The Economic Journal of Nepal, Vol. 33, No. 3, July-September 2010 (Issue NO. 131) © CEDECON-TU

Fiscal Policy and Economic Growth in Nepal: An Endogenous Growth Framework

T.P. Koirala*

Abstract

This paper investigates the impact of various measures of the fiscal policy on the economic growth in Nepal. The key finding of this paper is that fiscal policy matters for the economic growth. Categorizing government expenditure into productive and unproductive and taxes revenue into distortionary and non-distortionary, the results provide some supports for the theoretical underpinning of endogenous growth model that the productive expenditure components of both the recurrent and capital expenditure of the government have positive impact on growth via productivity enhancement effect of the human capital and capital stock. Moreover, indirect taxes and foreign grants respectively have positive and negative impact on growth in addition to neutral effect of unproductive expenditure and distortionary taxes of the government.

Introduction

The extent to which fiscal policy brings about economic growth continues to attract theoretical and empirical debate. On the theoretical front, there are primarily two competing approaches regarding the role fiscal policy in stimulating economic growth. The proponents of the fiscal policy in enhancing economic growth envisage the role of the government in ensuring knowledge accumulation, research and development, productive investment, maintenance of law and order and provision of other public goods and services in the economy which hence contributes in stimulating economic growth both in the short-run and the long-run (Easterly and Rebelo 1993, Mauro 1996). Further, the advocates of an active role of fiscal policy suggest that government intervention in economic activity can promote long-term growth under an economy lacking an efficient mechanism to return to full potentials (Eskesen, 2009). Moreover, government's role in ensuring efficiency in resource allocation, regulation of markets, stabilization of the economy and harmonization of social conflicts are some of the important ways in which the government could facilitate economic growth (M'Amanja and Morrissey, 2005).

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* Dr. Koirala is Assistant Director, Research Department, Nepal Rastra Bank, Kathmandu, Nepal. The views expressed in this paper are personal and do not necessarily represent the official stance of Nepal Rastra Bank.

However, the opponents of active government role in the productive activities of the economy opine that governments are inherently bureaucratic and less efficient so that it hinders growth rather than facilitates growth. In addition, fiscal policy tends to suppress economic growth through distortionary effect of taxation and inefficient government spending. According to the theory of Ricardian Equivalence, the effect of fiscal policy on growth is neutral. Considering the response of the forward-looking economic agents, there is an exact offsets of the increase in private saving due to tax cut at present by the decrease in public saving to finance debt in the future and therefore, fiscal neutrality on growth (Eskesen, 2009). However, in light of the foregoing argument, the reliance of fiscal policy in achieving economic goals rests on its effectiveness to achieve macroeconomic goals.

Fiscal policy aims at stimulating economic and social development by pursuing a policy stance that ensures a balance between taxation, expenditure and borrowing that is consistent with sustainable economic growth (Mankiw, 2004). Fiscal policy is the economic term that focuses on the effective use of the government budget for the purpose of achieving certain macroeconomic objectives such as economic growth and full employment, equitable distribution of wealth and ensuring that every government actions are consistent with economic stability (Valmont, 2006). The main instruments of the fiscal policy under the government control are taxes and spending. Fiscal policy stimulates economy growth both through the demand and supply sides. The demand-lead countercyclical fiscal policy is short-term policy prescription to tame business cycles of the economy given that the economic agents have information asymmetry and price inertia (Hemming, Kell, & Mahfouz, 2002). However, in the long run, fiscal policy stimulates growth by improving the productivity capacity of the economy which is described in the supply-lead growth theories (Gerson, 1998).

The government of Nepal has been spending a huge sum of resources every year in order to bust the economy realizing its role in regulating market, ensuring efficiency in resource allocation and stabilizing the economy. The share of the government investment out of total is around 30 percent. However, the growth performance of the economy is not satisfactory achieving an average annual growth rate of real GDP less than 5 percent over the long run. In addition, Nepalese economy is characterized by a number of economic challenges comprising low per capita income, higher level of poverty, poor social indicators, underdeveloped physical infrastructure, and high-cost economy leading to higher cost of production and so on. While the world economy in general and the emerging and developing economies, India and China at our doorsteps in particular, are moving fast along the trajectory of economic growth, Nepal leading to higher cost of production and so still finds itself grappled with a host of problems that demand early and effective solutions to ensure an inclusive, just and high economic growth on a sustainable basis. Government's role in stimulating the economy by the effective implementation of fiscal policy is crucial under such circumstances.

Whether fiscal policy stimulates or stifles growth remains an empirical question. The existing empirical findings show mixed results. In light of this argument, the study to see

the effect of fiscal policy generally on the economy and particularly on the growth would be of immense importance for the policy makers to determine the area of the need for correction in the fiscal management and to provide recommendations to the fiscal authority for the efficient fiscal management. It is of considerable interest to examine the impacts of fiscal policy on growth in a small developing economy like Nepal focusing the effects of various components of the government expenditure and taxes on economic growth. This paper aims to quantify the effects of fiscal policy on economic growth.

Review of Literatures

A natural place to start a review of the theoretical literature on fiscal stimulus and economic growth hinges on a precise demarcation of growth theories between demand-lead countercyclical policies and supply-lead growth theories. Simple Keynesian model gives policy prescription of short-term demand management to tame business fluctuation (Dornbusch, Fischer and Startz, 2000). Under the assumptions of price rigidity and excess capacity in the economy, a fiscal expansion (increase in expenditure as well as decrease in taxes) believes to have a multiplier effect on aggregate demand and output. However, government consumption crowds out private investment, which leads to dampen economic stimulus in the short run and reduce capital accumulation in the long run (Diamond, 1989).

The extensions of the simplest Keynesian model allow for induced changes in interest rates in crowding out effect as depicted in IS-LM model. The well known IS-LM model helps to analyze the short-run effect of policy changes under sticky price assumption. Given LM curve, any expansionary or contractionary policy and resulting shift in IS curve leads to changes in output and employment (Froyen, 2003). The Mundell-Fleming model is the extension of closed economy into small open economy and it explains that the appreciation of the dollar and the resulting fall in net exports reduces the short-run expansionary impact of the fiscal change on output and employment (Levacic and Rebmann, 1982). However, the stimulating effect of fiscal policy depends among others on the determinants of fiscal multiplier.

The study of growth theories, that are developed to explain long-term perspective of the economic phenomenon, is another part of macroeconomic analysis which focuses on enhancing standard of living of the citizen (Solow, 1956). Therefore, the proponents of growth theories believe that even small differences in long-term growth rates when cumulated over a generation or more, have much greater consequences for standards of living than the kinds of short-term business fluctuations. To put it another way, if we can learn about government policy options that have even small effects on the long-term growth rate, then we can contribute much more to improvements in standards of living than has been provided by the entire history of macroeconomic analysis of countercyclical policy and fine-tuning (Barro, and Sala-i-Martin, 1995). Therefore, economic growth is the part of macroeconomics that really matters.

