PUBLIC EXPENDITURE ON TRANSPORTATION INFRASTRUCTURE AND GROWTH: EVIDENCE FROM NEPAL

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Abstract

The speedy growth in public investment in various sectors was assumed after decades of conflict and an unstable political situation. With the declaration of the Federal Republic, Nepal is going to embark on accelerated economic growth. This has somewhat caused concerns among policymakers of its implication for economic growth. And the government investment in transportation infrastructure is one of the core strategies, called the 'infrastructure of infrastructures'. The main aim of this study is, therefore, to explain the relationship between economic growth and public expenditure in the transportation sector in Nepal. Primarily, this study has focused on the distinction of expenditures in the five-year development plans in three systems (Panchayat, Democratic, and Republic). This study used time series data collected between 1975 and 2016. The statistical and econometric tools have been used for the study. The result shows that the trend of government investment on public expenditure has increased in the Republic system. This study reveals that the variables are stationary on the first difference. The obtained regression model is satisfactory by diagnostic tests (errors are normally distributed, no serial correlation and homoscedastic). The data explain the positive and significant influence of Transportation Capital Expenditure on Gross Domestic Product, and, hence, it is contributing to economic growth. Furthermore, the results show short-run unidirectional causation from Transportation Capital Expenditure to Gross Domestic Product.

Keywords: Public Expenditure, Transportation Infrastructure, Growth, Nepal

Introduction

Nepal is going to embark on an accelerated economic growth for which transport development has been recognized as one of the core strategies. This work is an intensive work of government. Hence, public investment has a great degree of implication. Public investment is an investment in the public sector in specific assets, whether through central or local governments or through publicly owned industries or corporations. The general definition of the public sector includes government ownership or control rather than mere function and thereby includes, for example, the exercise of public authority or the enactment of public policy.

Associated with the problems of public administration in developing countries have been the widespread activities of State-owned Enterprises (SOEs). In addition to their traditionally

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dominant presence in utilities (gas, water, and electricity), transportation (railroads, airlines, and buses), and communications (telephone, telegraph, and postal services), SOEs have been active in such key sectors as large-scale manufacturing, construction, finance, services, natural resources, and agriculture. Sometime, they may dominate these sectors, particularly in the areas of natural resources and manufacturing (Todaro & Smith, 2012).

Furthermore, public investment has arisen historically from the need to provide certain goods, infrastructure, or services that are deemed to be of vital national interest. Hence, Shikha (2016) claimed private sector is reluctant to these projects due to their high startup cost, both financial and national, to infrastructure capital development. The Public strategic vision for the development of the country is determined by the 3 I's for growth: Investment, Infrastructure, and Inclusion. Investment is the foundation of a sustainable growth model but in Nepal, the state, firms, and households are lowering the investment (World Bank, 2014). Unless investment is done, there is no economic growth.

Hence, there is a positive relationship between the public investment and growth. Stieglitz (2000) also pointed these two factors as a critical subject for development analysis and possessed interrelation between them. Barro & Sala (1992) suggested direct effects of public expenditure on infrastructure with the growth of the economy.

In Nepal, inadequate and unbalanced transport infrastructure is often blamed for underdevelopment and increasing regional disparity. Political instability, non-inclusiveness, and ethnic conflict are the growing issues in Nepal where an uneven distribution of income across the regions has been taking place. Because of geographical complexity, current settlement pattern and slower development process, people from some parts of a country are struggling to achieve the minimum access to the services and economic activities. Whereas, in some places of the country urbanization is so rapid which result the increasing income, resulting in the requirement of more speedy and reliable transport system.

Recently, the government of Nepal has set a target to uplift the economic status of the country from the least developed to the developing country by the year 2022. The estimated annual economic growth rate is 9.2 percent until 2022 for the graduation from least developed to the developing nation. However, the average annual economic growth rate over 1960 to 2013 was less than 2 percent (NPC, 2014). To achieve the ambitious rate of economic growth, National Planning Commission (NPC) has pointed some new policy options such as a change in resource allocation pattern, increase in absorption capacity of the economy, ensuring development friendly policy and so forth. NPC has also estimated the need for investment to achieve this goal. The estimated growth rate of investment is 19 percent per annum (GoN, 2014). The transport sector is identified as a major sector for the investment (NPC, 2014). Since transport is the "infrastructure" of the infrastructures it needs due attention for the rapid economic growth. Transport has been taken as a major sector since 1956 when periodic planning process has been introduced. With the analysis of current scenario of transport development, this paper identifies issues, challenges and the strategies for the transport development for the rapid economic development.

