BUOYANCY AND ELASTICITY OF VAT IN THE NEPALESE ECONOMY

[1]Binod sah, [2]Endang Lestari, [3]Eva Rianty Angelina Sitanggang*, [4]Sanju Kumar Singh
[1]Central Department of Management, Tribhuvan university, Kathmandu Nepal, [2]Sekolah Tinggi Illmu Ekonomi Harapan Duri, [3]Institut Bisnis dan Komputer Indonesia, [4]Postdoctoral Fellow Center for Data and Business Intelligence, Universitas Nahdlatul Ulama Surabaya, Indonesia.
[1]binod.cdm@gmail.com, [2]Endangdanendang123@gmail.com, [3]sitanggange779@gmail.com, [4]Singhsanju44@postdoc.unusa.ac.id

Abstract: *This study examines the buoyancy and elasticity of VAT in the Nepalese economy by shifting the conventional responsiveness framework toward an endogenous-growth perspective that evaluates how VAT mobilization relates to aggregate real GDP while controlling for exchange rate, remittance, market capitalization, money supply, and government spending. Using annual time-series data for fiscal years 2003/04–2022/23 compiled from Government of Nepal Economic Surveys, all variables were converted to constant prices using the GDP deflator (base year 2013/14), transformed into log-linear form, and assessed for stationarity and classical assumptions. The preferred model exhibited strong explanatory power (adjusted* $R^2 \approx 0.814$*), acceptable serial-correlation and heteroskedasticity properties, no structural break, and no multicollinearity (VIF < 10), supporting long- and short-run inference. VAT showed a positive and statistically meaningful association with real GDP: a 1% rise in VAT corresponded to a 0.427% increase in real GDP in the short run and 0.46% in the long run, indicating modest but sustained marginal productivity of VAT. Descriptive evidence further showed Nepal's heavy reliance on indirect taxes (average share 58.87% of total revenue) and a fluctuating VAT share; after VAT adoption (1997/98–2016/17) VAT rose only sixfold and averaged 27.58% of total revenue, only 0.93 percentage points higher than the replaced taxes pre-VAT, implying implementation gaps. Overall, results suggest VAT supports growth but exhibits low long-run buoyancy/elasticity, underscoring the need for targeted reforms to strengthen VAT administration, compliance, and revenue efficiency.*

Keywords*: Buoyancy, VAT administration, GDP, VAT*

INTRODUCTION

The Value Added Tax (VAT) is the solitary most significant development in the tax system during the last fifty years in terms of its influence on government revenue, its rate, its base, and its geographical coverage. As such, VAT has become a standard element of the fiscal system in advanced as well as emerging countries throughout the world (Luitel, 2005). Resistance and flexibility are two important measures that are frequently used to address these apprehensions. The elasticity coefficient refers to the tax system that is capable of producing determined revenue from variations only in economic environments, keeping the influential set-up, tax rates, and bases unbroken, while the tax buoyancy processes the revenue effect of both variations in economic circumstances and exogenous policy changes including secretarial and policy reforms. A rising VAT-to-GDP ratio will help condense both financial deficit and public debt level. The essential for higher VAT revenue deployment for emerging countries is substantial. The essential to spend a remarkable amount of public resources to meet high growth ambitions of people without compromising macroeconomic balance. When a country has flexibility and springiness of VAT greater than that of the union, it has a revenue evolution larger than the growth rate of nationwide income (GDP). Buoyant and elastic tax systems raise the VAT-to-GDP ratio, help keep the fiscal and debt situation amalgamated, and reduce foreign

dependence for development financing. The growth rate of national output raises revenue, but the degree to which it raises revenue is also determined by the level of VAT escaping and VAT elusion dominant in the country. The necessity of VAT exemptions also reduces VAT revenue collection.

This indicates that VAT is struggling to be a commanding method to promote economic growth (GDP) in the country. Wearing on transitional transactions, business tax hints at the loss of creation productivity. Therefore, in preparation, VAT is used to replace the business tax and the single-stage sales tax. However, some scholars trust that VAT, in uncomplicatedness and universality, has potential advantages compared with turnover tax, but the comparative advantage is not dramatically remarkable in economic efficiency in the thought of an ordinary person. In terms of VAT, the studies initially focused on assessing the impact of this tax on international trade (Feldstein and Krugman, 1989) or on identifying the determinants of tax revenue (Bogetic and Hassan, 1993). Later, attention was directed to studying the effectiveness of this type of tax (Bird and Gendron, 2006). More recently, the relationship between VAT revenue and total tax revenue has been studied, but in terms of the impact that the tax system can have on economic growth (Okoli and Afolayan, 2015). The problem was formulated exclusively in terms of economic impact and less in terms of fiscal sustainability. The European Commission (2015) tended to be more interested in enhancing the fiscal system. Issues such as exchange rate, remittance, market capitalization, money supply, and government spending disturb the value-added tax revenue collection. The theoretical logic behind this argument is that intensification in exchange rate, market capitalization, money supply, and reduction in government spending and remittance depress the purchasing power of the individuals in the nation. When purchasing power falls, it leads to a reduction in consumption, while VAT is a consumption-based tax, so it also declines.