The whole spectrum of growth theories up to now can be divided into two broad categories: neo-classical growth theory and endogenous growth theory. Under the assumption of diminishing marginal productivity of capital, neo-classical growth theory focuses on saving decisions and its link to capital accumulation. When saving increases, there is an increase in investment and hence increase in capital stock (capital accumulation). Given the quantity of labor constant, an increase in capital stock raises capital/labor ratio and hence raises per capita income. Capital accumulation, as argued by neo-classical economist, is one of the important sources of economic growth. High saving rates and investment increase capital accumulation. Capital-labor ratio and level of per capita GDP are increased with the increase in capital accumulation. The well-known contribution in neoclassical growth theory is made by Solow (1956).

Technology is one of the major determinants of economic growth. The Neo-classical theories assumed the technology as constant parameter while endogenous growth theory stresses the dominant role of technology and it impact on economic growth (Dornbusch, Fischer and Startz, 2000). Technological progress enhances the productivity of factor inputs (labor and capital). It is achieved by way of investment in research and development (R&D), discoveries and inventions and innovations. Such investment results to an increase in human capital. Even poor and developing countries reap benefits of economic growth by using ideas from industrial countries in their borders (Romer, 1992). Such countries can learn lesson from the developed countries that produce ideas for sale on world markets. The important guidelines of the successful accumulation of technology consists of substantial inflow of foreign technology coupled with the rapid development of indigenous capabilities of business firms, investment in education and training, incentives for invention, innovation and discoveries, and favorable market conditions (Bell & Pavitt, 1992).

In connection with the policies of the government that can be used in stimulating the long run growth of an economy, researchers should seek guidelines from two important theories of growth. The first is neoclassical or exogenous growth theory and the second is endogenous growth theory. The former theory relies on the policy actions that can only have short-run effects on growth (Solow, 1956). The theory is developed on the basis of the proposition that the government policy can affect only the output level but not the growth rate (Judd, 1985). According to the theory, long-run economic growth is achieved by two exogenous factors: technological progress and economically active population.

So far as the endogenous growth model is concerned, it opines that policies that affect the incentives to invest in either physical or human capital can have permanent (long-run) effect on growth (Gerson, 1998). The application of endogenous growth model to examine the relationship between fiscal policy and economic growth can be understood by analyzing different components of neoclassical production function†. The production

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† $Y(t) = f[A(t)K(t), B(t)L(t)]$ where Y is output at time t, $K(t)$ and $L(t)$ are the stocks of physical capital andlabor, espectively, at time t, $B(t)$ is labor productivity,

function states that at any moment, the total output of the economy depends on the quantity and quality of capital and labor. In a world with decreasing returns to physical capital, the economy will tend to a constant capital/labor ratio, additional growth in the stock of capital per worker will take place only if the productivity of the capital stock is enhanced through technological innovation $L(t)$ or improvements in the quality of the labor force $B(t)$ (Solow, 1956), Swan (1956). The clear difference between neo-classical or Solow's growth model and endogenous growth or endogenous growth model is that former assumed $B(t)$ and $L(t)$ constant with the assumption of decreasing productivity of labor and capital while latter assumed these variables as endogenous.

According to the endogenous growth approach some elements of the government budget have positive effects (productive expenditures, and budget balance) or some have neutral effect (non-distortionary taxation and unproductive expenditures) or some have negative effect (distortionary taxation) on economic growth (Barro and Sala-I-Martin, 1992). A large number of empirical studies have been undertaken in the area in establishing linkage between fiscal policy and economic growth based on endogenous growth model in case both the developed as well as developing countries.

In view of the empirical literature of the relationship between fiscal policy and long run economic growth in the developed countries, there are studies that test whether the evidences are consistent with the predictions of endogenous growth model that the structure of taxation and public expenditure can affect the steady-state growth rate. Borro and Sala-I-Martin (1992, 1995) showed the positive effect of productive government spending and the adverse effects of distortionary taxes on growth supporting the argument of endogenous growth theory. Higgins, Young and Levy (2006) examined the relationship between growth of US economy and the size of government for federal, state and local level and concluded that sizes of the governments in all levels are either negatively correlated or uncorrelated with economic growth.

Kneller, Bleaney and Gemmell (1999) conducted an empirical study to verify Barro's (1990) theoretical model for 22 OECD countries using panel data estimation technique. They found the beneficial effect of productive government expenditure and the harmful effect of taxation, where government expenditure was classified into productive and unproductive categories while tax revenue into distortionary and non-distortionary categories. They demonstrated that the productive government expenditures have growth enhancing effect while non-productive expenditures stifle growth. In a reassessment of the work of Gwartney and Holcombe (1998) in case of 22 OECD countries, Grimes (2003) found that the size of government has only a minor effect on long-term growth outcomes.

The relationship between economic growth and government size in case of Indonesia has been reviewed by Ramayandi (2003). His finding claims that government size tends to have a negative impact on growth. Afonso and Sousa (2009), in their working paper

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$A(t)$ productivity of physical capital. The equation states that at any moment, the total outut of the economy depends on the quantity and quality of capital and labor.

entitled "the macroeconomic effects of fiscal policy" examined the effect of government spending shocks for US, UK, Germany and Italy and found a trivial effect of government spending shocks on growth rather than significant crowding-out effects. Cashin (1995) found a positive relationship between economic growth and government transfers and public investment and negative relationship between distortionary taxes and growth. The author used panel data for 23 developed countries between 1971 and 1988 in the analysis. Similarly, using cross-section data for 100 countries for 1970-1988 and panel data for 28 countries for 1870-1988, Easterly and Rebello (1993) found positive correlation between growth per capita and variables comprising public transportation, communication and educational investment and negative correlation between growth per capita and aggregate public investment.

Endogenous growth model has been utilized to examine the effects of fiscal policy on economic growth in the context of developing countries too. Claiming an important contribution in fiscal policy-growth literature in case of a small open developing country, M'Amanja and Morrissey (2005) found an unproductive expenditure and non-distortionary tax revenue to have a neutral effect on growth for Kenya. The authors used the time series techniques to investigate the relationship between various measures of fiscal policy on growth applying an autoregressive distributed lag model to capture dynamic responses between variables on annual data in their analysis. Further they also found government investment to have a beneficial impact on growth in the long run. Miller and Russek (1997) examined the effects of fiscal structure on economic growth for developing countries. They found evidence to support the view that debt-financing government expenditure retarding growth and tax-financed stimulating growth.

Herath (2009) empirically analyzed the effect of government expenditure (or government size) on economic growth for Sri Lanka using annual data ranging from 1959-2003. He applied non-linear model popularized by Armey (1995) for the examination of optimal size of the government in determining the efficient levels of government expenditure. The results of the study suggest that Sri Lankan government is spending at least 2 percent more money than the required amount of spending from an optimization point of view. Bagdigen and Hakan (2008) examined the validity of Wagner's Law in case of Turkey and concluded that public expenditure in Turkey was found to have no effect on economic growth.