With an objective of providing some valuable insights to the policymakers, this paper adopts a broad-brush approach to review the past efforts, identify current trend and pattern, explore linkages with theoretical concepts, and finally list out important strategies that would guide Nepal's transport development towards a sustainable development. It is expected that the contents of this study would provide useful guidelines for the transport policy makers in Nepal.

In case of Nepal, an easy access between the Capital City and Terai, the store-house of the country and is very necessary. To facilitate this promotion of an improved core road network, Government of Nepal has launched the Kathmandu-Terai Fast Track Project. Many concerned personalities and sectors had considered this project to be number one in the list of seventeen projects of national pride declared by the government. Length of 72.6 km fast track from Kathmandu – Lalitpur – Makawanpur and up to Nijgadh in Bara district to link with the East-West Highway will be of four lanes with 50 m on each side. The project was proposed to have 96 bridges big or small; 1.6 km long tunnel will be built in Thingan of Makawanpur on public-private partnership. It had projected costs of more than NRs 250 million. Upon the completion of the fast track, the distance and time to reach the capital city from Terai will come down to only 1.5 hours and will transform the capital, eastern Terai and the country as a whole. It is estimated that NRs 4.5 billion will be saved annually of the transport cost (Dahal, Dahal, Khanal, Poudel, & Khatiwada, 2014) this paper tries to identify the trend and structure of transportation expenditure of public investment and also to analyze the impact of transportation expenditure of public investment in economic growth.

Objective of the Study

The study aims to identify the long run relationship between expenditure on transportation infrastructure and growth in Nepal.

Literature Review

Ghani and Din (2006) analyzed the impact of public investment and growth of the economy in Pakistan and explored the role of public investment in the process of economic growth. The results showed that growth is largely driven by private investment and that no strong inference can be drawn from the effects of public investment and public consumption on economic growth.

In the similar works of Murty and Soumya (2006).Counterfactual policy simulations of a sustained increase in public investment in infrastructure in India, financed through borrowing from commercial banks, show a substantial increase in private investment and thereby output in this sector. Similarly, due to increases in absorption, real private investment and output in all other sectors also seem to increase, resulting in several other macroeconomic changes. In the work of Okoro (2013).The Co-integration test employed revealed that there is a long run relationship between the variables studied in Nigeria.

The study recommends that Government increase both capital expenditure (investment in roads, power supply, transport, and communication) and recurrent expenditure mostly on issues that should attract economic growth. Adopting secondary data, Granger Causality test, Johansen

Co-integration Test and Error Correction Mechanism models were used in the study. But in the work of Patricia and Izuchukwu (2013).Government expenditures are very crucial instruments for economic growth at the disposal of policymakers in developing countries like Nigeria. The study recapitulated Total Expenditure Education is highly and statistically significant and has a positive relationship on economic growth in Nigeria in the long run. The result has an important implication in terms of policy and budget implementation in Nigeria. The objectives of the study were to determine the effect of public expenditure on economic growth in Nigeria.

Model Specification

Nepal is one of the Asian countries with higher availability of natural resources that can satisfy sustainable economic growth and development but due to lack of long-term vision for its growth, the country's productivity yielding capacity is not in the optimum state. Nepal is a landlocked country of 147,181 km^2 and a population of 26.4 million. The main source of revenue for the country is tourism and tax. The secondary data on Gross Domestic Product (GDP), Government Transportation Capital Expenditure, and Transportation Recurrent Expenditure were extracted from NRB for the year 1974 to 2016.

The underlying analytical framework for the nexus of economic growth is Harrod -Domer model which links output growth to aggregate investment in a linear function. The rate of output growth in the HD model can be captured in production function with capital as the sole input. Therefore, production function of developing countries can take the following form $(t) = ((t))$ (Xayavong, n.d.).