LITERATURE REVIEW

Traditionally, tax buoyancy and elasticity have measured the responsiveness of tax revenue (dependent) to changes in GDP (independent). However, the model specified—where GDP is the dependent variable and VAT revenue is the independent variable, controlled by exchange rates, money supply, market capitalization, and government spending—shifts the analytical focus to an endogenous Growth Model. In this framework, the research objective is to determine how effectively VAT mobilization drives economic growth through fiscal channels, rather than merely measuring the tax system's automatic responsiveness to growth gear and events, which are available for assessing the resistance and Flexibility of VAT and its influence on the economy. VAT is of German and American paternity. Shortly after the First World War, the basic principles were developed in both nations (Adams, 1921; Siemens, 1921). In the 1950s, there was a revival of interest in VAT in Western Europe and America (Laure, 1952; Huiscamp, 1954; Schmblders, 1956; Shoup, 1955). Studenski (1940) constructed a general ethical philosophical foundation for the use of VAT and developed and related to VAT a "cost of services variant" of the benefit principle of taxation justice. In the same year, Senator O'Mahoney introduced the value-added concept in proposed federal legislation (O'Mahoney, 1940).

Recent studies emphasize that VAT is the single largest source of government revenue in Nepal and is a critical driver of macroeconomic stability. Impact on Aggregate GDP: Research by Sah (2023) titled "VAT

elasticity on Nepalese economy without agriculture" specifically examines the impact of VAT on aggregate GDP levels. The study establishes that VAT collection has significant elasticity with respect to economic output, suggesting that formal sector growth (captured by VAT) is a potent indicator of overall economic health. Growth vs. Accumulation Trade-off:** A study assessing tax revenue in Nepal found that while VAT revenue and GDP share a positive relationship, high VAT collection can have a negative effect on private capital accumulation growth. This suggests that while VAT funds the state, the consumption-tax burden may constrain private investment if not reinvested efficiently into productivity-enhancing infrastructure

In Nepal, VAT was implemented in 1997, two years after the VAT Act was approved by the assembly in 1995. It substituted the erstwhile sales tax, contract tax, service tax, and entertainment tax. Therefore, VAT is inclusive of all four taxes it replaced. After the implementation of VAT, it slightly changed the prices of goods and services. Under the VAT system, the tax is based on the principle that each producer or distributor adds value, in some way, to the materials they have purchased, and this added value is taxed at each stage of the production and distribution chain. In the VAT system, producers, distributors, and people providing services charge VAT for the products or the services sold or provided and the claim a refund of VAT on the goods or services purchased to make these sales. If the tax on sale is less than the tax on purchase, the person claims a refund for the difference. Thus, VAT has been perceived as a vital device for securing macroeconomic solidity and growth by placing domestic revenue mobilization comparatively by sounder base (Adhikari, 2003). To implement the VAT universal, the fiscal matters Department of the IMF has provided a considerable amount of mechanical support to various countries.

VAT is the vital content of the contemporary tax management system as it shortens the tax administration and expands tax compliance. However, VAT also has some possible difficulties and is not favorable to competence. When the transaction chain breaks, VAT leads to a loss of production efficiency (Desai-Hines, 2005). In addition, because the tax system is not perfect and the statutory tax rebate is too high, VAT does not help exports and trade; hence, it reduces exports and domestic output. Meanwhile, VAT has a negative impact on the informal sector of the economy (Piggott and Whalley, 2001; Emran and Stiglitz, 2005; Keen, 2008). Meanwhile, it is not clear whether the presentation of value-added tax is favorable to the development of competence.

Modern investigation emphases on examining the association between VAT revenues and economic growth, both using a regression model in which the instructive variables are the tax revenues of each type of tax, and GDP is the variable explained (Kalaš et al., 2018), or applying VAR models (Mutaşcu and Dănuleţiu, 2011) or by checking the Granger causality (Al-Abbadi and Abdel Khaliq, 2017). Similarly, Romer and Romer (2010) focused on the impact of fiscal policy changes on economic activity. Unrestricted VAR and structural VAR models were also applied to assess the macroeconomic effects of fiscal policy (Afonso and Sousa, 2011). In fact, this approach constitutes a return to the way of looking at taxation from an economic point of view. Economists' concerns were almost exclusively related to the influence of public spending on economic growth, rather than the influence of taxation, the main growth model

being analyzed comprehensively by Barro. & Sala-i-Martin, X.I. (1995). When tax revenues are considered, the meaning of the analysis is from taxation to economic activity (Leibfritz et al., 1997; Perotti, 2004).

METHODOLOGY

To observe the elasticity and buoyancy among value-added tax (VAT) and financial development proxied by GDP at the comprehensive level, the study employs descriptive and explanatory investigation plans in view of VAT as a self-determining variable and GDP as the needy variable at the aggregate level, in addition to remittance, exchange rate, market capitalization, money supply (M1 M2), and government spending as overriding variables. In so doing, it is theorized that there is significant positive impact of VAT on GDP. Likewise, it is also theorized that the overriding variables government spending and money supply have optimistic association, whereas exchange rate and market capitalization have undesirable. In the progression of using and testing the association between remittance and GDP with other overriding variables, error correction model (ECM) is employ. Numerous additional examinations such as unit root test, DF and ADF, autocorrelation, fractional correlation, correlogram, test, Durbin Watson, HDW, Jarque-bera normality test, serial correlation test, heteroscedasticity, Glejser test, specification test, test of Exogeneity, structural break test, Multicollinearity test Ramsey test and Chow-test have correspondingly been employed to validate the model. The measurable data employed in this study have been collected from the Economic survey published of Government of Nepal.

