An Empirical Study on the Determinants of Government Revenue in Nepal

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Abstract

This paper aims to examine the determinants of government revenue in Nepal. The macroeconomic variables, namely, GDP per capita, imports, consumer price index, exchange rate, and foreign aid from 1975 to 2021 have been included to assess their effect on government revenue. We have performed descriptive and econometric analyses. Government revenue increased by about 15 percent on average from 1976 to 2021 and the revenue-to-GDP ratio stood at around 22 percent in 2021. The empirical results reveal that GDP per capita and imports are the major determinants of government revenue in the short run. Likewise, GDP per capita, imports, and exchange rate are the major determinants of government revenue in the long-run. The error correction term suggests that the short-run disequilibrium in the system takes about 3 years to converge to equilibrium.

JEL Classification: C32, H70

Key Words: Government Revenue, ARDL

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We would like to thank Executive Director Dr. Prakash Kumar Shrestha, Deputy Director Mr. Siddha Raj Bhatta and Assistant Director Mr. Chop Kanta Subedi for their valuable suggestions.

I. INTRODUCTION

Government holds key responsibilities of assuring the availability of infrastructures, social amenities, peace, security, and stability without compromising macroeconomic balance and debt sustainability. Upholding the role of supporter, facilitator, and caretaker, it needs to invest in social overhead capital to support developmental goals and simultaneously finance the recurrent expenditure. The capacity of the government to spend on recurrent and capital expenditures depends upon the amount of revenue it generates.

Government revenue is a matter of concern for policymakers. Government revenue is more crucial in developing countries as they need a plethora of funds for developmental activities. Developing countries will need to rely substantially on domestic revenue mobilization as excessive reliance on foreign financing may in the long run lead to problems of debt sustainability (Gupta, 2007) and consequently lead to a never-ending cycle of a debt trap.

Revenue mobilization in Nepal has remained satisfactory so far. Government revenue to GDP ratio also increased from 14.6 percent in 2009/10 to 20.3 percent in 2019/20. However, government revenue is not enough to cover government expenditures. Government expenditure was Rs. 250.81 billion in 2009/10, which also increased fourfold and reached Rs. 1038.02 billion in 2019/20. The government expenditure to GDP ratio was 21.6 percent in 2009/10 and reached 27.9 percent in 2019/20 (NRB, 2021). The size of government revenue and expenditure expanded with the implementation of federalism.

The increasing budget deficit has raised serious concerns in Nepal. Historically, development activities are financed through foreign aid as government revenue is just sufficient to cover the recurrent expenditure. The inadequacy of government revenue even to cover recurrent expenditures pose a threat to macroeconomic stability. It is essential to tame the widening budget deficit by adopting measures to strengthen the revenue base. Different factors affect revenue collection in the economy, such as nominal GDP, imports, exchange rate, foreign aid etc. Several

studies, such as Ayenew (2016), Boukbech et al. (2018), NRB (2017) etc. consider GDP as a base of government revenue. However, imports may supplant GDP or exist as a primary source of government revenue in an economy heavily dependent on imports[3]. Thus, this paper aims to identify the major determinants of government revenue in Nepal using cointegration analysis.

There are few limitations of this study. First, despite the tax rate being a major determinant of government revenue, we excluded it as we are unable to get its historical series. Second, the study uses annual data which may provide less dynamic results.

II. LITERATURE REVIEW

Several international studies such as Ayenew (2016), Gupta (2007), Nezhad et al. (2016) etc. have carried out intensive studies on determinants of government revenue. Likewise, Boukbech et al. (2018), Neog and Gaur (2020), Saibu and Sinbo (2013) etc. explored tax revenue and its determinants. We reviewed Ayenew (2016), Boukbech et al. (2018), Gupta (2007), Neog and Gaur (2020), Nezhad et al. (2016), Piancastelli and Thirlwall (2020), and Saibu and Sinbo (2013).

