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ASSESSING MULTIPLIER EFFECTS OF PUBLIC EXPENDITURES ON ECONOMIC GROWTH IN NEPAL: SVAR MODEL ANALYSIS

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ABSTRACT

Expansionary public expenditure is a popular important fiscal measure in the constraint of budgetary resources to achieve higher economic growth with the expectation of higher multiplier effect on productive sectors in the world. Since the actual multiplier effect contradicts with the expected multiplier effect in this discretionary fiscal practice, the goal of higher economic growth is not well achieved. In this context, the practice of public expenditure is a key concern of scholars to understand whether it is the best one or whether its multiplier effect is higher. In this context, this study is an important attempt. This paper assesses the multiplier effects of public expenditures on economic growth in Nepal, covering time series data sets of public expenditures and economic growth from 1974-75 to 2018-19 by using the structural vector auto-regressive (SVAR) model. As a result of the SVAR model, the multiplier effect of public expenditure, recurrent expenditure, and capital expenditure is positive for economic growth. In the results, the multiplier effect of recurrent expenditure is found to be more promising than capital expenditure for economic growth in the short run, but in the long run, it is lower. Similarly, the multiplier coefficient value of capital expenditure is lower in the short run. This is probably due to leakages in the economy, corruption and improper management of development funds, seasonal expenditure trends, and poor management of development projects. Thus, public expenditure is an important fiscal measure to developing economy like Nepal to create a multiplier effect through aggregate demand on national income and employment. Therefore, the government should improve the efficiency of public expenditure and the ratio of capital expenditure and private investment to improve the higher multiplier variable in the long run. The result of this paper will be a valuable input to the policymaker and the planner of Nepal to improve the efficiency of public expenditure through the implementation of a mid-term expenditure framework.

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INTRODUCTION

Public expenditure is universally accepted as public spending of the government on public entity under the fiscal policy and framework for driving macro-economic variables for the expected macro-economic objectives and target (Keynes, 1967; Manikow, 2007; Blanchard, 2007). Keynes (1967) argues its multiplier effects through effective demand on national income and employment. In the practice, its forms are transfer payments, public consumption, and public investment (Lindbeck and Weibull, 1988). Increasing these forms could create effective demand and multiplier effect to encounter cyclical fluctuations as well as growth deficits of developing countries.

In recent years, public expenditure is a popular as a counter cyclical fiscal policy as well as multiplier in the world (Heijdra and Ploeg, 1996). In 17th and 18th centuries, this term was a waste of money with their beliefs traditional function of the state was to maintain security and law and order (Srivastava, 1992). In the 19th century, laissez-faire economists argued its limited role because they believed that money was left to the private sector for higher incentives (Keynes, 1967). In 20th century, Keynes emphasized its significant role and needed in the global recession in 1936 to determine production and distribution of the economy with effective demand and multiplier (Keynes, 1967). This term became popular with universal acceptability. Besides it, the developing countries have used it to solve their growth deficit with discretionary expansionary public expenditure policy under the mid-term expenditure framework by producing public goods.

In the 21st century, the growth of public expenditure under the expansionary fiscal policy is quite popular in laissez-faire regimes of the world, although liberal and modern economists like Adam Smith's book, Wealth of Nations (Smith, 1776) and

Milton Friedman's book, Freedom to Choose (Friedman, 1980) argued the idea of a market economy as the solution and system of the global economy. Additionally, WTO has made the world one global free market of goods, services, capital, knowledge, technology, and finance, has geared up the market economy as the main economic system as well as philosophy. In simple words, the market solves the issues of production, distribution, exchange, and resource allocation. However, the economic role of the state follows neo-liberal Keynesian Economics across different political economic philosophies' endorsers and followers through excessive public expenditures, thus expanding the huge budget deficit (Baxter and King, 1993).

The growth of public expenditure is an inbuilt fiscal policy framework in the cross-section countries in the world with the expectation of a higher multiplier effect, like a theoretical idea of Keynesian economics that is increasing public expenditure solves demand deficit in labor and goods market through increasing aggregate demand for raising national income and employment. Its result is the multiplier in the profit of the firms in the short and long run (Heijdra and Ligthart, 1997). In Keynesian Economics, the concept of multipliers is based on the success story of recovery from the Great World Recession in 1936 and the Global Financial Crisis in 2008 (Lekhi and Singh, 2015; Bose and Bhanumurthy, 2015; Munir and Riaz, 2020; Bista, 2021). In the theoretical literature on Keynes, four multipliers are explained, such as the investment multiplier, budget multiplier, fiscal multiplier, and export trade multiplier. In the different economies and phases of the trade cycle, economic decisions and the behavior of the government create different multipliers with desired or undesired results. In this context, Haavelmo (1945) argues for public spending with a multiplier as a remedy for unemployment and a driver of redistribution income in society. Pérez-Montiel (2020) broadens Haavelmo (1945) narrow concept by discussing the dynamic multiplier of public investment and its effect on output levels. In Pérez-Montiel's (2020) estimation of government public investment dynamic multiplier effects, an empirical analysis for Spain from 1980-2016 found a positive and permanent effect on the level of GDP from the growth of the public investment. One year after fiscal expansion, the dynamic fiscal multipliers of infrastructure investment (INFINV) and social investment (SOCINV) reach values above one, thereby confirming that government public investment expansions have Keynesian effects on the level of output. In the study, the economic effect of public financing, Adelino et al. (2017) discovered a local income multiplier with 1.9 local income multiplier and a cost per job of USD20,000 per year when the local government increases expenditure. Besides, government spending through a deficit budget improves recovery during a recession.

