Macroeconomic Impact of Value Added Tax in Nepal: A 2SLS and 3SLS Approach

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Abstract

The study's aim to evaluate the impact of VAT on macroeconomic variables (TCON, GDP, Import (M) and GOVEXP) and the reverse effects of Macro variables on VAT. This study included macroeconomic development variables such as GDP, GDP (-1), VAT, remittance (REM), total consumption (TCON), export (X), import (M), gross fixed capital formation (GFCF), bank rate (BRATE), trade openness (TOPEN), government expenditure (GOVEXP) and one period lagged government expenditure (GOVEXP (-1)). However, this study has been enhanced over previous analyses by incorporating 45 years of nominal data from 1974/1975 to 2018/19. It examines the connection between VAT and significant macroeconomic variables such as GDP, GDP (-1), REM TCON, X, M, GFCF, BRATE, TOPEN, GOVEXP and GOVEXP (-1). To address the challenges of simultaneous equation bias and inconsistent findings, this study utilized the two-stage least squares (2SLS) and three-stage least squares (3SLS) methodologies to assess the impact of VAT on macroeconomic variables.The findings of the study are that value-added tax (VAT) negatively impacts TCON. VAT positively and significantly impacts on GDP, import(M), and GOVEXP. The study revealed that while TOPEN negatively affected Nepal's GDP, GOVEXP, GFCF, and X had a significant and positive influence on GDP.

Keywords: Value added tax, total consumption, economic growth, government expenditure, simultaneous equation

Introduction

The Egyptians put general sales taxes on major markets, but Caligula got rid of the general sales tax in 1940 when the Roman Republic started (Poirson, 2006). At the start of the 20th century, excise and tariff taxes were phased out as governments switched to more sensible and all-encompassing sales and income taxes.

Thomas S. Adams proposed modern Value Added Tax (VAT) in America in 1918, However, VAT was implemented in France in 1954. After the inception of VAT in France, it has expanded across countries on all continents. Before the 1960s, very few nations adopted VAT, but in the 1980s, VAT became a popular fiscal weapon for most industrialized countries. Thirty nations have implemented VAT since the 1980s, and sixty countries have introduced VAT in their countries. Some nations, Tanzania, Benin, Tobago, Thailand, and Paraguay, imposed VAT in the last two years. VAT was a great fiscal event in the twenty-first century (Adam, 1982).

Many countries have followed VAT since its execution in France in 1954. Many believe the VAT improves tax equity and consistency and encourages output and industrialization. Comparing industrialized and emerging nations' VAT is significant. Financial Times being published in London, reviewed the last 100 years, said that economic and technological changes in the century had made VAT the typical tax today (Bird, 2005). VAT has been a significant and flexible revenue stream for the past 50 years. In tax history, this has never happened. Canada,Argentina,India and Brazil have needed support implementing VAT. There have been attempts to implement VAT in the US. Despite these issues, VAT is a good concept for utmost countries, especially evolving ones. VAT is a central government tax that generates the maximum revenue (Tait, 1988).

Historical Development of VAT in Nepal Before the idea of a "value-added tax" was introduced; indirect taxes were the only type of taxation used in Nepal. Land revenue, customs charges, and excise duties were the primary sources of income tax apart from indirect taxes. The eight plans (1992-1997) included the introduction of the VAT concept. Sales tax and excise agencies organised a VAT task force in preparation for VAT implementation after the government announced plans to convert the import/manufacturing level sales tax to VAT. A VAT steering group was also established to examine and keep an eye on how teams were getting ready after a comprehensive look at various issues that impact the structure and operation of VAT implementation. Until 1997, Nepal did not have VAT. Nepal to start the debate on VAT in the Eight Five-Year Plans (1992–1997). In April 1997, the government finally said that VAT had to start. For VAT, the Finance Acts of 1992 and 1994 put two sales tax stages in place. In 1993, a task force was also set up to write the VAT law. In 1995, a group at very high levels in the tax system review process said VAT should be added (Dahal, 1995).

After years of political and economic discussion in Nepal, the introduction of

VAT has been one of the most awaited changes (Dahal, 2009). When judging the overall success of VAT in Nepal and how it affects the economy, it is essential to look at how much revenue it brings in. The various industrialized sectors and service sectors must be revised.