The data facts for these variables included in annual observation from fiscal year 2003/04 to fiscal year 2022/23. The values of all the variables are converted into real price by GDP deflator. Mainly, real GDP without agriculture, real remittance, real money supply, real market capitalization, and real exchange rate are calculated as nominal exchange rate (that is, NPR to USD) multiplied by the GDP deflator (i.e., base year 2013/14=100) over 20 years period. The simple linear model was converted into a log linear model. For the specification model of the cointegrated regression model with time-series data, the variables are employed in the model. of the variables were employed for the study period of 20 years from 2003/04 to 2022/23. Econometrically, the modeling of such behavior requires a stationary data process, which is absent in many economic variables (Wood, 1995).

Model specification

To measure a cointegrated regression model with time series data, the variables are laboring for the study period of 20 years from 2003/04 to 2022/23. Econometrically, modeling such behavior requires stationary data, which are preoccupied with economic variables (Wood, 1995). The stationary data process designates the constant mean and variance of each data series of the variables involved in the model. Lawful estimation is not possible when a set of stationary variables is cointegrated, and the set of views remains worthless. This means that the approximation based on non-stationary data series does not help to admit or discard

the estimation. The cointegrated regression shows the occurrence of a long-run balance association. Theoretically, one should be cautious in the custom of time-series data, whether stationary or non-stationary, for conditions of macro data such as GDP. Modeling economic performance requires attention. As GDP is significant for the economic planning of the country, this necessitates information on the status of the economy and its comportment.

The model used in this revision was the cointegration approach. Various fictions are available regarding this approach. The important contributions are made by Engle and Granger (1987, 1991) and Dickey et al. (1991), (Wood, 1995), and (Perman, 1989, 1991, 1993), who contended for the need of stationary data series to employ cointegration theory. As many economic variables do not possess the characteristics of stationarity, it is essential to keep in mind the type of data series used in the model. Lawful approximation and extrapolation are not imaginable when a set of non-stationary variables is cointegrated. After the approximation of three different equations to find suitable variables for the approximation, an Error Correction Model (ECM) is employed for VAT efficiency procedures with the use of lagged dependent variable also simplifies to obtain short and long-term consequence of value added tax (VAT). The first differences data is used for ECM. The cointegration of a set of variables delivers adequate pounded for stipulating a corresponding error correction or dynamic equation for these variables and is well-matched with long-run steadiness behavior.

Model specification: GDP as dependent, VAT revenue and other intervening variables

So as to scrutinize the influence of VAT revenue on national economic development provided by GDP as dependent variable, allowing for VAT as independent variable and exchange rate, remittance, market capitalization, money supply (M1, M2), and government spending, as intervening variables. The relationships between the variables are specified as below:

$$GDP_{ct} = f\ (VAT_{ct},\ Exr_{ct},\ R_{ct},\ MC_{tc},\ MS_{ct},\ GS_{ct})$$

The relationship and impact of VAT on GDP has specified as:

$$\ln GDP_{ct} = = \beta_0 + \beta_1 \ln VAT_{ct} + \beta_2 \ln EXR_{ct} + \beta_3 \ln R_{ct} + \beta_4 \ln MC_{ct} + \beta_5 \ln MS_{ct} + \beta_6 \ln GS_{ct} + \dots \dots + e_i \dots . (1$$

$$\ln GDP_{ct} = \beta_0 + \beta_1 \ln VAT_{ct} + \beta_2 \ln EXR_{ct} + \beta_3 \ln R_{ct} + \beta_4 \ln MC_{ct} + \beta_5 \ln MS_{ct} + \dots \dots + e_i \ .(2)$$

$$\ln GDP_{ct} = \beta_0 + \beta_1 \ln VAT_{ct} + \beta_2 \ln EXR_{ct} + \beta_3 \ln R_{ct} + \beta_4 \ln MC_{ct} + \beta_5 \ln GS_{ct} + \dots \dots \dots + e_i \ (3)$$

where:

lnGDP_ct = Characterizes Gross Domestic Products at constant price at time‘t’ in logarithm.

lnVAT_ci = Characterizes Value Added tax revenue in constant price at time‘t’ in logarithm.

lnEXR_ct = Characterizes Exchange Rate at constant price at time't' in logarithm.

lnR_ct = Characterizes Remittance at constant price at time't' in logarithm.

lnMC_ct = Characterizes Market capitalization at constant price at time't' in logarithm.

lnMS_ct = Money Supply at constant price at time't' in logarithm.

lnGS_ct = Government spending at constant price at time, 't' in logarithm.

$\mathbf{H_{01}}$: VAT has significant impact on GDP on aggregate level

Unit root test

A unit root test verifies whether a time-series variable is nonstationary using an autoregressive model. A well-known test that is valid in large samples is the augmented Dickey–Fuller (ADF) test. Optimal finite sample tests for a unit root in autoregressive models are developed. Dickey and Fuller (1979) developed a procedure to test whether a variable has a unit root or, equivalently, whether the variable follows a random walk. Hamilton (1994) described four different cases to which the augmented Dickey–Fuller test could be applied. In the process of checking whether the variables have a unit root. If the absolute test statistics are more than the critical value, then the null hypothesis that the series is non-stationary cannot be accepted. That is the guidelines. However, if the absolute test statistics are less than the critical value, the null hypothesis can be rejected and the alternative hypothesis will be accepted. A unit root test verifies whether a time series variable is non-stationary using an autoregressive model. A well-known test that is valid in large samples is the augmented Dickey–Fuller test

H_1: The variable log linear at constant price has stationarity or no unit root.