In the study of analyzing welfare effects of alternatives forms of public spending, Lindbeck and Weibull (1988) found a positive impact on effective demand and then national income and employment. In the study of the Keynesian macroeconomic model in the monopolistic market, Startz (1989) found a traditional multiplier in the short run. However, in the long run, the disappearance of the multiplier was found. Its results were optimal private behavior and optimal social behavior. According to the Keynesian perspective, a positive response to household consumption to an increase in government spending is achieved by incorporating price rigidities and non-Ricardian consumers (Galí et al., 2007). This efficiency of public expenditure can be measured by the multiplier, which shows a percentage point change in Gross Domestic Product (GDP) in response to an increase in government expenditure (Gupta and Verhoeven, 2001; Hamer-Adams and Wong, 2018). The logic of the theory of consumption, saving, and employment in Keynesian Economics is a multiplier effect of public expenditures on different economic activities of the national economy's economic sectors for achieving the desired effects—stability, growth, and stimulation (Gupta and Verhoeven, 2001; Popa and Codreanu, 2010; Bista, 2016; Bista, 2021).Therefore, almost all countries have a higher rate of public expenditure to GDP ratio, particularly in the capital expenditure to GDP ratio in the world. Conducting the empirical study on government public investment dynamic multiplier effects in Spain using data sets from 1980 to 2016, Perez-Montiel (2020) found a positive and permanent effect of increasing public investment on the level of GDP as Keynesian multiplier effect through productive infrastructure investment and social investment.

Besides, the nature of public spending creates multipliers. Archibald (1967), Yoshida and Kenmochi (2011), and Yen et al. (2015) have provided sector multipliers. Archibald (1967) mentioned the need for a multiplier in the regional economy in the UK. Similarly, in a two-sector model of monopolistic competition, Yoshida and Kenmochi (2011) found the growth of national income as a multiplier effect of government spending on health services in the short run but the reverse in the long run. Likewise, Yen et al. (2015) found in the study income and employment multiplier effects of the Malaysian higher education sector found larger direct and indirect income impacts of private higher education institutions (HEIS) on the private than the public, with 1.34 and 1.32 income multipliers on additional income for every initial ringgit of labor income, respectively. The private and public income and employer effects are 3.09 and 3.05, respectively. Higher education creates 1.21 workers per RM 10,000 invested.

Additionally, the multiplier effect depends on public spending decisions and the government's behavior in the phase of trade cycles. For example, Batini et al. (2014), and Garry and Rivas Valdivia (2017) argue fiscal multiplier estimation because it allows policymakers to visualize the expected benefits of a change in government spending. Both pieces of literature consider this process valuable in assisting policy decisions and the design of targeted fiscal strategies (Garry and Rivas Valdivia, 2017). Likewise, Batini et al. (2014) emphasize the need to accurately measure the relationship between the two variables to plan and forecast the effect of policy actions. Therefore, understanding multipliers of public spending is relevant to measuring whether the nature and pattern of public spending are on the right course to achieve the desired effect on national output, national income, and employment level.

The large literature on the multiplier of public expenditure is available. In this literature, multiplier effects of public spending are mixed with different values. Large literatures (Blanchard and Perotti, 2002; Fatás and Mihov, 2002; Ramey, 2011; Bachmann and Sims 2012; Auerbach and Gorodnichenko,

2012, 2017; Ilzetzki et al., 2013; Hernández de Cos and Moral-Benito, 2013; Martínez and Zubiri, 2014; Hory, 2016; Gechert and Mentges, 2018; Afonso and Leal, 2019) found a positive value with below and above 1. However, few works of literature (Perotti, 2004; Ilzetzki et al., 2013) found negative value. Thus, public expenditure has a positive multiplier effect on national income and employment.