VAT has developed into a significant basis of revenue for Nepal. The Nepalese government intends to rise the proportion of VAT taxed on goods and services due to their importance to the financial base of a country. As such, it is necessary to research to regulate the influence of VAT on the nation's economic progress. The effect of VAT on economic growth and macroeconomic factors should be empirically examined. VAT is a substantialfoundation of income for the government, and crucial fiscal policy tools play a critical role in stimulating the wealth generation and attaining a high economic growth rate (khan &Shadab, 2013). A significant resource constraint and reliance on foreign revenue challenges Nepal. Nepal's economy has been suffering from chronic stagnation. Tax reform and VAT implementation are significant fiscal events (Dangal, 2018).

This study explores the impact of Value Added Tax (VAT) on economic growth and its influence on Nepal's macroeconomic variables. It utilizes annual time series data spanning from 1974/75 to 2018/19, employing both descriptive and inferential data analysis methods. The primary economic indicators analyzed in this study include Gross Domestic Product (GDP), One Period Lagged GDP (GDP(-1)), VAT, Remittances (REM), Total Consumption (TCON), Export (X), Import (M), Gross Fixed Capital Formation (GFCF), Bank Rate (BRATE), Trade Openness (TOPEN), Government Expenditure (GOVEXP), and One Period Lagged Government Expenditure (GOVEXP(-1)).

Unlike previous research, this study is distinct and advanced, utilizing forty-five years of nominal data from 1974/75 to 2018/19. It aims to establish the relationships between VAT and key macroeconomic variables, including GDP, GDP (-1), REM, TCON, X, M, GFCF, BRATE, TOPEN, GOVEXP, and GOVEXP (-1). Consequently, this study develops a specific macroeconomic model that incorporates these variables, providing a comprehensive analysis of the effects of VAT on Nepal's economy.

This study examines the experimental indication on the macroeconomic effect of VAT on macroeconomic variables and the feedback effect of macroeconomic variables on VAT. It is necessary to examine the current efficacy of VAT and possible moves on multiple VAT rates. It uses the annual data from 1974/75 to 2018/19. To get insight into the above concerns, answers to the following research question is necessary and will form the study's basis.

  a. How does VAT impact the macroeconomic variables in Nepal?
  b. How do macroeconomic variables affect VAT in Nepal?
The specific objective of the study are:
  a. To assess the impact of VAT on macroeconomic variables (TCON, GDP,

Import (M) and GOVEXP).
  b. To examine the effect of macroeconomic variables on VAT revenue in Nepal.

The Research Hypothesis

  a. H_1: There is significant impact of VAT on macroeconomic variables (TCON, GDP, Import (M) and GOVEXP).
  b. H_2: Macroeconomic variables significantly affect VAT revenue in Nepal.

Significance of the Study

VAT may improve macroeconomic variables. This study seeks to examine VAT's impact on macroeconomic variables and prove its validity. The study aims to find out how much VAT has helped Nepal's economy grow and how it affects macroeconomic variables. The study helps policymakers understand how the VAT affects economic growth, distribution, and fairness. VAT may increase savings, investment, growth, income redistribution, and government expenditure. VAT minimizes current account reversals, which helps preserve stability. The study's results will help the management of Nepal's revenue authority fix problems in how taxes are handled so that taxpayers will help.

Limitations of the Study

  a. These study incorporates45 years of data, from 1974/75 to 2018/19. The reason for choosing such a period is mainly to maintain analytical simplicity
  b. In Nepal, VAT was implemented on November 16, 1997; no time series data earlier than that date is available. As a result, before 1997, aggregate statistics on entertainment tax, sales tax, hotel tax, and contract tax were substituted for VAT.
  c. Macroeconomic variables such as VAT, GDP, GDP (-1), REM, TCON, X, M, GFCF, BRATE, TOPEN, GOVEXP and GOVEXP (-1). are considered for this research. The effects of value-added tax on several macroeconomic variables, TCON, GDP, M, and GOVEXP at current prices.

Literature Review

A literature review aims to determine what studies have already been completed and what research still needs to be undertaken. Even though VAT has only been implemented since 1954, especially in a global context, there have been countless research and trial projects on the subject, which has been the significant tax reform instrument for the previous six decades and a half (Sanchez, 2009). However, there have only been a few research studies on this topic in Nepal, which is distressing.

Izedonmi and Okunbor (2014) analyzed the impact of VAT on Nigeria's economy using time series data from 1994 to 2010. They employed multiple regressions to assess

the relationship between VAT revenue and GDP, Total Tax Revenue, and Total Revenue. Their findings indicated that 92% of fluctuations in Nigeria's GDP were attributable to changes in VAT revenue, demonstrating a positive correlation between VAT and GDP.