Ayenew (2016) examines the model of the determinants of government revenue using country-specific data from Ethiopia. Similarly, Saibu and Sinbo (2013), and Neog and Gaur (2020) examine the model of the determinants of tax revenue using country-specific data from Nigeria, and India respectively. Likewise, Boukbech et al. (2018) conduct research on determinants of tax revenue using the data of 29 lower-income countries while Piancastelli and Thirlwall (2020) carry out similar work using the data of 59 developed and developing countries. Correspondingly, Gupta (2007) and Nezhad et al. (2016) examine the relevant determinants of government revenue using global-level data.

3 Share of import-based tax on total tax revenue of Nepal is 54.3 percent in 2021/22 (MoF, 2022b).

Ayenew (2016) finds that real GDP per capita income, foreign aid, and industrial value-added share of GDP positively affect the government revenue in the long run, while real GDP per capita income and inflation have a negative effect and industrial value-added share of GDP has a positive effect on tax revenue in the short run. Boukbech et al. (2018) also derive similar results. They find per capita GDP and share of value added to agriculture have a positive relationship with tax revenue.

Gupta (2007) also presents similar results. Structural factors such as per capita GDP, agriculture share in GDP, trade openness and foreign aid are significant and strong determinants of revenue performance. Similarly, other factors such as corruption, political stability, and share of direct and indirect taxes also significantly affect revenue performance. Neog and Gaur (2020) also found very similar results to Ayenew (2016), Boukbech et al. (2018), and Gupta (2007). Neog and Gaur (2020) find that tax revenues are positively related to development assistance, growth of the economy and trade openness whereas the inflation rate is found quite detrimental to revenue performance

Nezhad et al. (2016) assess the potential determinants of tax revenue and find that GDP growth rate, the share of agriculture over GDP, the official exchange rate, urbanization and democracy are the relevant variables. The results derived by Nezhad et al. (2016) aligns with Ayenew (2016), Boukbech et al. (2018), and Gupta (2007). Similarly, Piancastelli and Thirlwall (2020) identify that level of per capita income, the share of trade in GDP, the productive structure and the level of financial deepening are the major components of the taxable capacity of the country. Likewise, Saibu and Sinbo (2013) conclude that tax revenue tends to be significantly responsive to changes in income level, exchange rate and inflation rate.

Table 1 : Summary of Review of Literature

Literature	Variables	Findings
Ayenew (2016)	Real GDP per capita income, foreign aid, the industrial value-added share of GDP, inflation	Real GDP per capita income, foreign aid and industrial value-added share of GDP have a positive relationship with revenue in the long run
Boukbech et al. (2018)	Per capita GDP, the share of value added on agriculture, population growth, trade openness	Per capita GDP and share of value added to agriculture have a positive relationship with tax revenue while population growth has a negative relationship
Gupta (2007)	Per capita GDP, agriculture share in GDP, trade openness, foreign aid, corruption, political stability, the share of direct and indirect taxes	Per capita GDP, agriculture share in GDP, trade openness and foreign aid are the significant and strong determinants of revenue performance.
Neog and Gaur (2020)	Development assistance, growth of the economy, trade openness, and inflation	Development assistance, growth of the economy and trade openness positively affect tax revenue whereas the inflation rate has a negative relation to tax revenue
Nezhad et al. (2016)	GDP growth rate, the share of agriculture over GDP, official exchange rate, urbanization	GDP growth rate, the share of agriculture over GDP, official exchange rate, and urbanization are potential determinants of tax revenue
Piancastelli and Thirlwall (2020)	Per capita income, the share of trade in GDP, the productive structure and the level of financial deepening	The level of per capita income, the share of trade in GDP, the productive structure and the level of financial deepening are the major components of taxable capacity
Saibu and Sinbo (2013)	Real GDP, trade openness, exchange rate, inflation rate, and the ratio of external debt to GDP	Tax revenue tends to be significantly responsive to changes in income level, exchange rate and inflation rate.

Source: Review of literature

The review of the literature reveals the convergence in the choice of variables. Most of the literature have considered similar variables for their analysis and derived similar results despite variation in sample, time, and methodology. National studies, such as Dangal (2018), NRB (2017), Timsina (2007) etc., have studied tax elasticity and buoyancy in Nepal. However, studies on determinants of government revenue have not been carried out considering Nepal.