With the expectation of a multiplier on national income, employment, and economic growth, the multiple political regimes from the 1950s to 2021 have followed neo-liberal and Keynesian philosophy and model in the fiscal policy framework under the macro-economic model. In the monopoly market, the Panchayat Regime (1960-1990) focused expansionary public expenditure on labor-intensive public goods and services production and infrastructure development for employment generation, higher economic growth, and welfare to the people since the 1950s (Bista, 2021). Its efficiency as multiplier effect was poor. Its output was the macro-economic crisis in the 1980s. As a countercyclical fiscal measure, the political regime used increasing public expenditure. The natural monopoly market was liberalized in the 1980s and 1990s under a structural adjustment program. In the 1980s, the state-led development model could not stabilize macro-economic negative fluctuations; in the 1990s, the democratic government desired economic stimulators for economic growth miracles for economic development and welfare (Bista, 2016). These reforms transformed the natural monopoly into a monopolistic and partially perfect competitive market in which expansionary public expenditure has been consistent to date. It means a deficit budget for excessive public expenditure with the assumption of a positive multiplier on macro-economic variables. On this issue, none of the literature has assessed the multiplier of public spending in the national economy of Nepal, although Kharel (2012), Bhusal (2014), and Kunwar (2019) have shown that the expansion of government expenditure contributes positively to economic growth, while that by Chaudhary (2010) has proved that large government expenditure has a negative impact on economic development. Therefore, this study is relevant.

In this context, this study estimates the multiplier of public spending in the national economy of Nepal with a few queries on whether public spending will be positive for economic growth and whether the value of the multiplier is positive. Its results will be valuable to policymakers, particularly the nature and pattern of public spending on which sectors and how.

The board objective of the paper is to estimate the multiplier effect of public expenditure on economic growth in Nepal. The specific objectives are: to estimate the multiplier effect of public expenditure on the economic growth of Nepal and to find out its policy implications,

METHODOLOGY

Conceptual Framework

This idea of the multiplier effect is Keynes's basic idea in which Keynes argues autonomous government expenditure has a multiplier effect on aggregate demand and output of GDP through the growth of employment, income, and consumption (Diulo, 1983). Thus, the change in real GDP is a multiplier effect of autonomous government expenditure. Thus, the relationship between government expenditure and economic growth is shown in detail in Figure 1.

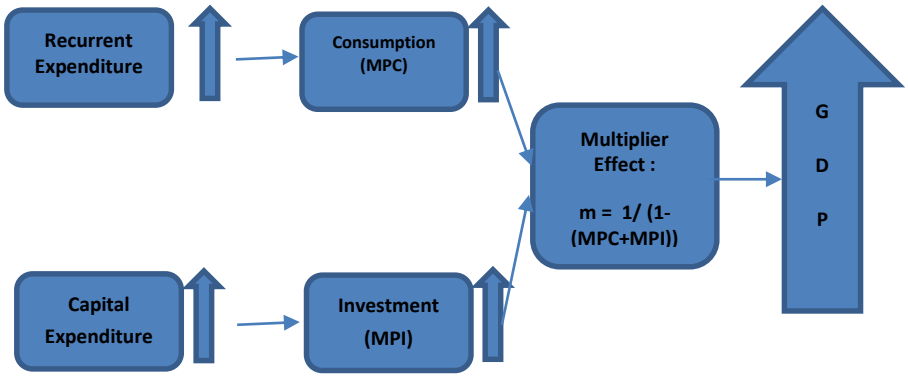

Figure 1. Framework for multiplier effect of government expenditure.

In Keynes' economics, the value of the multiplier depends on marginal propensity to consume (MPC), because MPC measures how much of the income generated from employment output is destined for autonomous public expenditure. Similarly, the remaining portion of income transfers into saving and then investment. As a result, investment is a key ingredient of autonomous public expenditure. Therefore, its effect on the income-generating process cannot be neglected. An autonomous change in the rate of investment will initiate a multiplier process of income generation (Diulo, 1983). This increased income will raise consumption, which will induce further investment through the accelerator process. Hence, if we allow for the income-generating effects of both consumption and investment expenditures, the multiplier coefficient (m) can be written as;

$$m = \frac{1}{1 - (MPC + MPI)}$$

Where, MPC = marginal propensity to consume given by change in consumption to change in income.

MPI =marginal propensity to invest given by the change in investment to change in income

To capture multiplier effect "m", consider structural vector autoregression model (SVAR), with the set of relationships between structural shocks (e_t) and reduced from shocks (μ_t) represented by the following equations.

$$e_t^{rge} = C_{11}\mu_t^{rge} + C_{12}\mu_t^{rgdp} + C_{13}\mu_t^{rtax}$$

$$e_t^{rgdp} = C_{21}\mu_t^{rge} + C_{22}\mu_t^{rgdp} + C_{23}\mu_t^{rtax}$$

$$e_t^{rtax} = C_{31}\mu_t^{rge} + C_{32}\mu_t^{rgdp} + C_{33}\mu_t^{rtax} \quad (1)$$

The impulse response of one unit shock of reduced from residual μ_t^{rge} on structural residual e_t^{rgdp} gives the public expenditure multiplier.

Specification of Model

In the literature of SVAR, Jain and Kumar (2013) mention the issue of simultaneity bias and endogeneity in the relationship between fiscal policy and economic growth with the solution of models incorporating instrumental variables or vector autoregression (VAR) framework to allow feedback effects. Besides, numerous studies (Sims, 1986; Blanchard and Perotti, 2002; Nafie and Atlam, 2019) have used the SVAR model on these variables.