Rashid et al. (2014) explored the effects of implementing GST in Malaysia, set for 2015, aiming to increase government income and reduce deficits. The study examined GST's impact on variables like the CPI and structural equilibrium, comparing experiences in Indonesia, Thailand, and Singapore to guide best practices. Recommendations included transparency in GST implementation and periodic reviews every five years.

Ibadin and Oladipupo (2015) used 34 years of data (1981-2014) to assess the effects of VAT, PPT, and CED on Nigeria's RGDP, using unit root ADF tests and the Error Correction Model (ECM). The study found that VAT and PPT positively influenced RGDP, while VAT with a two-period lag showed a negative but significant relationship with RGDP.

Dangal (2018) highlighted the importance of VAT in Nepal since replacing the sales tax in 1997. Using secondary data, the study showed VAT's significant role in revenue collection despite administrative inefficiencies. VAT revenue reached NR 11,516 crores in 2014/15, contributing 5.42% to GDP and 48.14% to indirect tax revenue.

Acosta-Ormaechea and Morozumi (2019) investigated the relationship between the VAT system and economic growth. They emphasized that VAT rates, bases, administration, and the use of VAT income are crucial for economic growth. A well-designed VAT system can encourage consumption, reduce compliance costs, and support productive government spending.

Enemuo et al. (2021) analyzed the impact of VAT on Nigeria's economy from 2000 to 2020 using a descriptive research approach. Their findings revealed that VAT significantly contributed to economic growth, as indicated by its positive correlation with GDP. They recommended that VAT revenues be used to improve infrastructure and living standards.

Chapagai (2021) studied the impact of VAT on Nepal's GDP from 2001 to 2019. Using OLS for hypothesis testing, the study found that VAT significantly contributed to GDP, with a strong positive correlation. The research suggested that improved coordination among government agencies could enhance VAT revenue and support economic growth.

Sapkota (2021) examined VAT implementation in Nepal, highlighting its role as a crucial indirect tax. The study revealed a lack of public awareness about VAT, with many businesspeople and consumers uninformed about its application. It concluded that public awareness and tax education are vital for effective VAT implementation and revenue collection.

Research Methodology

A quantitative analytical research design was employed in this study, utilizing time series data from 1974/75 to 2018/19. This approach allows for a thorough examination of the impact of Value Added Tax (VAT) on various macroeconomic variables. The study constructs a conceptual framework to provide a comprehensive understanding of VAT's effects on the economy.

The specific objectives of this study are to analyze how VAT influences key economic indicators such as GDP, consumption, investment, remittances, exports, government expenditures, and imports. By examining each of these aspects in depth, the conceptual framework facilitates a better understanding of VAT's impact on Nepal's economy and provides valuable insights for policymakers to implement VAT effectively. After reviewing existing literature, the study developed a framework, as illustrated in the diagram below, to explore the effects of VAT on essential economic indicators in Nepal.

Figure 1

Conceptual Framework System Related to Total Consumption
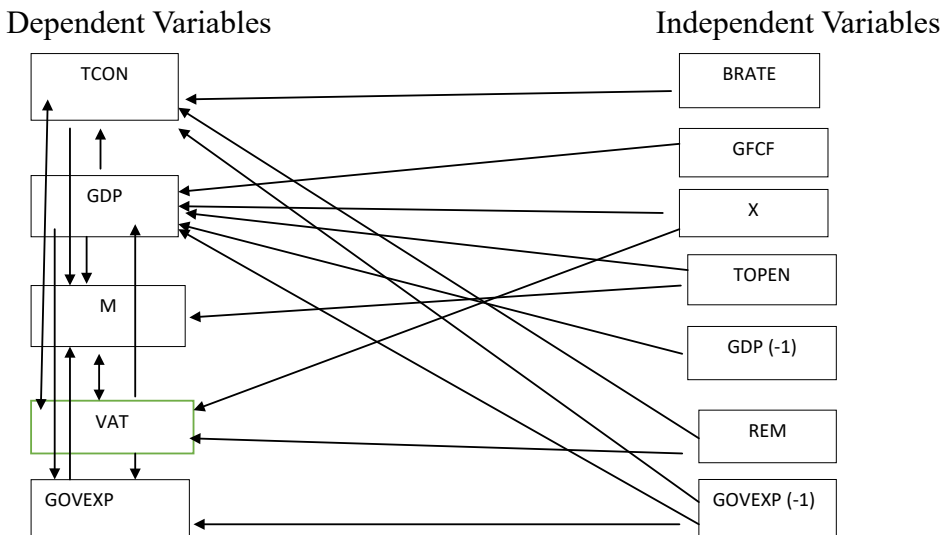
Source: Researcher's construction based on the system related to total consumption

To analyze the impact of Value Added Tax (VAT) on macroeconomic indicators and its potential inverse effects, this study utilized 45 years of time series data spanning from 1974/75 to 2018/19. Secondary data was obtained from the Ministry of Finance (MoF), Nepal Rastra Bank (NRB), and the Central Bureau of Statistics (CBS). Details regarding these sources are provided in Table 1.