III. DATA AND METHODOLOGY

3.1 Data and variables

Gupta (2007) and Saibu and Sinbo (2013) have been followed for the choice of relevant variables. The study uses annual data on government revenue, imports, real GDP per capita, foreign aid, and exchange rate. These data are obtained from the Database of Nepalese Economy recently published by Nepal Rastra Bank.

Table 2 : Description of variables

SN	Notation	Variable	Unit	Expected Sign
1	Revenue	Government Revenue	Log transformation; values in million rupees	
2	Imports	Imports	Log transformation; values in million rupees	+
3	GDP_{PC}	Nominal GDP at basic price per capita	Log transformation; values in million rupees	+
5	Aid	Foreign Aid	Log transformation; values in million rupees	+/-
6	EXC	Exchange Rate	Log transformation; USD/NPR	-

Government revenue includes all revenue mobilized by the Government of Nepal in a fiscal year. It includes both tax and non-tax revenues. Imports and GDP are the revenue base for the Government of Nepal. Likewise, foreign aid and exchange rate are the control variables. The exchange rate has been used in the indirect quotation. Likewise, foreign aid includes both grants and loans received from the rest of the world. The consumer price index has been excluded as all the variables are in nominal terms.

3.2 Descriptive Analysis

Under descriptive analysis, we have carried out trend analysis and correlation analysis of major macroeconomic variables. Trend analysis presents the trend of major macroeconomic variables as a percent of GDP, a pattern of growth of those variables, the share of components of tax revenue, and components of tax revenue as a percent of GDP. Correlation analysis has been carried out considering log transformation as well as log difference.

3.3 Econometric Analysis

Time series data are trended and the existence of a common trend among the variables means that in the long run, the behaviour of the common trend will drive the behaviour of the variables (Bhatta et al., 2020). The regression analysis on time series has benefitted from the concept of cointegration (Bhatta et al., 2020). The study uses the ARDL approach to cointegration. Batteries of tests that check the robustness of the model have also been carried out.

Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration was developed by Pesaran and Shin (1999) and Pesaran et al. (2001). The ARDL approach to cointegration has become popular in recent years due to low power and other problems associated with other cointegration tests (Bhatta et al., 2020).

Following the ARDL approach proposed by Pesaran and Shin (1999), the existence of a long-run relationship has been tested using the equation.

$$\Delta Revenue_t = \alpha + \sum_{i=0}^{q} \beta_i \Delta Imports_{t-i} + \sum_{j=0}^{q} \beta_j \Delta GDPpc_{t-j} + \sum_{k=0}^{u} \beta_k \Delta EXC_{t-k} + \sum_{l=0}^{v} \beta_l \Delta Aid_{t-l} + \delta_1 Imports_{t-1} + \delta_2 GDPpc_{t-1} + \delta_3 EXC_{t-1} + \delta_4 Aid_{t-1} + u_t \quad .....(1)$$

Here, all variables are as previously defined. δ_1, δ_2, δ_3 and δ_4 are long-run coefficients while β_i, β_j, β_k and β_l are short-run dynamics and u_t is a stochastic term. The order of lags in ARDL is selected by either the Akaike information criterion (AIC) or Bayesian information criterion (BIC) (Narayan, 2004), however, Pesaran and Shin (1995) state that ARDL-BIC estimators perform slightly better compared to ARDL-AIC. So, the study uses the BIC criterion in lag selection.

IV. RESULTS AND DISCUSSION

Result and discussion section presents descriptive and econometric analyses. We present trend and correlational analysis under descriptive analysis. ARDL approach has been applied for econometric analyses.

4.1 Descriptive Analysis

Trend analysis and correlational analysis have been carried out. Trend analysis is important in time series analysis as it shows the pattern of movement of variables over the period. Time series data have an inherent trend component due to the presence of inertia (Bhatta et al., 2020). Also, the pattern of movement of macroeconomic variables provides an idea about the event that occurred in the specific period. Likewise, correlational analysis depicts the degree and direction of the relationship between variables, but they do not ensure the presence of a cause-and-effect relationship.