Mourmouras and Rangazas (2008), in their IMF working Paper entitled Fiscal Policy and Economic Development, supports Wagner's Law Hypothesis that there is an upward tendency of both the size of government expenditure and the economic development as a result of the structural transformation of the economy from traditional to modern production methods. A relatively high tax rates ignoring private sector welfare reduces economic growth by slowing the structural transformation. Eskesen (2009) analyzed the effectiveness of fiscal policy in the stabilization of Korean economy. Using a macroeconomic model calibrated for Korea, the author found that counter-cyclical fiscal policy measures focused on spending such as investment spending and the targeted transfers of the government contribute in stabilizing economy. Devarajan, Swaroop and

Zou (1996) found that current expenditures of the government increasing growth while capital expenditure retarding growth in their sample of developing countries.

With an objective to identify the transmission channels between fiscal policy and economic growth, Baldacci, Hillman, & Kojo (2003) found contrary finding in case of high-income and low-income countries. Investment is the primary channel linking fiscal policy to growth in high-income countries while in the low-income countries factor productivity as principal channel. As such, the data set used by the authors covers 39 low-income countries that had IMF-supported programs for the period 1999-2001. Shrestha (2009) empirically analyzed the contribution of infrastructure development to growth in case of Nepal under endogenous growth framework. By utilizing annual time series data ranging from 1981 to 2007, he found a positive effect of public expenditure on economic growth. According to him, the prevailing low economic growth in Nepal is attributable to the low expenditure of the government on infrastructure sector.

In summing up the empirical finding as discussed above, Borro and Sala-I-Martin (1992, 1995), Barro (1990) and Kneller, Bleaney, & Gemmell (1999) found positive effect of productive expenditure and non-distortionary income on growth while negative effect of unproductive and distortionary income. Grimes (2003) found weak relationship between productive expenditure and economic growth. In a relationship between government size and growth for US economy, Higgins, Young and Levy (2006) found a negative correlation between the variables. Ramayandi (2003) found negative relationship between both the productive and unproductive expenditure for Indonesia. A small effect was detected between productive and unproductive expenditure and growth for US, UK, Germany and Italy in the study undertaken by Afonso and Sousa (2009). M'Amanja and Morrissey (2005) found neutral effect of unproductive and non-distortionary tax revenue for Kenya. Miller and Russek (1997) found debt financing government expenditure retarding growth while tax financing stimulating growth. Using Armey Curve tool to analyze the size of the government to growth, Bagdigen and Hakan (2008) and, Herath (2009) found in support of the hypothesis of the curve in case of Turkey and Sirlanka. Mourmouras and Rangazas (2008) found an initial increase and then decrease in growth as a result of an initial increase in government expenditure. Shrestha (2009) found a positive effect of public expenditure on growth particularly through infrastructure development in Nepal.

Methodology

So far as the methodological issue is concern, the neoclassical (also called the exogenous growth model) and endogenous growth models are the two important models that bring our understanding for the selection of estimable models and hence establishing the long run relationship between fiscal policy variables and economic growth. The former model as developed by Solow has got less attraction for the empirical analysis because of its limitation ascribed to short-run analysis.

Endogenous growth model, on the other hand, incorporates channels through which fiscal policy can affect long-run growth (Barro 1990, Barro-Sala-i-Martin 1992, 2004). The model has been built under the belief that fiscal policy can influence the long run growth rate of the economy. It integrates the fiscal policy to that of growth models enabling the policy to influence long run growth performance. According to the theory of endogenous growth, some elements of the government budget have positive effect on the long run growth rate of the economy (productive expenditures, and budget balance), while others have neutral effect (non-distortionary taxation and unproductive expenditures), or negative effect on growth (distortionary taxation).

Turning to the specification of the model in this study, we want to test the predictions of endogenous growth models, as found in the workings of Barro (1990) and Barro and Sala-i-Martin (1992, 1995), in case of Nepal by establishing the relationship between the structure of public spending/taxation and economic growth. Though the latter authors employ the Cobb-Douglas-type production function to examine the effect of productive government spending and distortionary taxes on economic growth where the government provides goods and services as inputs, we specify growth equation in line with the simplified model proposed by Kneller, Bleaney and Gemmell (1999) that incorporates both fiscal (g_{it}) and non-fiscal (h_{jt}) variables in the growth equation as follows:

$$y_t = \lambda + \sum_{i-1}^{k} \beta_i h_{it} + \sum_{j-1}^{m} \gamma_j g_{jt} + \varepsilon_{it} \qquad (1)$$

where y_t is the growth rate of output, (h_{it}) is the vector of non-fiscal variables, (g_{jt}) is the vector of fiscal variables and ε_{it} are white noise error terms. With regard to fiscal variables, the workings of Kneller-Bleaney-Gemmell (1999) argue that the omitted element of the fiscal variables (g_{mt}) must be that which theory suggests has neutral effect on growth. Consequently, we can re-write (1) in the following form as.

$$y_t = \lambda + \sum_{i-1}^{k} \beta_i h_{it} + \sum_{j-1}^{m-1} \gamma_j g_{jt} + \gamma_m g_{mt} + \varepsilon_{it} \qquad (2)$$

From equation (2), we can omit g_{mt} to obtain our final growth equation given below.

$$y_t = \lambda + \sum_{i-1}^{k} \beta_i h_{it} + \sum_{j-1}^{m-1} (\gamma_j - \gamma_m) g_{jt} + \varepsilon_{it} \qquad (3)$$

The growth equation (3), as specified in the working of Kneller, Bleaney and Gemmell (1999) constitutes our estimatable model. Specified in this manner, the interpretation of the coefficients of fiscal variables should be seen in terms of implied financing. That is, we test the null hypothesis that $(\gamma_j - \gamma_i) = 0$ instead of the conventional null that $(\gamma_j) = 0$. Accordingly, the interpretation of the coefficient of the fiscal variables is the 'effect of a unit change in the relevant variable offset by a unit

change in the element omitted from the regression' Kneller, Bleaney and Gemmell (1999). If the null is rejected, more precise parameter estimates can be obtained if the neutral elements are eliminated from the model (i.e. $\gamma_i = 0 \Rightarrow (\gamma_j - \gamma_i) = \gamma_j$.

Since there is no generally agreed growth model to guide on what factors to include in the growth model we drop those fiscal variables which, as stated above, are found to have a neutral effect on growth. We formulate five variants of the growth equation as presented in equation (3). Firstly we estimate a model in which all the fiscal variables are included. Secondly, unproductive government consumption expenditure is dropped from the equation while retaining all the other expenditure and revenue variables and then testing for zero coefficient of the remaining neutral element (i.e. non-distortionary revenue) is conducted. Third, we drop nondistortionary tax revenue, but retain all the other variables including unproductive expenditure and then testing for zero coefficient of the other neutral element (i.e. unproductive consumption expenditure) is conducted. Theoretically, the two neutral elements of fiscal policy should be insignificant in the model and therefore in the fourth specification, we drop both of them. In the final specification, we drop consistently insignificant variables throughout the models to obtain robust model.