Table 1

Sources of Secondary Data

Variable Definition	Data Source
Gross Domestic Product (GDP)	Ministry of Finance, Various issues of economic surveys
Value Added Tax (VAT)	Ministry of Finance, Various issues of economic surveys
Trade Openness (TOPEN)	Ministry of Finance, Various issues of economic surveys and quarterly economic bulletin
The volume of Export (X)	Nepal Rastra Bank, quarterly economic bulletin
The volume of Import (M)	Nepal Rastra Bank, quarterly economic bulletin
Remittance (REM)	Nepal Rastra Bank, quarterly economic bulletin
Gross Fixed Capital Formation (GFCF)	Ministry of Finance, Various issues of economic surveys
Bank Rate (BRATE)	Nepal Rastra Bank, quarterly economic bulletin
Private Consumption (PCON)	Ministry of Finance, Various issues of economic surveys
Government Expenditure (GOVEXP)	Ministry of Finance, Various issues of economic surveys
One Period Lagged GOVEXP (GOVEXP (-1)	Ministry of Finance, Various issues of economic surveys
Total Consumption (TCON)	Ministry of Finance, Various issues of economic surveys
One period Lagged GDP (GDP (-1)	Ministry of Finance, Various issues of economic surveys
Total Tax Revenue (TTR)	Ministry of Finance, Various issues of economic surveys

The two-stage least squares (2SLS) and three-stage least squares (3SLS) methods are used in this research to assess the impacts of VAT on macroeconomic variables and the reverse to avoid simultaneous equation bias.

The Model Specification

This study utilizes significant macroeconomic development indicators such as Gross Domestic Product (GDP), One Period Lagged GDP (GDP (-1)), Value Added Tax (VAT), Remittance (REM), Total Consumption (TCON), Export (X), Import (M), Gross Fixed Capital Formation (GFCF), Bank Rate (BRATE),

Trade Openness (TOPEN), Government Expenditure (GOVEXP), and One Period Lagged GOVEXP (GOVEXP (-1)). By employing time series data spanning 45 years, from 1974/75 to 2018/19, this study analyzes the influence of VAT on macroeconomic indicators and its inverse effects. The research establishes the association between VAT and major macroeconomic variables, including GDP, GDP (-1), REM, TCON, X, M, BRATE, GFCF, TOPEN, GOVEXP, and GOVEXP (-1). Consequently, the model developed for this study is based on these selected macroeconomic variables: GDP, GDP (-1), REM, TCON, X, M, GFCF, BRATE, TOPEN, GOVEXP, and GOVEXP (-1).

System Related to Total Consumption

Second Stage Least Square (2SLS)

Equation 1: Impact of VAT on TCON

The functional equation is

TCON = f (VAT, GDP, REM, BRATE, GOVEXP (-1)) ……………. (Equation 1)

Natural logarithm form of equation 1

$\text{Ln TCON} = \Phi_0 + \Phi_1 \text{Ln (VAT)} + \Phi_2 \text{Ln (GDP)} + \Phi_3 \text{Ln (REM)} + \Phi_4 \text{Ln (BRATE)} + \Phi_5 \text{Ln (GOVEXP (-1))} + \mu$ ……………… (1.1)

Where,

      TCON = Total Consumption

      VAT = Value Added Tax

      GDP = Gross Domestic Product

      REM = Remittance

      BRATE = Bank Rate

      GOVEXP (-1) = One Period Lagged GOVEXP

      Ln = Natural Log

      μ = Stochastic Error Term

      Φ_0 = Constant and Φ_1, Φ_2, $\Phi_{3, \Phi_4,}$ and Φ_5 are the Parameters Coefficient

Equation 2: Impact of macroeconomic variables on VAT

The functional equation is

VAT = f (M, TCON, X, REM) ………………. (Equation 2)

Natural logarithm form of equation 7

$\text{Ln VAT} = \alpha_0 + \alpha_1 \text{Ln (M)} + \alpha_2 \text{Ln (TCON)} + \alpha_3 \text{Ln (X)} + \alpha_4 \text{Ln (REM)} + \mu$ ………… (2.1)