Hence, the methodology for the study is of the linear regression model in which GDP acts as the function of Government Expenditures and the source of revenue. So, the model is in the form of

$$Y = (X_1, X_2) + u \qquad (3.4a)$$

Where, Y=Gross Domestic Product

X_1= Real Capital Expenditure of transportation

X_2= Real Recurrent Expenditure transportation

u = Stochastic error term

Hence, the linear econometric model takes the form of:

$$LN\_RGDP_t = \beta_0 + \beta_1 LN\_RTC_t + \beta_2 LN\_RTR_t + u_t \qquad (3.4b)$$

The nominal value of all variables is converted into real term by applying following formula. And the basic price is adjusted taking base year 2000/01.

Real value= $\times 100$, i = 1 ..... n (3.4c)

In order to carry out modeling, the test of stationary is the main work, which can proceed through Unit Root Test. Hence, to test the unit root Augmented Dickey-Fuller Test proposed by Dicky and Fuller (1979) is used. Further co-integration is done. The error correction mechanism first used by Sargan (1964) and later popularized by Engle and Granger and Weiss (1987) was also used to correct for disequilibrium in order to describe both the short-run and the long-run equilibrium relationship of the model. Various assumptions underlying the validity of the model are also examined.

Results and Discussion

The Unit Root Test

The plots of time series generally provide the simplest method for checking stationary. The results of stationary and non-stationary plots of the variables are provided in the appendix. To numerically confirm the stationary of variables, Augmented Dickey Fuller Test (ADF) was performed. To make the variable stationary, we should go for first differencing.

The Hypothesis is formulated as:

Null Hypothesis (H_0): Variable is not stationary or got unit root.

Alternative Hypothesis (H_1): All the data are stationary.

Table 1: *ADF Test for the Variables*

Variable Status	Variable Name	RWOCT	RWC	RWCT	Order of Integration
Original	Gross Domestic Product (Y)	11.8302 (1.0000)	0.0244 (0.9554)	-2.8198 0.1988)	I(0)
	Capital Expenditure Transportation (X_1)	1.3869 (0.9563)	-0.0751 (0.9454)	-1.2692 (0.8816)	I(0)
	Recurrent Expenditure Transportation (X_2)	1.0355 (0.9184)	-0.5838 (0.8632)	-3.0670 (0.1311)	I(0)
1st Difference	Gross Domestic Product(Y)	-0.2696 (0.5821)	-7.2558*** (0.0000)	-5.8539*** (0.0001)	I(1)
	Capital Expenditure Transportation (X_1)	-7.0009*** (0.0000)	-7.3289*** (0.0000)	-7.4956*** (0.0000)	I(1)
	Recurrent Expenditure Transportation (X_2)	-5.5910*** (0.0000)	-5.6767*** (0.0000)	-5.6903*** 0.0002)	I(1)

Note: ***denotes variables stationary at 5 percent level of significance.
() indicates P-Value.
Source: *Author's Calculation through E-Views 10.*

All the variables showed non-stationary in a level that is all the variables are converted and made simpler taking log. Initially the data after logarithms tested for their stationary. Variables turned out to be non-stationary. Then after first difference again ADF test is verified. Eventually

these variables showed stationarity on first difference. If the variables turned out stationary on level, then the model is considered to be I (0). However, it showed stationarity in first difference. Therefore, the test is integrated to I (1).

Regression Result

Table 2 provides the regression result, which shows that both the variables are likely to affect the gross domestic product of the country.

Table 2: *Regression Result*

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	6.821242	1.543553	4.419182	0.0001
LN_RTC	0.614460	0.261704	2.347924	0.0240
LN_RTR	0.098906	0.143712	0.688222	0.4954

Source: Author's Calculation through E-Views 10.