Trend, Estimation and Analysis of the Variables

Trends of the Variables

The empirical as well as theoretical underpinnings of the relationship between fiscal policy and economic growth as discussed in the previous paragraphs enhance our understanding about different proxy measures of fiscal policy variables. The components of fiscal variable that have positive, negative and neutral effect on economic growth are presented in Appendix A. In this study, the recurrent or consumption expenditure of the government is further categorized into productive and unproductive expenditure. This classification is in line with Barro's (1990) that the productive expenditures are those that enter into the production function of the private agent whereas the unproductive expenditures go into the private agent's utility function. However, it is not theoretically clear which items of public expenditure fall under the Barro's category as such some subjectivity cannot be entirely ruled out. In this study, the recurrent expenditures on health, education and economic services are treated as productive expenditure with residuals pertaining to unproductive expenditure. There are, of course, caveats to this categorization since there may be some elements of the productive expenditure that are unproductive and vice versa.

Figure 1 in the Appendix B presents time trends of some major categories of government expenditure expressed as the share of real GDP during 1975 to 2009. The percentage share of total expenditure to real GDP appears to be trending upward. The total expenditure which was merely 1 percent of the real GDP in 1975 climbed up to 36 percent 2010. If we observe the share of recurrent and capital expenditure of the

government as percentage of GDP, on the average, recurrent expenditure was 5.2 percent of GDP while that of capital expenditure it was 4.4 percent. The share of recurrent expenditure exceeded that of capital expenditure during the years after 2000 attributing various procedural and institutional delays in the disbursement of capital expenditure accompanied with political instability in the country that lead to passive development activities during the period. As shown in Figure 2, the real GDP growth seems random at the mean level of 4 percent over the long run. As such, the upward trend of the growth up to 1993 has been offset by the declining trend thereafter. The observed high variance of growth rates over the long run implies that achieving desired growth of GDP seems uncertain.

All the components of the revenue of the government as percent of real GDP are trending upward throughout the period under study as shown Figure 3. A pronounced trend of different components of the revenue as percentage of GDP is experienced after 2006. The components of the revenue are behaving high variance because of the uncertainty in the economic activities and governments' eager inclination for the revenue mobilization during 2001 to 2009. A persistent rise in budget deficit has been characterized by the wide difference between the rates of growth of the government expenditure and revenue. Figure 4 shows the share of budget deficit to GDP with and without grants over the study period. Budget deficit both after and before grants measured as percentage of real GDP are upward trending characterizing the pronounced rate of increase of deficit before grants compared to deficit after grants. This tendency shows the government's motivation in resorting to foreign grants to minimize revenue-expenditure gap. During the study period, annual average deficit as percentage of real GDP after and before grants stood at 2.8 and 5.4 percent respectively accompanied with their respective highest rates of growth of 6.3 and 18.7 percent in 2009. For the estimation purposes, and in view of the fact that deficits are likely to significantly affect growth in the short run than in the long run, we exclude it in the long run analysis.

Estimation of the Results

The fiscal, in this study, variables comprise productive expenditure (PROEXP), unproductive expenditure (UNPROEXP), direct tax (DIRTAX), capital expenditure (CAPEXP), indirect tax (INDTAX), and budget deficit (BUDDEF) whereas the non-fiscal variables are per capita real gross domestic product (PRGDP) and private investment (PINVEST). Foreign grants variable (FORGRNT) is considered capturing foreign sector influence. This paper utilizes 35 annual observations of the respective variables in the analysis. This study begins with testing the validity of the variables to be used in the analysis. In this connection, test of stationarity of fiscal and non-fiscal variables is conducted to identify their order of integration so that we can integrate both the short-run as well as long-run relationship among the variables. Focus is placed on the application of the ADF sequential search procedure in testing unit root problems. The test results are incorporated in this study and are available in request of the author. The results show that PROEXP, UNPROEXP, DIRTAX, INDTAX NONTAX, BUDDEF,

PRGDP and GRANT are found to have unit root problem in the deterministic trend (both drift term and time trend) and hence these variables that are said to be integrated of first order. Since level data of the variables are found to be non-stationary, the results are supposed to be spurious with the application of such variables.

As it has been experienced from the various trends of macroeconomic variables in different economies in the world, the variables that are unit root problems are transformed into stationary by making first difference. The variables are found to be cointegrated of order zero depicting that the variables used in this analysis are stationary in first difference. However, modeling variables with first difference may mislead the long-run equilibrium relationship among the variables (Engle, & Granger, 1987). Therefore, in order to address the problem of dynamic as well as long-run relationships among the variables, variables with same order of integration can be used to estimate long-run as well as dynamic relationships using error correction term (ECT) introduced in the model.

So far as the estimation of the model is concerned, the results estimated under five different representative models are presented in Table 1. Following general to specific approach of model specification, an over-parameterized model representing regression of per capita real GDP on all the fiscal and non-fiscal variables is shown in Model 1. Model 2 excludes the unproductive government expenditure which is hypothesized to have neutral effect on growth, while Model 3 leaves out only distortionary tax revenue which is expected to have neutral effect on growth.

In Model 4, both the unproductive expenditure and distortionary taxes are dropped which are hypothesized to have neutral and negative effect on growth. If these variables are indeed irrelevant in explaining growth as posited by theory, then the signs and magnitudes of the remaining coefficients in the growth equation should remain largely unchanged, but significant. Furthermore, in any specification in which either of the neutral elements is included, its coefficient should be insignificant. Model 5 excludes statistically insignificant fiscal as well as non-fiscal variables to obtain robust model.

In the over-parameterized Model 1, variables including productive (PROEXP), unproductive (UNPROEXP), capital expenditure (CAPEXP) and foreign grant (FORGRNT) are found to be statistically significant at either 5 percent or 10 percent level. Since all the variables have been transformed into logarithmic form, the coefficients are interpreted as elasticity coefficient.

The partial elasticity coefficient of per capita real GDP with respect to the productive expenditure is 0.057. The coefficient is interpreted that, ceteris paribus, one percent increase in productive expenditure (PROEXP) leads to 5.7 percent increase in the per capita real GDP. The relationship is in accordance to theoretical underpinning that productive expenditure is growth enhancing in Nepal. The partial elasticity coefficient is found to be statistically significant. The variation of the dependent variables explained by the variables included in the model is 98 percent which is considered a good fit of the model.