Table:1
Dickey fuller, Augmented Dickey fuller and unit root test

Variables	Test	Dickey-fuller	Augmented Dickey-fuller	p-value	Coefficient At lag	Unit root	
						t-stat ( )	p-value
$lnGDP_{ct}$	At level	-1.9662 (-3.029)	-3.0299 (-1.4044)	0.6671	-0.0471	1.238 (812.40)	0.000
	At first difference	-1.9628 (-4.125)	-3.0521 (-3.9937)	0.0081	-1.4106	1.6245 (309.399)	0.000
$lnVAT_{ct}$	At level	-1.9662 (0.3950)	-3.0299 (0.2921)	0.9712	0.0124	1.3581 (196.271)	0.000
	At first difference	-1.9614 (-4.6728)	-3.0403 (-4.8812)	0.0013	-1.1717	2.1093 (62.918)	0.000
$lnMC_{ct}$	At level	-1.9601 (-0.5294)	-3.0299 (-0.9999)	0.7312	0.0746	1.2805 (144.245)	0.000
	At first difference	-1.9644 (-3.7019)	-3.0655 (-3.6319)	0.0174	-1.3269	1.7718 (51.8051)	0.000
lnR_{ct}	At level	-1.9601 (-1.4005)	-3.0299 (-3.1243)	0.0417	-0.01874	1.2948 (159.197)	0.000
	At first difference	-1.9614 (-3.5551)	-3.0403 (-3.4501)	0.0226	-0.8662	1.8292 (56.0503)	0.000
$lnEXR_{ct}$	At level	-1.9601 (-0.5063)	-0.30299 (-0.4639)	0.8783	-0.0614	2.1073 (113.8986)	0.000
	At first difference	-1.9614 (-5.4741)	-3.0403 (-5.3507)	0.0005	-1.2857	-12.910 (-6.2871)	0.000
$lnMS_{ct}$	At level	-1.9601 (-1.5863)	-3.0299 (-1.7535)	0.3903	-0.2887	1.2420 (375.850)	0.000
	At first difference	-1.9614 (-6.8129)	-3.0403 (-6.6097)	0.000	-1.4639	1.6378 (142.2958)	0.000

It is obvious from the table that the variable $lnGDP_{ct}$ has the p-value that is 0.6671 > 0.05 so it cannot reject the null hypothesis, meaning that, the variable $lnGDP_{ct}$ at level has a unit root. The test statistics guidelines indicates that the test statistics is more than critical value at 5% it cannot reject the null hypothesis but the test statistics -0.4044 and critical value at 1% and 5% and 10% is less than test statistics. So, it cannot reject the null hypothesis, meaning that, the variables has a unit root the P-value >0.05. so it cannot reject the null hypothesis , meaning that the all the variables have a unit root at level. In addition, the coefficient at lag one is also negative i.e. -0.047117of all the variables. So the model is viable. After the first differences level of probability or the p-value that is 0.0081<0.05. so, the null hypothesis has rejected, meaning that the variables has no unit root or stationary after the first difference, including all the variables in the model.

Correlogram test various time lag the probability value or p-value < 0.05 indicates the null hypothesis cannot rejected, it means that the variables have auto correlation at level including variables $lnGDP_{ct}$, $lnVAT_{ct}$, lnRemit T_{ct}, $lnEXR_{ct}$, lnR_{ct}, $lnMC_{ct}$, and $lnMS_{ct}$. At the first difference level of the correlogram, an image of correlation statistics is ups and downs and highs and lows and ups and downs. This means there is no autocorrelation. Or p-value > 0.05 indicates the null hypothesis can be rejected. Meaning that the variables have no auto correlation at first difference level.

Table No. 2

Correlogram at first difference level of all the variables included in the model

Auto correlation	Partial correlation		AC	PAC	Q	Probability
. | . |	. | . |	1	-0.016	-0.016	0.0060	0.938
**| . |	**| . |	2	-0.369	-0.369	3.2006	0.202
.* | . |	. ***| . |	3	-0.093	-0.124	3.4165	0.332
. |**. |	. |* . |	4	0.283	0.162	5.5528	0.235
. |** . |	. |* . |	5	0.194	0.169	6.6298	0.250
.***| . |	. **| . |	6	-0.293	-0.169	9.2696	0.159
.**| . |	.***| . |	7	-0.324	-0.257	12.770	0.078
. |***. |	. |**. |	8	0.351	0.235	17.230	0.028
. |** |	. *| . |	9	0.151	-0.077	18.141	0.034
. **| . |	. |** . |	10	-0.094	0.087	18.530	0.047
.**| . |	. | . |	11	-0.214	-0.017	20.810	0.035
. |* . |	. *| .* |	12	-0.053	-0.163	20.972	0.051
. |* . |	. | . * |	13	0.198	-0.062	23.571	0.035
. *| *. * |	. *| . * |	14	-0.099	-0.175	24.351	0.042
. *| . |	. *| . |*	15	-0.188	0.023	27.860	0.022
. | * . |	.* | * . |	16	0.052	-0.010	28.215	0.030
. | .* |	. *| . |	17	0.017	-0.105	28.273	0.042
. | *. *|	. *| . |	18	-0.003	-0.109	28.276	0.058

Null hypothesis: the variables log linear at real price has auto

The table shows the occurrence of autocorrelation. This randomness is ascertained by calculating auto correlation for data values at varying time lag.