4.1.1 Growth of Selected Variables

The growth of selected variables considered for this study has been presented in Table 3. The average growth has been computed over the entire sample period as well as over specific years.

Table 3 : Average growth of selected variables

Variables	1976-2021	1976-1992	1993-2010[4]	2011-2021	1996-2006[5]
Revenue	14.9	15.3	14.3	15.1	9.8
Imports	14.7	16.9	13.7	12.9	9.1
GDP_{PC}	10.1	10.5	9.5	10.2	8.11
EXC	5.2	8.2	3.1	4.2	3.4
Foreign Aid	12.9	18.1	9.8	9.9	6.1

Source: Author's calculation

Government revenue grew by about 14.9 percent on average from 1976 to 2021. It grew by about 9.8 percent from 1996 to 2006. Imports grew by 14.7 percent on average from 1976 to 2021 almost same as goals of revenue. Likewise, GDP per capita increased by 10.1 percent on average from 1976 to 2021, while such an increase was 10.2 percent between 2011 and 2021. Similarly, the exchange

4 Dawn of economic liberalization in 1992

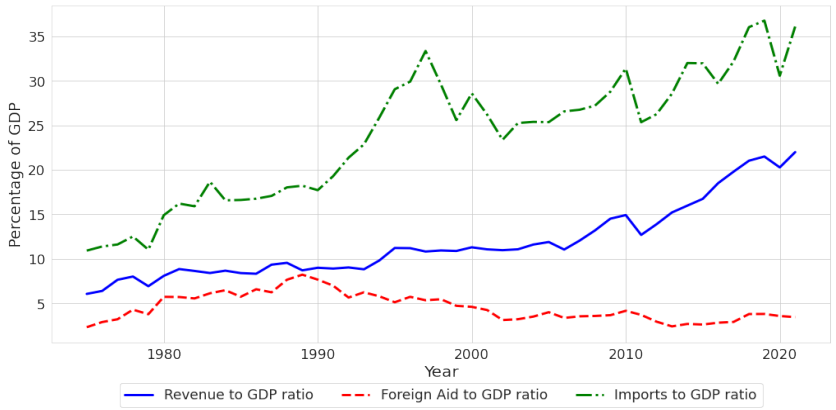
5 Moist insurgency and political turmoil

rate devaluated by about 5.2 percent per annum on average from 1976 to 2021. Foreign aid increased by 12.9 percent on average from 1976 to 2021.

4.1.2 Trend Analysis

Trend analysis of macroeconomic variables, namely, government revenue, exchange rate, foreign aid, imports, and real GDP per capita, have been carried out. The trend analysis of components of tax revenue, which is one of the major elements of government revenue, has also been sham.

Figure 1 : Trend of Revenue, Foreign Aid, and Imports as a percent of GDP

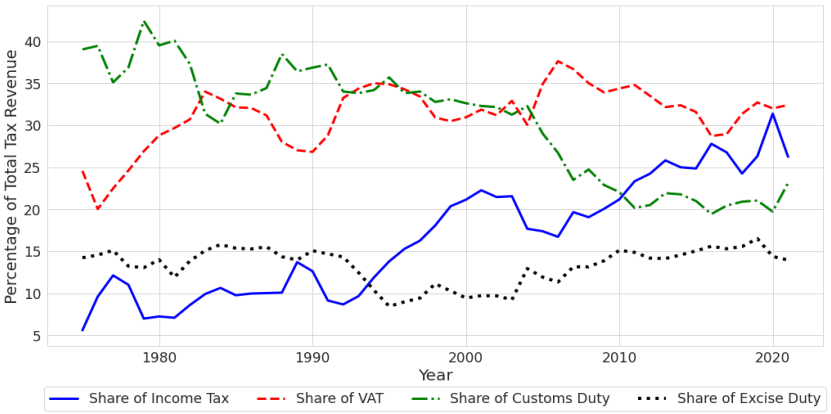


Source : Author's calculation

Figure 1 depicts the trend of revenue, foreign aid, and imports. Government Revenue reached to around 22 percent of GDP in 2021. Government Revenue to GDP ratio is gradually increasing over the period. Likewise, the imports to GDP ratio hovers around 36 percent; such ratio decreased in 2020 because of restrictions in movement to curb the contamination of coronavirus. Similarly, foreign aid as a percent of GDP has been declining in recent years.

