible leakages that hinder the multiplier effect of government expenditure and try to plug in them with sound policies. The measures to spend expenses evenly throughout the fiscal year would help reap the benefit of the expenditure within that fiscal year contributing to the efficacy of the expenditure in the short run. Fiscal discipline such as strictly adhering to the budgeting cycle and implementing trimester plans, along with timely budget releases and bill payments, has the prospective to greatly improve the efficiency of government expenditure in the short run. Policymakers should prioritize these areas for reform efforts.

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