Table-3

Autocorrelation table

Variables	At level			At first difference		
	AC	Q-Statistic	Pro.	AC	Q-Statistic	Pro.
$lnGDP_{ct}$	0.845	16.521	0.000<0.05	-0.016	0.0060	0.938 > 0.05
$lnGDPWA_{ct}$	0.853	16.836	0.000<0.05	-0.138	0.4206	0.517 > 0.05
$lnGDPP_{ct}$	0.792	14.515	0.000<0.05	-0.029	0.0190	0.890 > 0.05
$lnGDPPWA_{ct}$	0.825	15.775	0.000<0.05	-0.521	6.0150	0.096 > 0.05
$lnGDPT_{ct}$	0.751	13.057	0.000<0.05	-0.199	0.8788	0.349 > 0.05
$lnGDPS_{ct}$	0.849	16.679	0.000<0.05	-0.135	0.4017	0.526 > 0.05
$lnVAT_{ct}$	0.853	16.852	0.000<0.05	-0.163	0.5870	0.444 > 0.05
$lnPVAT_{ct}$	0.853	16.833	0.000<0.05	-0.404	3.6114	0.057 > 0.05
$lnTVAT_{ct}$	0.852	16.527	0.000<0.05	-0.288	1.8443	0.174 > 0.05
$lnSVAT_{ct}$	0.814	15.346	0.000<0.05	0.050	0.0556	0.814 > 0.05
$lnMS_{ct}$	0.638	9.4398	0.000<0.05	-0.464	4.7701	0.090 > 0.05
$lnMC_{ct}$	0.811	15.245	0.000<0.05	0.211	0.9879	0.320 > 0.05
$lnGSP_{ct}$	0.842	16.414	0.000<0.05	-0.065	0.0945	0.759 > 0.05
lnR_{ct}	0.756	13.248	0.000<0.05	0.1289	0.3611	0.548 > 0.05
$lnEXR_{ct}$	0.748	12.954	0.000<0.05	-0283	1.7796	0.182 > 0.05

Year	Before VAT revenue Rs.	Total Revenue Rs.	Before VAT % of TR
1977/78	6689.36	33659.57	19.87
1981/82	10455.22	39992.54	26.14
1986/87	12569.64	53349.11	23.56
1991/92	17750.77	69295.90	25.62
1996/97	29130.93	104376.29	27.91
Avg.	15418.38	59491.26	**26.66%**

Year	After VAT revenue Rs.	Total Revenue Rs.	After VAT % of TR
1997/98	27255.34	105132.14	25.92
2001/02	33942.84	133489.11	25.43
2006/07	54961.24	184734.83	29.75
2011/12	88963.25	306502.07	29.02
2016/17	146665.37	536722.47	27.32
Avg.	**68108.30**	**245358.75**	**27.58%**

Average differences between after VAT and before VAT= 27.58-26.66 i.e. 0.93%

Table -3 demonstrates the p-value > 0.05 indicating the rejection of null hypothesis Table-3 shows the p-value > 0.05 indicating the rejection null hypothesis implying that the variables has auto correlation at level. After the first difference implying that there is no auto correlation.

RESULT AND DISCUSSION

A Short overview of revenue mobilization in Nepal

In the total tax revenue collection, the portion of direct tax is comparatively less than the indirect tax. Total tax revenue collection represents the tax revenue collected from direct tax, indirect tax and non-tax revenue. Indirect tax includes excise duties, custom duties and VAT collection. The size of total revenue from direct tax, indirect tax including excise duty customs duty and VAT over 20 years from 1997/98 to 2016/17 in the interval of 5 years as given in the Table: 4.1_a and 4.1_b respectively.

Table **4. 1_a**

Share of Various tax revenue in total revenue

Years	Direct Tax%	Indirect tax%	Non- tax %
1997/98	18.79	59.97	21.25
2001/02	19.90	58.07	22.03
2006/07	21.64	59.45	18.91
2011/12	27.37	59.26	13.36
2016/17	31.32	58.55	10.13
2021/22	32.19	56.45	11.36
Average	**23.25%**	**58.87%**	**17.86%**

Table **4. 1_b**

Share of indirect tax revenue in total tax revenue

Years	Custom duty %	Excise duty %	VAT %
1997/98	25.81	6.33	25.92
2001/02	25.09	7.55	25.43
2006/07	19.05	10.65	29.75
2011/12	17.76	12.28	29.02
2016/17	18.359	12.88	27.32
2021/22	18.214	13.34	25.90
Average	**21.17%**	**10.11%**	**27.37%**

Source: Economic survey and Budget speeches of various years (Annex: 1)

Table 4.1_a shows the percentage of different sources of revenue on total revenue collected by the government during the period of 25 years, 1997/98 and 2021/22, at intervals of 5 years. The percentage average revenue from different sources such as direct tax, indirect tax and nontax revenue has been 23.25%, 58.87% and 17.86% respectively over the study period. Similarly, Table 4.1_b reveals the percentage of customs duty, excise duty, and VAT on total indirect tax during 1997/98 to 2021/22 at intervals of five years over period. Over the years, revenue from customs duty recorded a decreasing trend, while excise duty registered a steadily increasing trend. On the contrary, VAT remained fluctuating around the average over the period. Despite a higher average share of indirect tax in the total revenue around 58.87% throughout the

study period. Increasing contribution of indirect tax indicates the effects of modernization of tax system in the Nepalese economy over the period. However, fluctuating trend of VAT around the average indicates that there is a need for the effective implementation of VAT.

VAT revenue before and after VAT policy enforcement

VAT replaced sales tax, contract tax, hotel tax and entertainment tax since 17 November 1997(1Marga 2054). The VAT revenue in relation to total revenue before application and after the introduction of VAT has been analyzed. The size of VAT revenue before the VAT application from 1977/78 to 1996/97 in the interval of every five years, and after the VAT application from 1997/98 to 2016/17 in the same interval has been presented in Table 4.2_a and Table 4.2_b respectively.