Figure 2 depicts the share of income tax, VAT, share of customs duty, and excise duty in total tax revenue. The share of VAT is the highest while the share of excise duty is the lowest. The share of income tax has rising, while the share of customs duty has been falling.

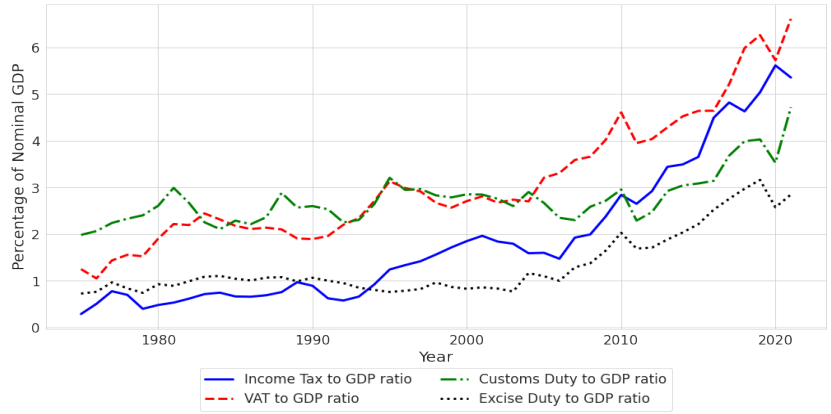
Figure 2 : Share of Income Tax, VAT, Customs Duty, and Excise Duty in Total Tax Revenue



Source : Author's calculation

Figure 3 presents income tax, VAT, customs duty, and excise duty as a percent of GDP. All components of tax revenues have increased over the sample period as a percent of GDP. VAT as a percent of GDP stood at around 6.5 percent, income tax to GDP ratio stood at around 5.2 percent of GDP. Likewise, customs duty and excise duty as a percent of GDP stood at around 5.8 percent and around 3 percent respectively.

Figure 3 : Income Tax, VAT, Customs Duty, and Excise Duty as percent of GDP



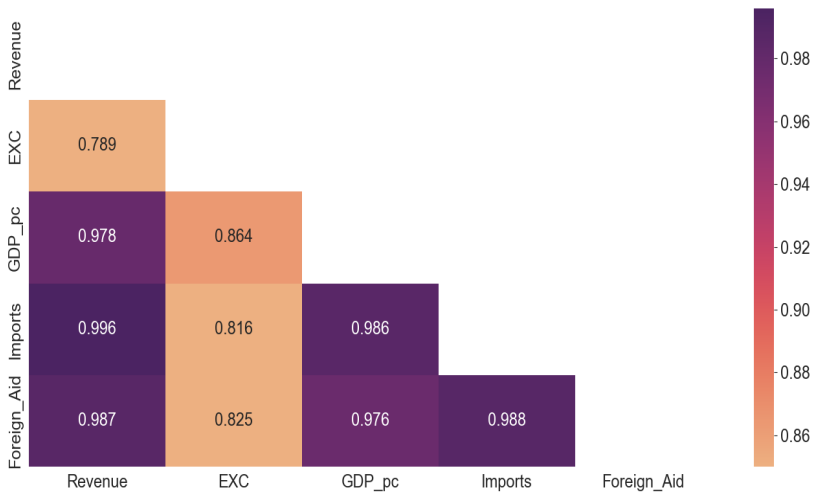
Source : Author's calculation

4.1.3 Correlation Analysis

Correlation analysis is one of the most used descriptive analyses that presents the degree and direction of a linear relationship between two variables. Correlation heatmap, instead of traditional tables, has been presented for better visualization of the results. Karl Pearson's correlation coefficient has been reported that ranges from -1 to 1.