Where,

      VAT = Value Added Tax

      M = Import

      TCON = Total Consumption

      X = Export

REM = Remittance

Ln = Natural Log

μ = Stochastic Error Term

α_0 = Constant and α_1, α_2, α_3 and α_4 are the parameters Coefficient

Equation 3: Impact of VAT on import (M)

The functional equation is

M = f (TOPEN, VAT, TCON, GOVEXP) ………………. (Equation 3)

Natural logarithm form of equation 3

Ln M = π_0 + π_1 Ln (TOPEN) + π_2 Ln (VAT) + π_3 Ln (TCON) + π_4 Ln (GOVEXP) + μ ……………………………… (3.1)

Where,

M = Import

GDP = Gross Domestic Product

TOPEN = Trade Openness (Export +Import)/ GDP

VAT = Value added Tax

REM = Remittance

TCON = Total Consumption

Ln = Natural Log

μ = Stochastic Error Term

π_0 = Constant and π_1, π_2, π_3 and π_4 are the parameters Coefficient

Equation 4: Impact of VAT on GDP

The functional equation is

GDP = f (GFCF, X, VAT, GOVEXP (-1), TOPEN, GDP (-1)) …………….(Equation 4)

Natural logarithm form of equation 4

Ln GDP= z_0 + z_1 Ln (GFCF) + z_2 Ln (X) + z_3 Ln (VAT) + z_4 Ln (GOVEXP(-1))+ z_5 Ln (TOPEN) + z_6 Ln (GDP (-1)) +μ ……….…………………… (4.1)

Where,

GDP = Gross Domestic Product

GFCF = Gross Fixed Capital Formation

X = Export

VAT = Value Added Tax

GOVEXP (-1) = One Period Lagged GOVEXP

TOPEN = Trade Openness (Export +Import)/ GDP

GDP (-1) = One period lagged GDP

Ln = Natural Log

μ = Stochastic Error Term

z_0 = Constant and z_1, z_2, z_3, zz_4, z_5 and z_6 are the parameters Coefficient

Model 5: Impact of VAT on GOVEXP

The functional equation is

GOVEXP = f (GDP, VAT, GOVEXP (-1)) ……………. (Equation5)

Natural logarithm form of equation 5

Ln GOVEXP = $¥_0$ + $¥_1$Ln (GDP) + $¥_2$Ln (VAT) + $¥_3$ Ln (GOVEXP (-1)) +μ ……….………………… (5.1)

Where,

> GOVEXP = Government Expenditure
>
> GDP = Gross Domestic Product
>
> VAT = Value Added Tax
>
> GOVEXP (-1) = One Period Lagged GOVEXP
>
> Ln = Natural Log
>
> μ = Stochastic Error Term
>
> $¥_0$ = Constant and $¥_1$, $¥_2$ and $¥_3$, are the parameters Coefficient

Third Stage Least Square(3SLS)

Ln TCON = β_0 + β_1Ln (VAT) + β_2Ln (GDP) + β_3Ln (REM) + β_4Ln (BRATE) + β_5Ln (GOVEXP (-1)) + μ ………… (Equation 1)

Ln GDP = θ_0 + θ_1Ln (GFCF) + θ_2Ln (X) + θ_3 Ln (VAT) + θ_4Ln (TOPEN) + θ_5Ln (GDP (-1)) + θ_6Ln (GOVEXP (-1)) +μ ………………… (Equation 2)

Ln VAT = γ_0 + γ_1Ln (M) + γ_2Ln (TCON) + γ_3Ln (X) + γ_4Ln (REM) ………………… (Equation 3)

Ln M= δ_0 + δ_1Ln (TCON) + δ_2Ln (TOPEN) + δ_3Ln (VAT) + δ_4Ln (GOVEXP) + μ ……………… (Equation 4)

Ln GOVEXP = $¥_0$ + $¥_1$Ln (GDP) + $¥_2$Ln (VAT) + $¥_3$Ln (GOVEXP (-1)) + μ ...(Equation 5)

Where,

> TCON = Total Consumption
>
> GDP = Gross Domestic Product
>
> VAT = Value Added Tax
>
> M = Import
>
> X = Export
>
> GFCF = Gross Fixed Capital Formation
>
> REM = Remittance
>
> BRATE = Bank Rate
>
> TOPEN = Trade Openness
>
> GOVEXP = Government Expenditure
>
> GOVEXP (-1) = One period Lagged GOVEXP