Table 5_a

Before VAT policy VAT revenue (Rs. million real price)

Year	Before VAT revenue Rs.	Total Revenue Rs.	Before VAT % of TR
1977/78	6689.36	33659.57	19.87
1981/82	10455.22	39992.54	26.14
1986/87	12569.64	53349.11	23.56
1991/92	17750.77	69295.90	25.62
1996/97	29130.93	104376.29	27.91
Avg.	15418.38	59491.26	**26.66%**

Table 5_b

After VAT policy VAT revenue (Rs. millic real price)

Year	After VAT revenue Rs.	Total Revenue Rs.	After VAT % of TR
1997/98	27255.34	105132.14	25.92
2001/02	33942.84	133489.11	25.43
2006/07	54961.24	184734.83	29.75
2011/12	88963.25	306502.07	29.02
2016/17	146665.37	536722.47	27.32
Avg.	**68108.30**	**245358.75**	**27.58%**

Average differences between after VAT and before VAT= 27.58-26.66, that is, 0.93%

Source: IRD annual report and Economic survey of various years (Annex-2)

Tables 4.2a and 4.2b show the size of VAT revenue before the introduction of VAT in 1977/78 at real price was NPRs 33659.57 million, which was 19.87% of total tax revenue, while that increased to NPRs. 104376.29 million in 1996/97 showing 27.91% of total revenue. Thus it increased by 26.96 times over the period of 20 years before introduction of VAT. However, after the introduction of VAT, VAT revenue was collected NPRs. 105132.14 at real price (25.92% of total revenue) in 1997/98 and NPRs. 536722.47million at real price (27.32% of total revenue) in 2016/17. During the period of 20 years of VAT application VAT increased only 6 fold.

The average percentage of VAT equivalent was 26.66% of total revenue, whereas the average percentage of VAT has been 27.58% of total revenue. Thus, the difference of average percentage before and after the implementation of VAT is only 0.93%, implying that the contribution of VAT seems lower than what the government expected at the time of introducing VAT in the country. Figure 4.2 portrays the comparative trend of replaced tax revenue before and VAT revenue after the implementation of VAT.

Figure: 1

VAT revenue percentage before and after VAT policy enforcement of total revenue

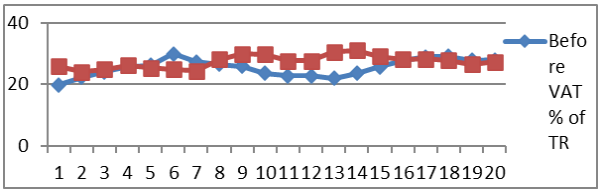

Figure 1 shows VAT registered growth in total revenue; however, the comparative proportionate contribution of replaced tax and VAT on total revenue registered a fluctuating trend during the study period. The percentage of replaced tax on total revenue was lowest, i.e. 19.87% in 1977/78 and highest 27.91 in 1996/97, averaging out at 26.66%. Similarly, the percentage of VAT on total revenue was lowest, i.e., 25.43% in 2001/02 and highest, i.e. 29.75% in 2006/07, making an average of 27.58%. The percentage of average difference between replaced tax and VAT is only 0.93%., which implies less average contribution VAT than the government's expectations.

GDP as dependent variable

The logical relationship as specified in the research framework hypothesizes that the national economy (GDP) is positively affected by VAT revenue, remittance and money supply, while there is a negative effect of market capitalization and government spending but a mixed effect of exchange rate on national economy (GDP). In order to examine the effect of each of these independent variables on economic development, a multiple regression has been used. For the purpose of examining the

factors affecting the national economy (GDP), the empirical models have been specified with/ without government spending and money supply. As given in equations 1, .2, and 3

$$\ln GDP_{ct} = \beta_0 + \beta_1 \ln VAT_{ct} + \beta_2 \ln EXR_{ct} + \beta_3 \ln R_{ct} + \beta_4 \ln MC_{ct} + \beta_5 \ln MS_{ct} + \beta_6 \ln GS_{ct} + \ldots + e_i \quad (1)$$

$$\ln GDP_{ct} = \beta_0 + \beta_1 \ln VAT_{ct} + \beta_2 \ln EXR_{ct} + \beta_3 \ln R_{ct} + \beta_4 \ln MC_{ct} + \beta_5 \ln MS_{ct} + \ldots + e_i \quad (2)$$

$$\ln GDP_{ct} = \beta_0 + \beta_1 \ln VAT_{ct} + \beta_2 \ln EXR_{ct} + \beta_3 \ln R_{ct} + \beta_4 \ln MC_{ct} + \beta_5 \ln GSP_{ct} + \ldots + e_i \quad (3)$$

The results of regression equations 1, 2 and 3 specified for economic development as dependent variable in aggregate level and the VAT revenue as independent variable.