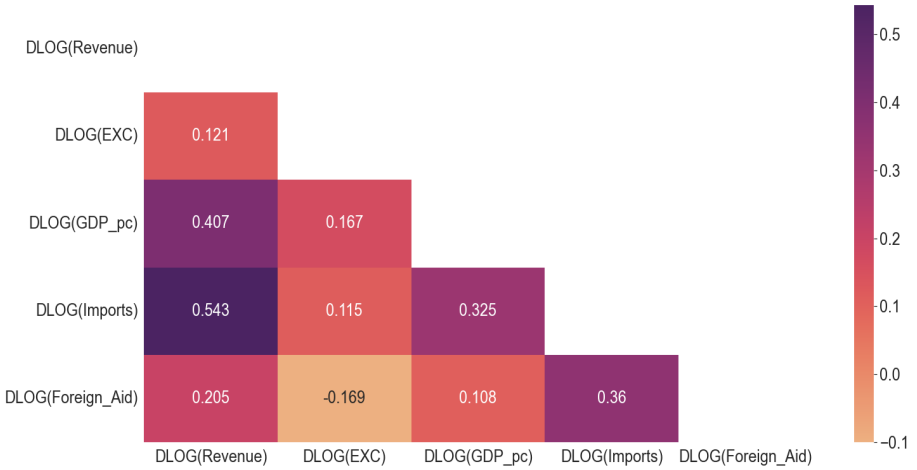
Figure 4 presents the correlation between selected variables in their log transformation. Revenue has a high correlation with all selected variables except the exchange rate. Revenue has a very high correlation with imports (0.996), which signifies that revenue increases with the rise in imports (Figure 4). Likewise, foreign aid has also a high correlation with revenue (0.987). Imports are the major source of government revenue. Similarly, GDP per capita has a strong correlation with revenue (0.978) (Figure 4). As GDP per capita increases, the spending capacity of economic agents increases, which eventually increases government revenue.

Figure 4 : Correlation between selected variables in their log transformation



Source : Author's calculation

Figure 5 : Correlation between selected variables in growth term



Source : Author's calculation

Figure 5 depicts the correlation between macroeconomic variables considering their growth. As expected, revenue growth has a positive correlation with growth in imports (0.543). Revenue growth has a weak positive correlation with a change in the exchange rate (0.121) and growth in foreign aid (0.205) compared to other variables. Growth in GDP per capita has a positive correlation with revenue growth (0.407) as expected.

4.2. Econometric Analysis[6]

Time series data are inherently trended, so most of the time series data are non-stationary. The regression model suffers from a spurious relationship in presence of non-stationary series (Gujarati, 2004). So, it is imperative to begin the analysis with a unit root test.

4.2.1. Unit Root Test

The formal test for stationary is the test of a unit root. Specifying parameters during the test is extremely important to draw correct inferences (Bhatta et al., 2020). Augmented Dickey-Fuller (ADF) test has been applied for the test of a

6 For more explanation of econometric analysis for time series, see Bhatta et al. (2020). Also, we have provided full EViews code and a link to EViews program file.

unit root. The data in levels[7] are trended and have intercept, so both intercept and trend components have been included. Likewise, the first difference of the data is detrended but has intercept, so only intercept has been included.

Table 4 : ADF Test

Variables	At Levels	At First Difference	Order of Integration
Revenue	-1.90	-5.86**	I (1)
Imports	-1.46	-6.27**	I (1)
GDP_{PC}	-1.88	-6.39**	I (1)
Aid	-2.63	-6.22**	I (1)
EXC	-0.62	-5.24**	I (1)

*Note: Dickey-Fuller Critical Value at 5 percent is -3.51. ** Significant at 5 percent.*
Source: Author's calculation using EViews 9.5

ADF test in Table 4 reveals that the calculated ADF t-statistics is greater than ADF critical values at 5 percent for all the variables in their first difference, while ADF t-statistics is less than ADF critical values at 5 percent for all the variables in their levels. So, it confirms that all the variables at levels and first difference are non-stationary and stationary respectively. Hence, the criteria for the ARDL approach to cointegration are met.