The VAR model can be written in the reduced form equation as;

$$Y_t = C(L)Y_{t-1} + u_t \quad (2)$$

Where C(L) represents N × N matrix polynomials in lag operator L for N × 1 vectors of endogenous variable (Y_t). u_t is the N × 1 vector of reduced form innovations or shocks that are independent and identically distributed.

As reduced form disturbances are correlated, the reduced form has to be transformed into the structural model to identify structural shocks (Nafie and Atlam, 2019). Multiplying both sides of equation (2) by matrix A yields the structural form.

$$AY_t = AC(L)Y_{t-1} + e_t \quad (3)$$

Matrix A defines the contemporaneous interrelationship between the endogenous variables. The relationship between the structural disturbances e_t and reduced form disturbance u_t is described by;

$$u_t = A^{-1}e_t \quad \text{or} \quad e_t = Au_t \quad (4)$$

To identify the structural components of the error terms, enough restrictions need to be imposed. Accordingly, the contemporaneous effect of only (i) increase in expenditure on GDP growth and (ii) GDP growth on tax revenue was allowed as is often expected in theory and practice (Jain and Kumar, 2013). This is shown in Matrix A, which is restricted as a lower triangular matrix with ones on the main diagonal. This restriction was a way of identifying its elements to reflect the contemporaneous relationships among the endogenous variables. After identifying the elements of A matrix, it is possible to proceed with the analysis of the dynamic response of Y_t to each shock in e_t.

Equation (3) after Cholesky ordering can be written in matrix form as;

$$\begin{bmatrix} e_t^{RGE} \\ e_t^{RGDP} \\ e_t^{RTAX} \end{bmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ C_{21} & 1 & 0 \\ 0 & C_{32} & 1 \end{pmatrix} \begin{bmatrix} \mu_t^{RGE} \\ \mu_t^{RGDP} \\ \mu_t^{RTAX} \end{bmatrix} \quad (5)$$

In this paper, the effect of RTGE, RRE, and RCE on RGDP are separately studied to understand their individual impact. So above general SVAR model is segregated into three different models as per use of a proxy for government expenditure (RGE). The model representations are;

Model 1: Impact of RTGE on RGDP

$$\begin{bmatrix} e_t^{RTGE} \\ e_t^{RGDP} \\ e_t^{RTAX} \end{bmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ C_{21} & 1 & 0 \\ 0 & C_{32} & 1 \end{pmatrix} \begin{bmatrix} \mu_t^{RTGE} \\ \mu_t^{RGDP} \\ \mu_t^{RTAX} \end{bmatrix} \quad (6)$$

Model 2: Impact of RRE on RGDP

$$\begin{bmatrix} e_t^{RRE} \\ e_t^{RGDP} \\ e_t^{RTAX} \end{bmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ C_{21} & 1 & 0 \\ 0 & C_{32} & 1 \end{pmatrix} \begin{bmatrix} \mu_t^{RRE} \\ \mu_t^{RGDP} \\ \mu_t^{RTAX} \end{bmatrix} \quad (7)$$

Model 3: Impact of RCE on RGDP

$$\begin{bmatrix} e_t^{RCE} \\ e_t^{RGDP} \\ e_t^{RTAX} \end{bmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ C_{21} & 1 & 0 \\ 0 & C_{32} & 1 \end{pmatrix} \begin{bmatrix} \mu_t^{RCE} \\ \mu_t^{RGDP} \\ \mu_t^{RTAX} \end{bmatrix} \quad (8)$$

Nature and Sources of Data Sets

In this quantitative research, the nature of the data set is time series. In the time-series data set, the paper has employed mainly four macro variables, including real economic growth (REC), real total government expenditure (RTGE), real regular expenditure (RRE), and real capital expenditure (RCE). Their sources are mainly secondary, including Annual Government Financial Statistics, Nepal Rastra Bank, Annual Economic Survey and Budget, Ministry of Finance, Nepal and Annual Statistical Pocket Books, Central Bureau of Statistics (CBS), Nepal.

Sample Size of Time Series Data sets

In the paper, the sample size of time series data for these major economic variables is 44 years, from 1974-75 to 2018-19, although Nepal has 61 year-long time series data sets from 1958 to 2019. However, time-series data sets were not properly recorded and accounted for from 1958 to 1974, although in 1959, a new accounting system was initiated, which was further revised and improved in 1963. Since 1974, the government of Nepal has initiated a scientific accounting and recording system. Therefore, time-series data from 1974–75 to 2018–19 was selected.

Techniques of Data Analysis

By nature, time-series data sets have issues with fluctuations due to political and natural shocks, as well as policy stimulators and stabilizers. These fluctuations have significant effects on changing the dynamic behavior and relationships of macro-variables in the time series SVAR models. Therefore, the time-series data sets from 1974–75 to 2018–19 are tested to understand whether the data sets are stationary or not and other cyclic fluctuations by using the unit root test.