Table 6. Regression result of VAT and other intervening variables on GDP

Parameters/variables	Equation: 1	Equation:.2	Equation: 3
Constant (β_0)	3.5160*	.475088*	3.3292*
	[0.278532]	[0.093710]	[0.268329]
	{12.6234	{37.08334}	{12.40746}
VAT revenue (β_1)	0.42267*	0.405056*	0.315055 *
	[0.118697]	[0.035651]	[0.035651]
	{3.594918}	{11.20273}	{3.076335}
Exchange rate (β_2)	−0.15566*	−155664**	−0.16882**
	[0.055805]	[0.0538214]	[0.058717]
	{−2.7194}	{−2.89223}	{−2.50154}
Remittance (β_3)	0.08633**	0.087151*	0.094320*
	[0.016248]	[0.0014837]	[0.016394]
	{5.313224}	{5.874045}	{5.747861}
Market Capitalization (β_4)	−0.03067	−0.030798***	−0.020801
	[0.017793]	[0.017146]	[0.017683]
	{-1.72423}	{−1.796172}	{−1.17628}
Money Supply (β_5)	−0.0479*	0.04514***	
	[0.029486]	[0.022432]	
	{1.627576}	{2.012641}	
Government Spending (β_6)	−0.02645	----	0.142290
	[0.140643]	----	[0.168659]
	{-0.156874}	----	{1.011708}
Adjusted R^2	0.992	0.993400	0.9920
Durbin –Watson	2.417	2.363	2.033
F-statistics	783.2866	572.9784	476.42141
Jarque-Bera statistic	4.6726	4.418	3.556
Breusch-Godfrey LM Observed χ^2:	1.521	4.997	4.917
Breusch- pagon observed: χ^2:	5.134	9.633	8.641
Glejser test Observed: χ^2:	5.485	5.210	3.806
RAMSEY TEST: F – statistics $_{(1,12)}$:	3.1123	2.4320	3.2121
ARCH Observed: R^2:	0.036	0.041	0.711
Chow test F – statistics $_{(7,6)}$:	9.681673	881.4447	214.1074

Figures in parentheses [], {} indicates standard error and t-statistics of the concerned variables and p-value

The result of the regression equation 1, 2 1nd 3 specified. The regression results of all the three different equations provide equation 2 as an appropriate model. It is because the sign of the coefficient of all the variables are as per the expectations.

It is apparent from Table 6 that application of the JB statistic is about 4.6726, 4.4182 and 3.556. The null hypothesis that there is no normality in the model has been rejected. Durbin Watson d statistics of the model is 2.417, 2.363 and 2.033 using VAT and 5 intervening variables with 20 observations. The guideline of the theory is that d-statistics has to remain between d_u and $(4-d_u)$ to confirm the no autocorrelation in the model. The econometric theory points out that the d-statistics has to lie between (d_u) and $(4-d_u)$ to confirm autocorrelation in the model. From the result, it shows that d-statistics 2.417, 2.3636 and 2.0338 lie between upper bound (d_u) and $(4-d_u)$ [i.e. $d_U < d < d_U$]. Thus, it confirms the absence of auto correlation in the entire model. But the value of DW d statistics lies in an indecisive area. $\chi 2$ is 4.997 and the p-value is 0.416 > 0.05. Therefore, it cannot reject null hypothesis or accept null hypothesis, implying that there is no serial correlation in the model. The observed $\chi 2$ is 9.633 and p-value i.e. 0.0.08 >0.05. So it cannot reject the null hypothesis, which means that there is no heteroskedasticity in the residuals of this model.

Glejser test: $\chi 2$ is 5.2107 and p-value i.e. 0.3907 > 0.05. Therefore, it cannot reject the null hypothesis indicating that there is no heteroscedasticity in the residuals of this model. The $F_{(1,12)}$: 2.7553 and p-value i.e. 0.00066<0.05. Therefore, it rejects the null hypothesis which indicates that the predicted value or value of a dependent variable is stable over the study period and for the prediction period. Test of Exogeneity: The test evaluates the consistency of an estimator when compared to an alternative, less efficient estimator which is already known to

be consistent. It helps one evaluate if a statistical model corresponds to the data. Hausman's formal results apply not only linear models, but also maximum likelihood methods. However, test statistics is not possible due to small sample size of no. of observations i.e. 20 years of VAT implementation in Nepal. **Structural break test: Null hypothesis: There is no structural break in the time series data. Since $F_{(7, 6)}$:** 881.447 and p-value i.e. 0.0006<0.05, null hypothesis cannot be rejected, indicating that there is no structural break on time series data used for the model of the study period.

Multicollinearity test:

Variables	VIF (1)	VIF (2)	VIF (3)
VATLOGC	150.399	15.299	100.165
EXRLOGC	2.611	2.6110	2.586
RLOGC	8.355	7.488	7.610
MCLOGC	10.231	14.412	12.758
LOGC	14.438	6.346	-----
LNGSPDC	161.664	-----	100.571

From the above three equations 1, 2 and 3, the second equation 2 is being employed for the error correction model. The time series data in the model involves at first difference. The residual of equation 2 is taken as an independent variable as shown in equation 4 as ($ECM_{(t-1)}$) in Table 7.

Error correction model (ECM)

Through the documentation of cointegration of a set of variables, the dynamics of economic development proxied by GDP was reconnoitered. The inclusion of a large number of lag lengths reduces the degree of freedom. However, because of the small sample size (need to preserve the degree of freedom) the first model includes only one lag on the dependent and independent variable. Where Δ is the first difference operator, ECM_{t-1} is the lagged error correction term from equation 2 of Table 6.

$$\Delta(\ln GDP_{ct}) = \beta_0 + \beta_1 \Delta\ln VAT_{ct} + \beta_2 \Delta\ln EXR_{ct} + \beta_3 \Delta\ln R_{ct} + \beta_4 \Delta\ln MC_{ct} + \beta_5 \Delta\ln MS_{ct} + \beta_6 \Delta\ln ECM_{t-1} + \beta_7 \Delta\ln GDP\beta_{t-1} \quad \text{- - - (5.6.4)}$$

Where, Δ is the first modification operator, ECM_{t-1} is the lagged error improvement term from equation 2 of Table.6.