Table: 1 Regression Result: Dependent Variable-Per Capita GDP (Sample: 1975-2009)

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5
C	8.419** (0.223)	8.444** (0.215)	8.545** (0.160)	8.507** (0.172)	8.516** (0.069)
LOG(PROEXP)	0.057** (0.029)	0.054* (0.032)	0.033 (0.026)	0.042* (0.026)	0.045* (0.025)
LOG(UNPROEXP)	0.118** (0.051)	-	0.092* (0.048)	-	-
LOG(INDTAX)	0.021 (0.067)	0.098* (0.063)	0.012 (0.070)	0.085* (0.061)	0.140* (0.055)
LOG(DIRTAX)	-0.047 (0.034)	-0.023 (0.033)	-	-	-
LOG(FORGRNT)	-0.041** (0.021)	-0.045** (0.023)	-0.037* (0.022)	-0.042* (0.023)	-0.114** (0.022)
LOG(CAPEXP)	0.066* (0.045)	0.060 (0.049)	0.049 (0.038)	0.051 (0.041)	0.051* (0.031)
LOG(NONTAX)	0.009 (0.033)	-0.004 (0.036)	0.017 (0.034)	0.001 (0.035)	-
LOG(PINVEST)	-0.043 (0.045)	-0.006 (0.047)	-0.033 (0.046)	-0.006 (0.046)	-
AR(1)	0.682** (0.185)	0.705** (0.195)	0.627** (0.160)	0.682** (0.017)	-
R2	0.988	0.985	0.987	0.985	0.982
Adj R2	0.984	0.981	0.983	0.981	0.980
Sum Sqr. Res.	0.015	0.019	0.017	0.019	0.025
DW	1.840	1.935	1.787	1.906	1.47
Inverted AR root	.68	.71	.63	.68	
F statistic	318.528** [.000]	F(8,25)** 359.711 [.00]	F(8,25)** 322.991 [.00]	F(7,26)** 383.038 [.00]	F(4,30)** 420.49 [.00]
Diagnostic Tests					
Serial Correlation	F(1,23) 1.058 [.314]	F(1,24) 1.548 [.225]	F(1,24) 1.177 [.289]	F(1,25) 1.364 [.254]	-
Functional Form	F(1,24) 0.074 [.788]	F(1,24) .007 [.867]	F(1,24) .0622 [.805]	F(1,25) .079 [.780]	-
Heteroscedasticity	F(1,32)** 1.349 [.254]	F(1,32)** 1.389 [.247]	F(1,32)** 2.289 [.140]	F(1,32)** 2.284 [.140]	-

** Statistically significant at 1% -5% implies 5% percent level
* Statistically significant at 5%-10% 10% percent level
- Figures in the parenthesis are standard error of the coefficient.
- Serial correlation- lagrange multiplier test of residual serial correlation
- Functional form-Ramsey's RESET test using the square of the fitted values
- Normality- Based on a test of skewness and kurtosis of residuals
- Heteroscedasticity- Based on the regression of squared residuals on squared fitted values

In Model 2, unproductive expenditure (UNPROEXP) of the government is dropped from Model 1 while retaining all the other fiscal and non-fiscal variables and then testing is made for zero coefficient of the remaining neutral element (i.e. distortionary revenue). While unproductive expenditure has been dropped, direct tax (DIRTAX) (non-distortionary revenue) became significant where this variable was not statistically significant in Model 1. The per capita real GDP (PRGDP) elasticity of income tax is found to be 9.8 percent implies that one percent rise in direct tax (DIRTAX) results into 9.8 percent rise in per capita real GDP.

Model 3 leaves out only distortionary tax revenue but retain all the other variables including unproductive expenditure and test is made for zero coefficient of the other neutral element (i.e. unproductive consumption expenditure). Left out the direct tax (DIRTAX) resulted to significant unproductive expenditure while productive expenditure as insignificant.

However, as depicted in Model 4, dropping both the unproductive expenditure (UNPROEXP) and direct tax (DIRTAX) from the model again brought the productive expenditure (PROEXP) and indirect tax (INDTAX) into being statistically significant. If unproductive expenditure and income tax (distortioanry tax) are indeed irrelevant in explaining growth as posited by theory, then the signs and magnitudes of the remaining coefficients in the growth equation should remain largely unchanged, but significant. Furthermore, in any specification in which either of the neutral elements is included, its coefficient should be insignificant. In view of this argument, the coefficients of the variables introduced in Model 4 are increasing as compared to Model 3 without loss of any generality. Therefore, Model 4 is robust compared to Model 3. Model 4 as presented in Table 1 can be rewritten in equation form as follows:

$$\ln(PRGDP)_t = 8.507 + 0.042\ln(PROEXP)_t + 0.085\ln(INDTAX)_t - 0.042\ln(FORGRNT)_t$$
$$(0.172)^{**}\quad (0.026)^{*}\qquad (0.061)^{*}\qquad (0.023)^{*}$$
$$+ 0.051\log(CAPEXP)_t + 0.001\log(NONTAX)_t + 0.006\log(PINVEST)_t 0.681AR(1) \quad (4)$$
$$(0.041)\qquad (0.035)\qquad (0.046)\qquad (0.017)^{**}$$
$$\bar{R}^2 = 0.98 \quad \text{SSR} = 0.019 \quad \text{SD of Dep. Var.} = 0.204 \quad \text{DW} = 1.91$$
$$F(7,26) = 383.038(0.00)^{**} \quad \text{(Sample: 1975-2009)}$$

So far as the Model 5 is concerned, the insignificant coefficients appeared throughout the Models 1 to 4 are dropped. These variables consist of non-tax revenue (NONTAX) and private investment (PINVEST). An advantage in doing so is that it brought capital expenditure (CAPEXP) to be significant without the loss of generality of the magnitude and the sign of the coefficient of foreign grants (FORGRNT). However, the latter variable possessed negative sign throughout the models signifies that it has significant negative effect on the per capita real GDP of Nepal. If we reiterate Model 5 into an equation form, it looks as:

$$\ln(PRGDP)_t = 8.516 + 0.045\ln(PROEXP)_t + 0.051\log(CAPEXP) + 0.140\ln(INDTAX)_t$$
$$(0.069)^{**} \quad (0.025)^{*} \quad (0.031)^{*} \quad (0.055)^{*}$$
$$-0.114\ln(FORGRNT)_t \quad (5)$$
$$(0.022)^{**}$$

$\bar{R}^2 = 0.98$ SSR = 0.026 SD of Dep. Var. = 0.204 DW = 1.47

F(4,30) = 420.49(0.00)** (Sample: 1975-2009)

The estimation procedure followed general to simple approach lead to find above robust model corresponding to the relationship between fiscal policy and economic growth. According to the finding, productive expenditure (PROEXP), capital expenditure (CAPEXP) and direct tax (DIRTAX) have statistically significant positive impact on growth whereas foreign grant (FORGRNT) has negative impact. The elasticity coefficients of PROEXP, CAPEXP, DIRTAX and FORGRNT in percentage term are 4.5, 5.1, 14.0 and 11.4 respectively. One percent increases in each of the variables of comprising PROEXP, CAPEXP and INDTAX lead to an increase in per capita real GDP by 4.5 percent, 5.1 percent and 14 percent respectively whereas one percent increase in foreign grants leads to decrease PRGDP by 11.4 percent. Detail implications of the coefficient are discussed subsequently after a brief preview of diagnostic test of the Equation (5).