Step I: Unit Root Test

The unit root test shows stationary. It can strongly influence its behavior and properties, e.g., the persistence of shocks will be infinite for non-stationary series (Greene, 2010). If not stationary, it indicates the problem of spurious regression, i.e., if two variables are trending over time, a regression of one on the other could have a high R^2 even if the two are unrelated. Secondly, if the variables in the regression model are not stationary, then it can be proved that the standard assumptions for asymptotic analysis will not be valid.

In other words, the usual t-ratios will not follow a t-distribution, so we cannot validly undertake the hypothesis tests about the regression parameters. Thus, before

performing any kind of test or model, it is necessary to determine whether the data is stationary or not, which can be done using the unit root test.

Augmented Dickey-Fuller (ADF) test is used. Its ADF model unit root test is as follows;

$$\Delta y_t = a_1 + \delta y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta y_{t-i} + u_t \quad (9)$$

The null hypothesis of ADF is δ=0 against the alternative hypothesis of δ<0. If null hypothesis is not rejected, the series is non-stationary, whereas rejection means the series is stationary.

Step II: Vector Auto Regression (VAR) and Structural VAR

Vector auto-regression (VAR) is a stochastic process model used to capture the linear interdependencies among multiple time series (Greene, 2010). VAR models generalize the univariate autoregressive model (AR model) by allowing for more than one evolving variable. All variables in a VAR enter the model in the same way: each variable has an equation explaining its evolution based on its own lagged values, the lagged values of the other model variables, and an error term. A VAR model is a multi-equation system where all the variables are treated as endogenous. A VAR model with 'p' lags can be written in regression form as;

$$\begin{aligned}
y_{1,t} &= c_1 + a_{1,1}^1 y_{1,t-1} + a_{1,2}^1 y_{2,t-1} + \cdots + a_{1,k}^1 y_{k,t-1} + \cdots + a_{1,1}^p y_{1,t-p} + a_{1,2}^p y_{2,t-p} + \cdots + a_{1,k}^p y_{k,t-p} + e_{1,t} \\
y_{2,t} &= c_2 + a_{2,1}^1 y_{1,t-1} + a_{2,2}^1 y_{2,t-1} + \cdots + a_{2,k}^1 y_{k,t-1} + \cdots + a_{2,1}^p y_{1,t-p} + a_{2,2}^p y_{2,t-p} + \cdots + a_{2,k}^p y_{k,t-p} + e_{2,t} \\
&\vdots \\
y_{k,t} &= c_k + a_{k,1}^1 y_{1,t-1} + a_{k,2}^1 y_{2,t-1} + \cdots + a_{k,k}^1 y_{k,t-1} + \cdots + a_{k,1}^p y_{1,t-p} + a_{k,2}^p y_{2,t-p} + \cdots + a_{k,k}^p y_{k,t-p} + e_{k,t}
\end{aligned}$$

Representing above equations in matrix form;

$$\begin{bmatrix} y_{1,t} \\ y_{2,t} \\ \vdots \\ y_{k,t} \end{bmatrix} = \begin{bmatrix} c_1 \\ c_2 \\ \vdots \\ c_k \end{bmatrix} + \begin{bmatrix} a_{1,1}^1 & a_{1,2}^1 & \cdots & a_{1,k}^1 \\ a_{2,1}^1 & a_{2,2}^1 & \cdots & a_{2,k}^1 \\ \vdots & \vdots & \ddots & \vdots \\ a_{k,1}^1 & a_{k,2}^1 & \cdots & a_{k,k}^1 \end{bmatrix} \begin{bmatrix} y_{1,t-1} \\ y_{2,t-1} \\ \vdots \\ y_{k,t-1} \end{bmatrix} + \cdots + \begin{bmatrix} a_{1,1}^p & a_{1,2}^p & \cdots & a_{1,k}^p \\ a_{2,1}^p & a_{2,2}^p & \cdots & a_{2,k}^p \\ \vdots & \vdots & \ddots & \vdots \\ a_{k,1}^p & a_{k,2}^p & \cdots & a_{k,k}^p \end{bmatrix} \begin{bmatrix} y_{1,t-p} \\ y_{2,t-p} \\ \vdots \\ y_{k,t-p} \end{bmatrix} + \begin{bmatrix} e_{1,t} \\ e_{2,t} \\ \vdots \\ e_{k,t} \end{bmatrix}$$

Shortening the above matrix into vector form;

$$Y_t = \alpha + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \cdots + \beta_p Y_{t-p} + u_t \quad (10)$$

Where,

Y_t is the n × 1 vector of time series variables ($y_{1,t}$, $y_{2,t}$,…$y_{k,t}$)

α is the n × 1 vector of intercepts (c_1, c_2, …,c_k)

β_i is the n × n matrix of co-efficient ($a_{1,1}^1$, ……$a_{k,k}^p$)

u_t is the n × 1 vector of error terms ($e_{1,t}$, $e_{2,t}$,…$e_{k,t}$)