4.2.2. Cointegration Tests

The bounds test (F-version) confirms the existence of cointegration in ARDL regression. However, the result is preliminary due to the arbitrary choice of lag selection and relies more on the other stages of estimation, especially the coefficient of the error correction term (Bahmani-Oskooee & Rehman, 2005).

Table 5 : Bounds test (F-version)

Variables	F-statistics	Cointegration	Lag Optimal
F(Revenue | Imports, GDP_{PC}, CPI, EXC, Aid)	34.68***	Cointegration	1,0,1,0,0,0
	Critical Value	Lower Bound (I0)	Upper Bound (I1)
	1%	3.29	4.37
	5%	2.56	3.49
	10%	2.20	3.09

Source: Author's calculation using EViews 9

7 Levels means log levels because all the series are in log as discussed in Description of variables in Table 2

The bounds test in Table 5 is greater than the critical value of the upper bound at 1 percent confirming that the long-run relationship exists. The negative and significant coefficient of error correction term in Table 6 provides strong evidence of the presence of cointegration. The long-run estimates and error correction model have been derived in the latter sections.

4.2.3. Long-run regression and Error Correction Model

Long-run regression and error correction models have been derived following the ARDL approach. The error correction model provides the short-term estimates along with the error correction term.

Table 6 : Short-run and Long-run coefficients

Revenue	ARDL Results	
	Short-run	**Long-run**
Imports	0.33***	0.54***
	(0.08)	(0.19)
GDP_{PC}	0.35***	0.89***
	(0.11)	(0.20)
EXC	-0.15	-0.41***
	(0.13)	(0.08)
Aid	0.03	-0.03
	(0.06)	(0.03)
ECM_{t-1}	-0.37***	-
	(0.07)	
Constant	-	0.41
		(2.72)

Note: *HAC standard errors have been calculated; Standard errors in parenthesis*
****, **, *: Significant at 1 percent, 5 percent, and 10 percent respectively*

Table 6 presents short-run and long-run coefficients obtained from the ARDL model. The long-run estimates suggest that GDP per capita, imports and exchange rates are the major determinants of government revenue. Quantitatively, a 10 percent rise in GDP per capita increases government revenue by 8.9 percent. Similarly, a 10 percent rise in imports increases government revenue by 5.4 percent. Likewise, a 10 percent depreciation in the exchange rate decreases government revenue by 4.1 percent in the long-run. Similarly, the short-run

estimates reveal that GDP per capita and imports are the major determinants of government revenue. Quantitatively, a 10 percent rise in GDP per capita and imports increases government revenue by 3.3 percent and 3.5 percent respectively. Lastly, the error correction term is negative and significant at 1 percent with a coefficient of -0.37 confirming that the short-run disequilibrium converges at the speed of 37 percent per annum.

4.2.4 Diagnostic Tests

Diagnostic tests have been carried out to assess the robustness of the model. For the test of overall goodness of fit of model, R squared and F-test has been carried out. D-W test and Breusch – Godfrey Serial correlation LM test have been applied to test autocorrelation. White's heteroskedasticity test has been carried out to test if the errors are homoscedastic. Jarque-Bera test has been carried out to test normality. Lastly, functional form misspecification has been assessed with the Ramsey RESET test.

Table 7 : Diagnostic tests

The goodness of fit test	
R squared	0.99
F-test	12146.42***
Autocorrelation test	
D-W statistics	1.93
LM statistics F-statistics	3.08 ^{NS}
Normality test	
Jarque-Bera Stat	0.83 ^{NS}
Heteroskedasticity test	
White's Test (Chi-sq)	3.17^{NS}
Functional misspecification test	
Ramsey RESET test (F-statistics)	2.96^{NS}

Note: ****, **, *, NS: Significant at 1 percent, 5 percent, 10 percent and not significant at 10 percent respectively*