Hence, the estimated regression model is,

$LN\_RGDP_t = 6.82 + 0.61 LN\_RTC_t + 0.09 LN\_RTR_t$

se (1.54) (0.26) (0.14)

t-statistic $(4.42)^*$ $(2.35)^{**}$ $(0.69)^{***}$

$R^2 = 52.89\%$ D.W. = 0.16

*Note: * denotes coefficient is significant at 1 percent level of significance.*

*** denotes coefficient is significant at 5 percent level of significance.*

**** denotes coefficient is not significant even at 10 percent level of significance.*

The model shows the value of constant is 6.82 and it is significant. It means the RGDP is autonomously change by 6.82. The model suggests that 1 Percent rise in RTC; the RGDP rises by 0.61 Percent. The p-value of transportation capital expenditure is 0.024. This suggests that level of significance is less than 5 Percent i.e., real transportation capital expenditure significantly determines the real GDP of Nepal.

Similarly, the model suggests that 1 Percent rise in real transportation recurrent expenditure leads to 0.098 percent rises in GDP, other things remaining the p-value for real transportation recurrent expenditure is 0.49 which implies level of significance is more than 5 percent which doesn't signifies good significance.

Since, R^2 of the model is 52.89 Percent that is 52.89 Percent is explained by the two variables and remaining 41.11 Percent is explained by other variables. And also, the Adjusted R-squared is 50.48 Percent. This also signifies that Transportation expenditure plays significant role for the increment or decrement of GDP or overall economic growth.

And again, DW is equal to zero so the regression is not spurious. Alternatively, R^2 (0.52) > D.W. stat (0.16) this also signifies the regression model is not nonsense regression. The prob (F-statistic) is 0.00 (significant even at 1 percent level of significance). It means all the explanatory variables jointly can influence the dependent variable. So the model is largely determined by the variables (RTC and RTR).

Residual Diagnostics Heteroscedasticity Test

To test the heteroscedasticity in residual, Breusch-Pagan-Godfrey Test has been used by setting following null hypothesis. The Breusch-Pagan-Godfrey test regressed the square residuals on the original regressors.

Null hypothesis (H_0): Residuals are not heteroscedastic that is homoscedastic

Alternative hypothesis (H_1): Residuals are heteroscedastic.

Table 3: Heteroskedasticity Test (Breusch-Pagan-Godfrey Test)

F_Statistic	0.075916	Prob. (1,41)	0.7843
Obs *R-Squared	0.079473	Prob.Chi- Square(1)	0.7780
Scaled Explained SS	0.063140	Prob.Chi- Square(1)	0.8016

Source: Author's Calculation through E-Views 10.

Table 6.2 shows that the result of heteroscedasticity tests. The corresponding probability values for F-test, observed R-squared and Scaled explained SS are more than 5 percent. It means that the null hypothesis is not rejected rather it is accepted. Hence it is concluded that the model is free from heteroscedasticity.

Serial Correlation

To test the serial correlation, Bueusch-Godfrey Serial Correlation LM test has been used by setting following null hypothesis.

Null hypothesis (H_0): Residuals are not serially correlated.

Alternative hypothesis (H_1): Residuals are serially correlated.

Table 4: Serial Correlation Test (Bueusch-Godfrey)

F_Statistic	0.103083	Prob. F(2,33)	0.9023
Obs *R-squared	0.260763	Prob.Chi- Square(2)	0.8778

Source: Author's Calculation through E-Views 10.

Table 4 shows that the result of serial correlation tests. The corresponding probability values for F-statistic and observed R-squared with degree of freedom 2 are more than 5 percent. It means that the null hypothesis cannot be rejected rather it is accepted. Hence it is concluded that there is no serial correlation.

Johansen Co-integration

For the Johanson co-integration to run, all the variables should be non-stationary and should turn to stationary at I (1). This is the primary condition of Johansen test. It checks either the existence of long run relationship between the variables or not. The further tests are determined by the results of the Johansen Co-integration. The following hypothesis is formulated. 1) For Trace test

Null hypothesis (H_0): The number of cointegration vectors is $r = r^* < k$.

Alternative hypothesis (H_1): $r = k$.

2) For Maximum Eigen Value test

Null hypothesis (H_0): The number of cointegration vectors is $r = r^* < k$.

Alternative hypothesis (H_1): $r = 1, 2$, etc.

Table 5 : Results of Johansen Co-integration (Trace statistics)

Hypothesized no. of CE(s)	Trace Statistics	P-Value Trace for Statistics	Max-Eigenvalue Statistics	P-Value for Max-Eigenvalue
None	0.183502	10.97501	29.79707	0.9618
At most 1	0.069132	2.865762	15.49471	0.9726
At most 2	6.57E-06	0.000263	3.841466	0.9891

Source: Author's Calculation through E-Views 10.