Diagnostic Test

A number of statistical criterions validate the fitted relationship presented in the Model 5. A visual inspection of the figures obtained by utilizing Model 5 confirms the stability of the model. For instance, the fitted values or in-sample forecasts are seen to have tracking the actual values of PRGDP that implies that Model 5 has a good forecasting ability as shown in Figure 5 of Appendix B.

Similarly, as shown in Figure 6, the residuals of the fitted relationship- the deviation of actual and fitted values- are found hovering around the tolerable band of two standard deviation from the mean value equal to zero implying stability of the model. The frequency distribution of residual derived from the relationship show almost normally distributed as shown in Figure 7 supporting model stabbility. One additional criteria of model stability is the plot of CUSUM statistics. The statistics are zero under the null hypothesis of constant parameters. The CUSUM statistics with 5 percent significance confidence bounds are presented in Figure 8. When the graph of the CUSUM statistics revolves around zero within its confidence bounds the null hypothesis of parameter constancy is not rejected implying consistency of model presented in Equation (5).

In addition to the graphical soundness of the Model 5 as explained above, the summary of different diagnostic tests statistics are presented in Table 2 to look at the statistical strength of the model based on Lagrange Multiplier (LM) version and Wald or F version.

Table: 2 Summary of Diagnostic Test (Based on Model 5)

S.No	Test Statistics	LM Version		F Version	
A.	Serial correlation	χ^2 (1)	2.757(.097)*	F(1,29)	2.479(.100)*
B.	Functional Form	χ^2 (1)	3.050(.081)*	F91,29)	2.768(.107)*
C.	Normality	χ^2 (2)	.112(.946)*	Not applicable	
D.	Heteroscedasticity	χ^2 (1)	.089(.765)	F(1,33)	.084(.773)

** Statistically significant at 1% -5% implies 5% percent level.

* Statistically significant at 5%-10% 10% percent level.

A: Lagrange Multiplier (LM) test of residual serial correlation

B: Ramsey's Regression Specification Error Test (RESET) using the square of the fitted values.

C: Based on the test of skewness and kurtosis of residuals

D: Based on the regression of squared residuals on squared fitted values.

Applying the LM test of residual serial correlation, the null hypothesis of no serial correlation of residual, derived from Model 5, cannot be rejected at 5 percent significance level. Similarly, based on Ramsey's Regression Specification Error Test (RESET) using the square of the fitted values, the coefficient of square of the fitted values in the unrestricted model is not found to be statistically significant implying residual from restricted model is normally distributed with mean zero and constant variance which hence also validates the stability of the model in terms of functional form. Using the normality test of the OIS residual applying Jarque-Bera (JB) test of normality,‡ the JB statistic is found to be about 0.112, and the probability of obtaining such a statistic under the normality assumption is about 94 percent. Therefore, we do not reject the hypothesis that the error terms are normally distributed. The validity of normally distributed residual signifies that the estimated coefficient is unbiased and consistent.

As the Equation (5) is found to be a robust model in this analysis satisfying different diagnostic test criterion, the variables selected in the equation are utilized to find the number of cointegrating relationship and representation of error correction model as the results presented in Appendix C and Appendix D respectively. Applying the Johensen test of cointegration, the estimation result found that there are two cointegrating relations among the variables. It implies that an utilization of the five variables defined in Equation (5) two sets of variables are found to be cointegrated that results into common trend and hence are applicable to show long-run relationship. One cointegrating relationship (vector normalized with respect to PRGDP) has been presented in Appendix C. The speed of

‡ $JB = n\left[\frac{S^2}{6} + \frac{(K-3)^2}{24}\right]$ where, n=sample size, S= skewness coefficient, and K=kurtosis coefficient. It is a test of the joint hypothesis that S and K are 0 and 3 respectively. In that case the value of the JB statistic is expected to be 0 to confirm normality.

adjustment has significance in interpreting time elapse to adjust the variable from short-run dynamics to long-run equilibrium.

Findings of the Analysis

In summing up the findings of the analysis, productive expenditure (PROEXP) has a positive impact on growth in Nepal. The partial elasticity coefficient of 4.5 percent is interpreted as one percent increase in productive expenditure lead to 4.5 percent rise in economic growth, ceteris paribus. The coefficient also supports the hypothesis envisaged by the endogenous growth model that productive expenditure of the government (recurrent expenditure on health, education and economic services) influences growth through its impact on human and physical capital. A significant ratio of productive expenditure to nominal GDP averaged to 3.6 percent obtained over the period accompanied with a persistent rise of such expenditure particularly after the year 1994 on the information and technology, research and development and different skilled programs implies the government's motivation in stimulating growth through the productive expenditure. If we compare the short-run elasticity coefficient of 3.0 percent for PROEXP (as presented in Appendix C) to the cointegrating coefficient of 4.5 percent, around 34 percent of disequilibrium is adjusted each period to reach into long run equilibrium that is considered sluggish adjustment in policy response.

Capital expenditure (CAPEXP) also has growth enhancing effect in Nepal. The average ratio of capital expenditure to nominal GDP stood at around 8 percent per annum during the review period. The statistically significant elasticity coefficient of CAPEXP with respect to PRGDP is 0.051 which depicts that one percent increase in CAPEXP leads to 5.1 percent increase in PRGDP, ceteris paribus. As envisaged in endogenous growth model, the channeling effect of capital expenditure for the provision of public sector infrastructure and hence enhancing productivity of private capital is shown to have relevant in the context of Nepal. The effect of capital expenditure on growth has been found larger in magnitude compared to productive expenditure. Among the various instruments of fiscal policy, capital expenditure can be a desired policy option in growth objective. The unidirectional causation running from CAPEXP to PRGDP as the result presented in Appendix E also supports our finding. Though CAPEXP has short-run statistically insignificant negative impact, as presented in error correction representation in Appendix D, the significant normalized cointegrating coefficient of CAPEXP shows growth enhancing effect of CAPEXP in the long-run.

Indirect tax (INDTAX) uncovered to have non-distortionary effect on growth in Nepal. Indirect tax by nature is a tax on consumption. Financing government expenditure resorting to indirect tax is the transfer of resources from the private sector to public sector. The marginal return from public investment should be greater than the disincentive to work resulting from the sacrifice of tax so that it has positive impact on growth. In light of this argument, a surprisingly high statistically significant indirect tax elasticity of growth figured at 0.14 as found in this analysis supports the prevailing experience of dependency on indirect tax particularly in the developing countries to

achieve growth objective. Since the share of indirect tax to total tax revenue of the government accounts for around 85 percent over the period, it is not surprising that the variation of growth is more influenced by indirect tax financing compared to direct tax. As the result presented in Appendix E, the causality running from indirect tax both to the productive expenditure and capital expenditure rather than directly to growth implies that indirect tax has growth enhancing effect also via latter variables.