Table 7
Cointegrated Regression Results

$$\Delta(\ln GDP_{ct}) = \beta_0 + \beta_1 \Delta\ln VAT_{ct} + \beta_2 \Delta\ln EXR_{ct} + \beta_3 \Delta\ln R_{ct} + \beta_4 \Delta\ln MC_{ct} + \beta_5 \Delta\ln MS_{ct} + \beta_6 \Delta\ln ECM_{t-1} + \beta_7 \Delta\ln GDP\beta_{t-1}$$

$$-3.6926 + 0.4270^{*}\ \Delta\ln VAT_{ct} - 0.0409\Delta\ln EXR_{ct} + 0.0706^{***}\ \Delta\ln R_{ct} - 0.03^{***}\Delta\ln MC_{ct}$$

[0.00523] [0.07887] [0.08473] [0.03590] [0.026132]
{-0.0052} {5.4143} {-0.4827} {1.96906} {-1.372}

$$+\ 0.033^{***}\ln\Delta MSi + 1.037\ln\Delta ECM_{t-1} - 0.027\ln\Delta GDP\beta_{t-1}$$

[0.015898] [0.503341] [0.196456]
{2.083} {1.845} {0.138900}

$F-_{(7,10)}$: $(6.270475)^{*}$ Adjusted R^2 : 0.8144
DW : 2.070645

Jarque-Bera	: 13.2955
Breusch-Godfrey LM. χ^2 :	: 2.1875
Breusch- pagon χ^2	: 2.1875
Glejser test χ^2	: 3.4518
RAMSEY TEST $F_{(2,7)}$	: 4.4826
ARCH R^2	: 0.4549
Chowtest $F_{(7,6)}$	: 4.43201

Multicollinearity test:

Variables	VIF
VATLOGC_1	1.30
EXRLOGC_1	1.53
RLOGC_1	3.84
MCLOGC_1	2.83
MSLOGC_1	1.54
RES_1	3.02
GDPLOGC_2	2.03

The results of the first difference lagged GDP facilitate the long-run and short-run influence of the variables included in the model by satisfying R2 and F-statistics are satisfactory.

Table 7 satisfies the necessary conditions, demonstrating the presence of a sound model of GDP and VAT relationship and the prediction of VAT productivity. The first difference of intervening variables exchange rate, market capitalization, remittance, money supply and error term keeping constant, there is a positive significant impact of VAT in the economic development of Nepal.The R^2 shows that the explanatory power of the model is 0.81 indicating that 81% of the variation of GDP is explained to the extent of 81 percent variation of the independent variable included in the model. The diagnostic test suggests that the residuals do not violate classical assumptions. The lagged residuals from 52 equation of Table 7 ECM_(t-1)are statistically significant indicating the acceptable ground to take variable as cointegrated set. The result allows long run and short run dynamics of all the relationship between GDP and VAT. The

estimated coefficient of VAT in error correction model shows that one percent point rise in VAT has led to 0.427 percent point increase in real GDP in short run, whereas it is found 0.46 percent point in the long-run. It means that the short-run marginal productivity of VAT is 0.427 percent point, whereas its long run percent point is 0.46.

Durbin Watson d-statistics 2.0706 lies between upper bound(d_u) and (4-d_u) [i.e. d_U< d < d_U], which confirms the absence of autocorrelation in the error correction model. The JB statistic is about 13.2955 and the probability of obtaining such a statistic under the normality assumption is about 0.001 and significant at 1% level. **Serial correlation test:** $\chi 2$ is 2.1857 and the p-value is 0.8422 > 0.05. So, it cannot reject the null hypothesis indicating that there is no serial correlation in the model. The observed $\chi 2$ is 2.1875 and probability i.e. 0.9487 >0.05. So it cannot reject the null hypothesis implying that there is no heteroskedasticity in the residuals of this model. **Glejser test:** $\chi 2$ is 3.4518 and p-value i.e. 0.8403 > 0.05. So it cannot reject the null hypothesis, which means that there is no heteroscedasticity in the residuals of this error correction model.

Specification test: The $F_{(1,12)}$: 4.4826 and p-value i.e. 0.02304<0.05. So the null hypothesis has been rejected implying that the predicted value or value of the dependent variable is stable over the study period and for the prediction period. .

Structural break test: Null hypothesis: There is no structural break in the time series data. $F_{(7,6)}$: 4.4320 and p-value i.e. 0.352>0.05. So it cannot reject the null hypothesis, which indicates that there is no structural break.

Multicollinearity test: Null hypothesis: explanatory variables are not correlated. By observing the equation 5.6.4, the error correction model in Table 5.7. The VIF of the model or the VIF <10. So, it cannot reject the null hypothesis, meaning that explanatory variables are not correlated or the error correction model has no multicollinearity problem. Again, this variance inflation factor indicates that the variance of the weight coefficient is not inflated by a factor.

CONCLUSION

Therefore, the association between VAT and National economy GDP has positive connections in the long and short run. The projected factor of VAT in the error correction model displays that one percent point increase in VAT has led to 0.427 percent point upsurge in real GDP in the short run, while it is found to be 0.46 percent point in the long-run. It states that the short-run bordering productivity of VAT is 0.427 percent point, while its long run percent point is 0.46. Hence, OLS estimates of the bounciness and resilience coefficients for the sample are simulated. All issues for collaboration terms are as per anticipation though marginal, and statistically momentous, inferring a regular enhancement in VAT supervision. Additionally, it found approximations to be prejudiced if the DGP is not habituated by income tax freedom. Experiential consequences display that long-run resilience and bounciness factors for VAT are the bottommost, representing the areas of reform to be focused in VAT revenue supervision.

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