Table 6: Results of Johansen Co-integration (Maximum Eigen-value)

Hypothesized No. of CE(s)	Trace Statistics	P-ValueTrace for Statistics	Max-Eigenvalue Statistics	P-Value for Max-Eigenvalue
None	0.183502	8.109248	21.13162	0.8969
At most 1	0.069132	2.865499	14.26460	0.9553
At most 2	6.57E-06	0.000263	3.841466	0.9891

Source: Author's Calculation through E-Views 10.

Since the p-value of none of the co-integration is greater than 5 percent, this implies the acceptance of null hypothesis that there are no co-integrating equations. Alternatively, in Unrestricted Cointegration Rank Test (Trace), trace statistics is less than critical value which accepts the null hypothesis. Further the maximum Eigen value test also signifies the rejection of alternative hypothesis and acceptance of alternative hypothesis.

So, it is possible to run VAR model for further analysis as there are no any co-integration relationship.

Granger Causality Test/ Block Exogeneity Wald Test

The short-run causal relationship between the variables of the bivariate models which are found to be not co-integrated in the long-run are investigated. The variables as TC (Transportation Capital) and TR (Transportation Recurrent) are tested with short run with GDP. However, it is mandatory task for this study to go for the short-run causality investigation of the variables.

The hypothesis is formed as follows:

1. For GDP as dependent and TC and TR are independent Null Hypothesis (H_0): DLNTC and DLNTR cannot cause LNGDP Alternative Hypothesis (H_1): DLNTR and DLNTC can cause DLNGDP

2. For LNTC as dependent and DLNGDP and DLNTR are independent Null Hypothesis (H_0): DLNGDP and DLNTR cannot cause DLNTC

Alternative Hypothesis (H_1): DLNGDP and DLNTR can cause DLNTC

3. For DLNTR as dependent and DLNGDP and DLNTC are independent

    Null Hypothesis (H$_0$): DLNGDP and DLNTC cannot cause DLNTR

 Alternative Hypothesis (H$_1$): DLNGDP and DLNTC can cause DLNTR

Table 7: Result of Granger Causality/Block Exogeneity Wald Tests

Model	Dependent Variable	Explanatory Variable	Chi Square Statistics	P-Value	Direction of Causality
1	DLN_RGDP	DLN_RTC, DLN_RTR	1.9726	0.3729	Both DLN_RGDP and DLN_RTR can cause DLN_RTC
2	DLN_RTC	DLN_RGDP, DLN_RTR	7.289836	0.0261	
3	DLN_RTR	DLN_RGDP, DLN_RTC	0.189212	0.9097	

Source: *Author's Calculation through E-Views 10.*

The table 5.7 shows the results of Vector Auto Regressive (VAR) tests for short-run causality has been performed. It is found that DLN_RTC and DLN_RTR jointly cannot cause DLNGDP. However, there exists short run causality that DLNGDP and DLNTR can cause DLNTC. Hence, the causality is unidirectional taking the level of significance to 5 percent.

Conclusion

Gross domestic product (GDP) of Nepalese economy has been steadily growing over the entire study period. But in case of real GDP, it in only decreased in the year 1979. In the year, real GDP is decreased because of series of protests amongst the student community in the country. The clashes that occurred had a significant historical impact, as they forced the monarchy to concede to holding a referendum on the possibility of a multi-party system in the country. On the other hand, it is increasing over the study period. Because, on the span of time there was development of lots of things such as; electricity, ability of new and advance technology in the international market, access of road, drinking water in rural areas etc. and improvement in the education, health conditions of the people, and also the improvement in the Human Development Index (HDI). There is also positive improvement in social indicators of development, which impact is the effect of increase in real GDP over the period of time. There is positive and statistically significant relationship between real government transportation capital expenditure and GDP while there is minimum significance of real transportation recurrent expenditures. Both the government capital expenditure and GDP having the increasing trend, RGDP is increasing in increasing rate and real government capital expenditure is also increasing with slower rate than RGDP.

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