The VAR model in equation (15) is reduced form VAR model. The structural form of the VAR in equation (15) can be obtained by multiplying the equation with n x n matrix A as;

$$AY_t = A\alpha + A\beta_1 Y_{t-1} + A\beta_2 Y_{t-2} + \cdots + A\beta_p Y_{t-p} + Au_t$$

Which leads

$$AY_t = C_1 Y_{t-1} + C_2 Y_{t-2} + \cdots + C_p Y_{t-p} + Be_t \quad (11)$$

Where, B and C are n x n matrices of coefficients. Matrix A captures contemporaneous relations among the endogenous variables and is the n-dimensional vector of the structural shocks that we want to recover. In Blanchard and Perotti (2002), the structural shocks e_t are assumed to be mutually uncorrelated, i.e., the variance-covariance matrix of the structural shocks $\sum_e = E[e_t, e_t']$ is a diagonal and fixed matrix; however, we assume the structural shocks to be standardized at 1, i.e., the variance-covariance matrix of the structural shocks is an identity matrix $E[e_t, e_t'] = 1$ The relation between the structural shocks and the reduced form residuals can be described by the AB model as follows;

$$Au_t = \mathrm{B}e_t$$

$$e_t = B^{-1} Au_t$$

Which is popularly represented as;

$$e_t = Su_t \quad (12)$$

Residual Diagnostics

The estimated VAR models are tested for serial correlation using Breush-Godfrey Serial Correlation LM tests and for normality using the Jarque-Bara residual normality test. The stability of the model is checked using the inverse roots of the characteristic autoregressive polynomial. The various forms of tests are dependent upon the software E-Views.

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RESULTS AND DISCUSSION

Result of Unit Root Test

Table 1 presents the result of the unit root test. In column 1, there are five key variables: GRGDP, GRRE, GRCE, GRTAX and GRTGE out of which GRGDP is the dependent variable and GRRE, GRCE, GRTAX and GRTGE are the independent variables. In Row 1, there are five indicators: test equation, t-statistics, p-value, critical values, and order of integration.

Result of Lag Length Selection

Our model consists of the autoregressive element, which calls for the selection of appropriate lag length. Table 2 presents the result of VAR lag order selection criteria for our three different models.

Result of Estimation of SVAR Models

First, we run reduced form VAR estimation and estimate the structural factorization for all three models. The result of the SVAR model is presented in Table 3. The study makes use of time-series data sets from 1974 to 2019 for GRGDP, GRRE, GRCE, GRTAX, and GRTGE. Series data sets have dynamic behavior and nature over time because of endogenous and exogenous variables. In such behavior, data fluctuates. In this study, the query is whether time series data sets are stationary or non-stationary.

Table 1. Result of Unit Root Test.

Sr. No	Variable	Included in test equation	t-statistics	p-value*	Critical Values			Order of Integration
					1%	5%	10%	
1	GRGDP	Intercept	-7.483775	0.0000	-3.592462	-2.931404	-2.603944	I(0)
2	GRGDP	Intercept and trend	-7.600585	0.0000	-4.186481	-3.518090	-3.189732	I(0)
3	GRRE	Intercept	-6.740219	0.0000	-3.592462	-2.931404	-2.603944	I(0)
4	GRRE	Intercept and trend	-6.729630	0.0000	-4.186481	-3.518090	-3.189732	I(0)
5	GRCE	Intercept	-5.136451	0.0001	-3.592462	-2.931404	-2.603944	I(0)
6	GRCE	Intercept and trend	-5.083820	0.0009	-4.186481	-3.518090	-3.189732	I(0)
7	GRTAX	Intercept	-6.025162	0.0000	-3.592462	-2.931404	-2.603944	I(0)
8	GRTAX	Intercept and trend	-6.144612	0.0000	-4.186481	-3.518090	-3.189732	I(0)
9	GRTGE	Intercept	-5.798639	0.0000	-3.592462	-2.931404	-2.603944	I(0)
10	GRTGE	Intercept and trend	-5.739921	0.0001	-4.186481	-3.518090	-3.189732	I(0)

* MacKinnon (1996) one-sided p values.

Table 2. Result of VAR lag order selection criteria.

Sample: 1975-2019						
Lag	LogL	LR	FPE	AIC	SC	HQ
Endogenous variables: GRTGE GRGDP GRTAX (Model 1)						
0	-365.628	NA	20288.34	18.4314	18.55807*	18.4772
1	-352.6495	23.36144	16661.46	18.23247	18.73914	18.41567*
2	-343.3647	15.31993	16572.86	18.21823	19.10489	18.53882
3	-331.7437	17.43148*	14854.07*	18.08718*	19.35384	18.54517
4	-323.4724	11.16624	16048.22	18.12362	19.77028	18.719
Endogenous variables: GRRE GRGDP GRTAX (Model 2)						
0	-374.9329	NA	32307.19	18.89665	19.02331*	18.94244
1	-359.5409	27.70559*	23515.76*	18.57705*	19.08371	18.76024*
2	-353.2588	10.36541	27179.85	18.71294	19.5996	19.03353
3	-350.6583	3.90076	38244.78	19.03292	20.29958	19.4909
4	-344.7514	7.974337	46504.52	19.18757	20.83423	19.78295
Endogenous variables: GRCE GRGDP GRTAX (Model 3)						
0	-400.6272	NA	116746.3	20.18136	20.30802*	20.22716
1	-385.8851	26.53563*	87784.33*	19.89426*	20.40092	20.07745*
2	-379.6995	10.20635	101952.6	20.03497	20.92164	20.35556
3	-371.9891	11.56554	111112.8	20.09946	21.36612	20.55744
4	-366.8916	6.881651	140690	20.29458	21.94124	20.88996