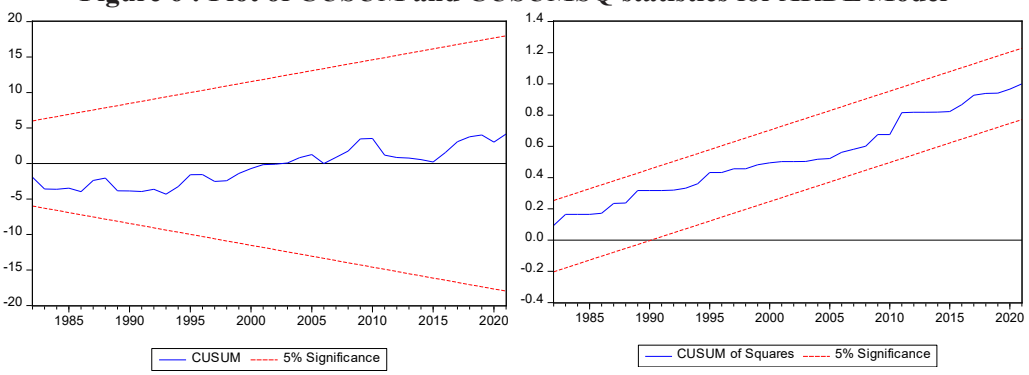
Source: Author's calculation using EViews 9.5

Table 7 presents the batteries of diagnostic tests. Time-series model has a high R square as series are cointegrated. F-test of overall significance indicates that the regression model provides a better fit to the data. The null hypothesis of the normality of residuals, the null hypothesis of no first-order serial correlation, the null hypothesis of no heteroscedasticity, and the hypothesis of no functional form misspecification are accepted as the p-value of their respective test is not significant at 5 percent for ARDL model.

4.2.5 Stability test

CUSUM and CUSUMSQ tests proposed by Brown et al. (1975) have been applied to test the stability of the model. The CUSUM test has higher power if the break is in the intercept of the regression equation whereas the CUSUMSQ test has higher power if the structural change involves a slope coefficient (Turner, 2020). If the CUSUM and CUSUMSQ statistics lie within the critical bounds of a 5 percent significance level, the null hypothesis that all coefficients in the error correction model are stable cannot be rejected.

Figure 6 : Plot of CUSUM and CUSUMSQ statistics for ARDL Model



Source: Author's calculation using EViews 9

Figure 6 presents the plot of CUSUM and CUSUMSQ statistics for the ARDL model. The results indicate the absence of instability of the coefficients during the period examined.

4.3 Discussion

Government revenue is positively affected by GDP per capita and imports but is negatively affected by the exchange rate. This result is similar to Ayenew (2016), Gupta (2007), and Nezhad et al. (2016). The rise in GDP per capita benefits all economic agents including the government. The rise in GDP per capita increases the spending capacity of economic agents that boosts consumption, which increases domestic production as well as imports. Similarly, imports are one of the principal sources of government revenue. Likewise, customs duty contributes about 23 percent to the total tax revenue of Government of Nepal (MoF, 2022b). Value-added Tax (VAT) is also levied on imports (DoC, 2021; MoF, 2022a). Thus, not only customs duty, but a large proportion of VAT and excise duty are collected through imports. Similarly, Thapa (2002) conclude that Marshall-Learner condition of currency depreciation hold for Nepal which justifies the negative coefficient of exchange rate in the long-run. Also, Dioda (2012), Nezhad et al. (2016), and Saibu and Sinbo (2013) also find a negative relationship between exchange rate and government revenue.

V. CONCLUSION

The analysis of determinants of government revenue in Nepal has found several fruitful insights with policy implications. The econometric analysis begins with the estimation of the ARDL model. The findings are plausible and justifiable from theoretical as well as economic perspectives. GDP per capita is the major determinant of government revenue followed by imports in the short run. Similarly, GDP per capita, imports and exchange rate are the major determinants of government revenue in the long run. The study provides few recommendations: (i) import-based revenue structure should be changed, (ii) increasing economic growth, which could be through increasing capital expenditure, can enhance revenue mobilization, (iii) enhancing export capacity can benefit from currency depreciation, which can substitute the import-based revenue loss at the time of currency depreciation against the US dollar.

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