Contrary to our hypothesis, the foreign grants (FORGRNT) is inversely related to growth. Though the grants is better interpreted an alternative source of revenue, the consistent negative elasticity coefficients as found in this analysis over the different models observed in Table 1 with a wide band hovering between -0.04 to 0.11 implies a nonsystematic distortionary effect on growth. Since, foreign grants are determined by grant policy of the donor, it cannot be an efficient source of the revenue. Foreign grants may also affect government consumption, which is known to have a negative effect on economic growth. Due to the lack of the flow of grants targeted to a particular set of investments, and specifically public sector investments, grants have been used for the consumption so that its impact on growth has become insignificant. Moreover, a significant portion of the grants has been spent on the benefits and other physical facilities of the consultants designated by the donors themselves, hence it has a little to do for the growth of national economy.

Conclusion

This paper attempts to study the impact of fiscal policy on economic growth in case of Nepalese economy focusing on the supply side of the economy, utilizing 35 annual time series data ranging from 1975 to 2009. One of the key finding is that fiscal policy matters for the economic growth. Following general to specific approach the growth stimulating fiscal variables as found in the analysis comprises of productive expenditure, capital expenditure and indirect tax whereas foreign grants has decelerating effect. The channels through which fiscal policy can affect the economic growth in Nepal supporting the argument in line with the endogenous growth model are (a) the effect of productive expenditure (government's recurrent expenditure on health, education and economic services) on human and physical capital (b) the effect of the capital expenditure for provision of public sector infrastructure and hence enhancing productivity of the private capital and (c) the effect of the indirect tax that minimize distortions to the supply and demand for capital and labor. These conclusions are deduced based on the statistically significant positive elasticity coefficient of corresponding variables. However, contrary to our expectation, foreign grants has negative impact on growth where the variables has been considered a foreign policy variable in this analysis. Nevertheless the policy responses of fiscal variables on growth approximately elapse three years for the long run equilibrium implying weakening policy reaction between the growth and policy variables as depicted by the adjustment coefficient. Therefore, in order for the fiscal policy to be growth enhancing, policies of non substitution of government spending to the private on education and health, efficiency in capital expenditure directed to the projects that would

increase the productivity of the capital stock without jeopardizing the complementary role to private investment, less resort to foreign grants as a source of financing deficit and effective use of indirect tax in productive activities of the government should be undertaken.

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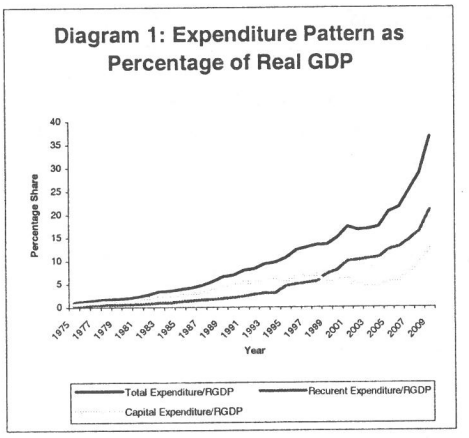
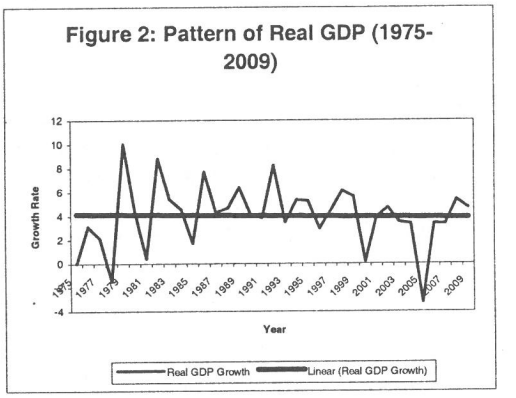
Appendix: A Variables, Description and Remarks/Expected Sign on Growth

Variables	Description	Remarks/Expected Sign on Growth
Productive expenditure (PROEXP)	Productive government consumption= recurrent expenditure on health+ eduction + economic services.	Expected to have positive relationship with economic growth but may be negative depending on its actual composition. (It is classified as the expenditure on human capital accumulation).
Unproductive expenditure (UNPROEXP)	Unproductive government consumption= total recurrent expenditure- recurrent expenditure on health- eduction - economic services.	Expected to have negative but insignificant impact on growth (Barro).
Capital Expenditure (CAPEXP)	Total capital expenditure of the government	Expected to have positive relationship with growth
Income tax (DIRINCTX)	Income tax revenue is distortionary revenue	Hypothesized to have negative association with growth; distorts incentives of private agents
Indirect tax (INDTX)	Indirect tax revenue is non-distortionary tax revenue	Hypothesised to have a positive but insignificant effect on growth (does not distort incentives to private agents)
Non-tax Revenue (nontax)	Non-tax revenue – includes capital revenue, fines, forfeitures, dividends etc	Expected to have positive effect on growth since it is nondistortionary way of financing government expenditure.
Budget deficit (BUDDEF)	Budget deficit – total revenues less total expenditures	Ambiguous, mostly negative for LDC because of crowding out effects. May have neutral effect on long run growth if Ricardian equivalence holds.
Per Capita Real Gross Domestic Product (PRGDP)	Real GDP in constant 2000/01 prices.	Real GDP divided by total population. Used as dependent variable to proxy for real output growth.
Foreign Grants (FGRNT)	Nominal receipts from abroad in form of grants.	Positive or negative depending on its usage by the government and on existence or otherwise of other supporting policies.