* 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; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion.

In order to understand the nature and pattern of time series data sets and their order of integration, Augmented Dickey-Fuller (ADF) unit root tests are used. In this test, SPSS allowed a maximum of 9 lags, and the optimum lags were automatically selected by minimizing the Schwarz Info Criterion (SIC). Its null hypothesis for the Augmented Dickey-Fuller test is that the variable under consideration has a unit root. An alternative hypothesis is that the variable under consideration does not have a unit root.

The ADF test results provide less than 5% of the p-value for all variables. It means time-series data sets have no unit root for all variables. All variables are stationary over the 44 year period. In this way, the null hypothesis that the variable under consideration has a unit root is rejected, and the alternative hypothesis is accepted.

In the SVAR model, the selection of how many lag lengths are in the model is important to select the quality of each model relative to each of the other models. Akaike information criteria (AIC) are its estimators for optimal lag length selection in models 1, 2, and 3. In general, a lower AIC value is better than a higher one. In this way, in model 1, the lower AIC value is 18.08. For model 1, the optimal lag is set at 3. Similarly, in model 2, the lower AIC value is 18.57. Therefore, the optimal lag for model two is 1. Likewise, in model 3, the lower AIC value is 19.89. Therefore, the optimal lag for model two is 1.

However, on residual diagnostics, it was found that models 1 and 2 suffer from serial correlation at these lag lengths. As a result, we optimize the lag length for these two models by adding one more lag. The optimal lag length for models 1, 2, and 3 is 4, 2, and 1, respectively.

Table 3. Result of SVAR estimations.

Model 1: GRTGE GRGDP GRTAX				
Sample (adjusted): 1980 2019				
	Coefficient	Std. Error	z-Statistic	Prob.
C(1) (GRTGE)	0.24175*	0.015942	15.16472	0.0000
C(2) (GRTAX)	-0.96832*	0.069598	-13.91297	0.0000
Model 2: GRRE GRGDP GRTAX				
Sample (adjusted): 1978 2019				
	Coefficient	Std. Error	z-Statistic	Prob.
C(1) (GRRE)	0.425763*	0.011769	36.17771	0.0000
C(2)(GRTAX)	-1.425458*	0.049548	-28.76943	0.0000
Model 3: GRCE GRGDP GRTAX				
Sample (adjusted): 1978 2019				
	Coefficient	Std. Error	z-Statistic	Prob.
C(1)(GRCE)	0.245816*	0.011021	22.30501	0.0000
C(2)(GRTAX)	-1.603152*	0.063513	-25.24144	0.0000

* Significant at one percent level.

In Model 1 SVAR model between GRGDP (dependent) and independent variables such as GRTGE (C1) and GRTAX (C2) has been run to estimate SVAR. In the estimation of the SVAR result of model 1 between GRGDP and GRTGE (C1), the coefficient value of GRTGE (C1) has a positive sign, indicating a positive relationship with 0.24 values. This variable is significant because it has a 0.0 p-value. It means that in a structural disturbance of GRGDP, one unit of growth shock of total government expenditure (GRTGE) increases by 24.17 percent. It means the occurrence of a positive multiplier of total government expenditures on the economic growth of Nepal through different-scale economic output activities in the different economic sectors. Somehow, the budget allocation on regular and capital programs, the expenditure system, and the expenditure tracking system seems to be effectively performing to achieve the desired effect on national output, national income, employment, and so on.

Similarly, GRRE is another component of GRTGE. In this model, a SVAR model between GRGDP (dependent) and independent variables such as GRRE (C1) and GRTAX (C2) has been run to estimate SVAR. In the result of the SVAR estimation of model 2 between GRGDP and GRRE (C1), the coefficient value of GRRE (C1) has a positive sign, indicating a positive relationship with 0.42 values. Likewise, in model 1, this variable is significant because of its 0.0 p-value. It means that one unit of growth shock of total government expenditure (GRRE) increases the structural disturbance of GRGDP by 42.57 percent. It means the occurrence of a positive multiplier of regular government expenditures on the economic growth of Nepal through the functional expenditures of different economic and non-economic agencies and institutions of the government, having an impact on the different economic sectors. This value is unexpected, but the growth of regular government expenditure has a positive impact on its performance and efficiency. In principle, the multiplier effect of regular expenditure on economic growth is lower. This result contradicts it. One possible reason is the growth of regular government expenditure; another is that regular government expenditure is used on capital activities.

Likewise, GRCE is a key component of GRTGE. This model-3: SVAR model between GRGDP (dependent) and independent variables such as GRCE (C1) and GRTAX (C2) has been run to estimate SVAR. As a result, the SVAR estimation of model 3 between GRGDP and GRCE (C1) and the coefficient value of GRRE (C1) also has a similar positive sign, indicating a positive relationship with 0.24 values. Likewise, in models-1 and -2, this independent variable is significant because of its 0.0 p-value. It means that in a structural disturbance of GRGDP, one unit of growth shock of total government expenditure (GRCE) increases by 24.17 percent. It means the occurrence of a positive multiplier of capital government expenditures on the economic growth of Nepal through the development activities of the different economic sectors. This value is too low, like the GRTGE. This is not a good sign for the Nepalese economy. Its primary causes are declining capital expenditure capacity and technical fallacy, and error in resource allocation for development activities and project selection. Another reason is the inefficiency of the government expenditure system and processes with higher leakage. Therefore, the multiplier effect of capital expenditure is lower than regular expenditure. It indicates the weak and critical economic structure and system of the national economy of Nepal. If these issues are not settled through economic reform, the economy will be in a big crisis.

CONCLUSIONS AND POLICY IMPLICATIONS

The paper estimates the multiplier effect of public expenditure (total government expenditure) on economic growth (RGDP) from a 44-year long time series database of macro-economic variables from 1974-75 to 2018-19 through the SVAR model with tests. As a result, time-series data sets of macro variables are stationary. The study found the positive values of the coefficients of SVAR estimate and multiplier values. It indicates that economic growth in Nepal responds positively to government expenditure and its components, including recurrent and capital expenditure. There is sufficient evidence that those multiplier effects of public expenditure and its components: recurrent expenditure and capital expenditure are positive for economic growth in the short and long run. Its value is less than 1. It endorses the multiplier effect of Keynesian economics, but it is not much more encouraging because its value is lower than 1. Somehow, it reveals the occurrence of inefficient public expenditure systems from allocation to disbursement and delivery to determine national income, employment, and economic growth.

Additionally, the study found a more prominent multiplier effect of recurrent expenditure than capital expenditure to induce

economic growth against priori expectations. In the short run, the multiplier effect is promising, but in the long run, it is lower over 44 years. In general, the multiplier effect of capital expenditure should be more than of recurrent expenditure, but in Nepal, it contradicts. It shows higher efficiency of recurrent expenditure than capital expenditure. Bista (2021) provides a reason for the higher recurrent expenditure-total public expenditure ratio (65%) than capital expenditure-total public expenditure ratio (24%) in the budget 2020 and 2021. Out of the 24 % capital budget, its disbursement was only 45 % in the fiscal year 2020. It shows the weak effectiveness of capital expenditure. Besides, the efficiency of the capital expenditure is poor due to leakages in the economy, corruption and improper management of development funds, seasonal expenditure trends, and poor management of development projects. Furthermore, the study found the lower positive value of the multiplier, revealing the low efficiency of the government expenditure. It means lower determinants of excessive recurrent expenditure and lowers capital expenditure to sector productive activities, employment, and economic growth. The excessive recurrent expenditure could not affect effective demand and employment of the national economy, whereas the lower capital expenditure could not affect national income, employment, and growth as expected through public investment. Thus, the multiplier of public expenditure on functional activities of the state is lower than of capital expenditure as required to achieve a higher economic growth rate. Therefore, the government should improve the efficiency of public expenditure and the ratio of capital expenditure and private investment to improve the higher multiplier variable in the long run.

The golden rule of fiscal policy is excessive capital expenditure to recurrent expenditure to create multiplier effect on national income and employment. However, the result of this study contradicts it with lower multiplier effect on macro-economic variables because of lower capital expenditure-total expenditure ratio and higher recurrent expenditure-total expenditure ratio. This is a big issue to Nepalese economy and then the government of Nepal to achieve macro-economic stability and higher economic growth. In this context, the result of the study will be valuable inputs to the policymakers and the economists of the government to correct the structure of public expenditure into excessive capital expenditure to recurrent expenditure and to strengthen the capital expenditure system of the country from the federal government to the local government (Municipality level) by improving good governance, financial discipline and mid-term expenditure framework.

The study covers the only dynamic relationship between public expenditure and economic growth over 44 years' time series data and the Structural Vector Auto-Regressive model. This lagged-based model does not permit more variables, except two and three. This limitation of the study will provide the scope of further research. Nepal has been suffering from the problem of lower capital expenditure-total expenditure ratio and uncontrolled recurrent expenditure, and lower multiplier value. These areas need further in-depth research by covering more than 44 years' time series data sets, using different time series models for the policy implication, and employing more than two variables.

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