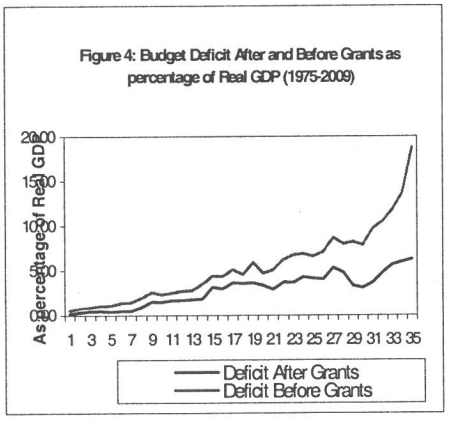
Appendix: B Diagrams



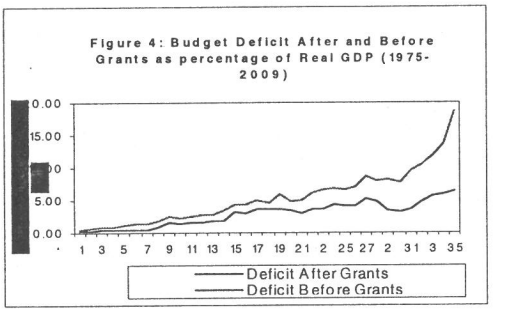
Source: Nepal Rastra Bank



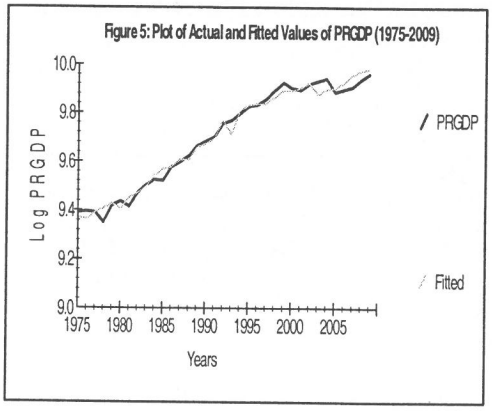
Source: Nepal Rastra Bank

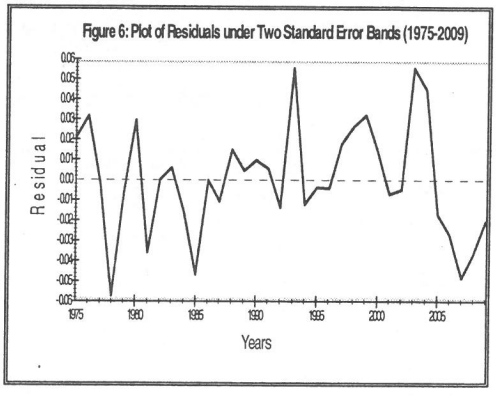


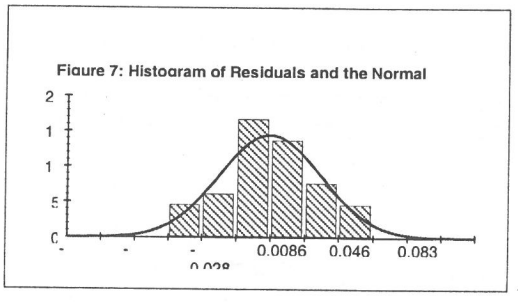
Source: Nepal Rastra Bank

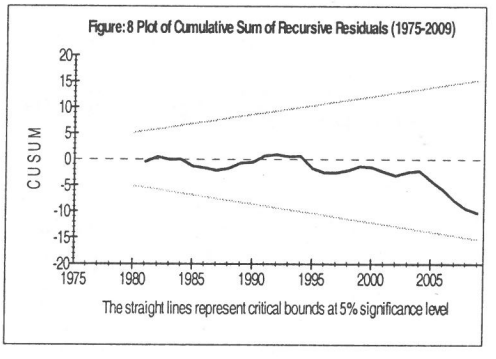


Source: Nepal Rastra Bank









Source: Author's calculation.

Appendix: C Cointegration Relationship among the Variables: PRGDP, PROEXP INDTX CAPEXP and FORGRNT (Five Variables VAR), (1975-2009)

Test Based on Maximum Eigenvalue (λ_{max}): Order of VAR = 1

Null Hypothesis	Alternative Hypothesis	Eigenvalues (λ_i)	Max-Eigen Statistics (λ_{max})	0.05 Critical Value	0.10 Critical Value
r = 0 *	r = 1	0.6386	33.588	33.46	38.77
r ≤ 1 *	r = 2	0.5708	27.91	27.07	32.24
r ≤ 2	r = 3	0.3525	14.344	20.97	25.52
r ≤ 3	r = 4	0.2683	10.310	14.07	18.63
$r \leq 4$	$r = 5$	0.0322	1.082	3.76	6.65

* denotes rejection of the hypothesis at the 0.05 level

Maxmium eigenvalue test indicates 2 cointegrating vector, that is, $r = 2$

Test Based on Trace Statistic(λ_{trace}):Order of VAR = 1

Null Hypothesis	Alternative Hypothesis	Eigenvalues (λ_i)	Trace Statistics (λ_{trace})	0.05 Critical Value	0.10 Critical Value
r = 0 *	r ≥ 1	0.638	87.240	68.52	76.07
r ≤ 1 *	r ≥ 2	0.5708	53.651	47.21	54.46
r ≤ 2	r ≥ 3	0.3525	25.736	29.68	35.65
r ≤ 3	r ≥ 4	0.2683	11.392	15.41	20.04
$r \leq 4$	$r = 5$	0.0322	1.082	3.76	6.65

*denotes rejection of the hypothesis at the 0.05 level

Trace test indicates 1 cointegrating vector, that is, $r = 2$

Analyzing the normalized cointegrating vector and speed of adjustment coefficients in the present study, one cointegrating vector normalized with respect to PRGDP is $\beta' = (1.0000,\ 0.049,\ -0.158,\ 0.254,\ 0.033)$. The economic interpretation of the normalized coefficient is that there is long term positive relationship between PRGDP and PROEXP,CAPEXP and FORGRNT and negative relationship between PRGDP and INDTX. The corresponding speed of adjustment or vector weight for the variables PRGDP, PROEXP, INDTX, FORGRNT and CAPEXP are $\hat{\alpha} = [-0.341,\ 0.763,\ -0.305,\ 1.687,\ 0.259]$. In this vector, -0.341 is the error correction coefficient.

$$\ln(prgdp)_t = \underset{(0.045)*}{0.0492\ln(pro\exp)_t} - \underset{(0.113)*}{0.158\ln(indinctx)_t} + \underset{(0.054)*}{0.254\ln(forgrnt)_t} + \underset{(0.056)*}{0.033\log(cap\exp)_t}$$

Appendix: D Error Correction Representation

$$\Delta \ln(prgdp)_t = -0.347 ECT_{t-1}[\ln(prgdp)_t - \{0.0492 \ln(pro\exp)_t - 0.158 \ln(indinctx)_t$$
$$(0.192)^* \qquad (0.045) \qquad (0.113)$$
$$+ 0.254 \ln(forgrnt)_t + 0.033 \log(cap\exp)_t \}] +$$
$$[0.015 + 0.030\Delta(\log(PROEXP)$$
$$(0.054) \qquad (0.056) \qquad (0.011) \quad (0.024)$$
$$+ 0.001\Delta(\log INDTX)) - 0.025\Delta(\log FORGRNT))$$
$$- 0.009\Delta(\log CAPEXP))]$$
$$(0.060) \qquad ((0.018) \qquad (0.038)$$

$\bar{R}^2 = 0.183$ SSR= 0.025 SD of Dep. Var. =0.026 DW=1.70
F=1.25

Appendix: E Causality Test of Variables included in Model 5 (1975-2009)

Granger Causality among the variables used in Model 5 (Observation: 35)

Direction of Causality	F value	P value	Conclusion
INDTX→PRGDP	2.981	0.094*	Unidirectional Causation
CAPEXP→PRGDP	3.368	0.076*	Unidirectional Causation
INDTX→ PROEXP	4.326	0.046**	Unidirectional Causation
FORGRNT→PROEXP	4.634	0.039**	Bidirectional Causation
PROEXP→FORGRNT	4.861	0.035**	
INDTX→CAPEXP	3.781	0.061**	Unidirectional Causation