GDP (-1) = One period Lagged GDP

Results and Discussion

System Related to Total Consumption
Second Stage Least Square(2SLS)

Equation 1.1

Estimated impact of Ln VAT on Ln TCON

Ln TCON= -0.59 -0.18**(VAT) + 1.06***Ln (GDP) + 0.03 ***Ln (REM) + 0.06 Ln (BRATE)

SE	(0.08)	(0.06)	(0.01)	(0.04)
T	(-2.26)	(16.71)	(2.81)	(1.34)

+ 0.10* Ln (GOVEXP (-1)) + µ

SE	(0.06)
T	(1.69)

$\overline{R}^2$ = 0.99,   F = 23534.05,   DW = 0.90,   N = 44

    *Note. Author's estimate of two-stage method of regression equation using the data from Appendix I. *Significant at 10 %; ** significant at 5 %; *** significant at 1%; standard Error and t-statistics in parenthesis.*

    The study found that most coefficients are statistically significant and have appropriate signs, except for the interest rate (BRATE). Specifically, VAT results in significantly negatively impact in total consumption (TCON), a significant negative relationship at the 5 percent level, consistent with Usman and Adeare (2013). Conversely, GDP leads to significantly positivecontribution TCON. Similarly, remittances (REM) and BARATE pose positive resultsin TCON, both showing positive and significant impacts. Additionally, government expenditure (GOVEXP) results positive effect in TCON, suggesting that previous government spending consistently boosts total consumption. These findings highlight that while VAT decreases consumption, GDP growth, remittances, interest rates, and past government expenditure positively affect total consumption.

    The coefficient of determination (R^2 = 0.99) indicates that 99 percent of the variation in TCON is explained by VAT, GDP, REM, BRATE, and GOVEXP (-1). The F statistic (23534.05) also demonstrates a significant joint impact of these explanatory variables on TCON.

Table 2

Diagnostic Tests of Equation 1.1

Test	F-Statistics	/	Obs*R-squared	P- Value
	Jarque-bera			

| Heteroscedasticity test: Breus- ch-Pagan-Godfrey | 1.16 | 5.84 | 0.32 |
| Normality | 1.16 | ------ | 0.55 |

Source: Researcher's calculation

The residual diagnostic tests of Breusch-Pagan-Godfrey's heteroscedasticity test (corresponding p-value = 0.32), and normality (corresponding p-value = 0.55) report the equation 1.1 has no heteroscedasticity and the Jarque-Bera test statistic implies retains the hypotheses that the residuals are normally distributed.

Equation 1.2

Estimated impact of Ln VAT on Ln GDP

Equation 1.2 reports a 2SLS estimation result between a dependent variable (Ln GDP) and five independent variables (Ln GFCF, Ln X, Ln VAT, Ln GOVEXP (-1), Ln TOPEN, and Ln GDP (-1)). This study finds a strong relationship between GDP and VAT in Nepal. The 2SLS regression shows that the effect of VAT on GDP is statistically significant. All other coefficients are statistically significant with an appropriate sign.

Ln GDP = 1.58 + 0.17*** Ln (GFCF) + 0.13*** Ln (X) + 0.14***Ln (VAT) + 0.11 Ln (GOVEXP (-))

| SE | (0.06) | (0.02) | (0.05) | (0.04) |
| T | (2.55) | (5.84) | (2.63) | (2.43) |

-0.27*** Ln (TOPEN) + 0.41*** Ln (GDP (-1)) +μ

| SE | (0.06) | (0.07) |
| T | (-4.24) | (5.48) |

$R^2 = 0.99$, F = 24042.88, DW = 1.58, N = 44

*Note. Author's estimate of two-stage method of regression equation using the data from Appendix I. *significant at 10 %; ** significant at 5 %; *** significant at 1%; standard Error and t-statistics in parenthesis*

In the above equation 1.2 coefficients expected signs are appropriate. The VAT results to positively significant impact on GDP; it means value-added tax plays a positive role in enhancing gross domestic product. This result is consistent and alignswithearlier studies found same result that VAT positively impacts a country's GDP (Ajakaiye, 2000; Adereti& Adesina, 2011; Baker, 2013; Acosta-Ormaechea&Morozumi, 2019). As the same way GFCF positively impact on GDP, demonstrating a relatively inelastic relationship. Export (X) shows significantly positive relation with GDP. Similarly, GOVEXP (-1) suggests positive and significant on GDP.Conversely, TOPEN put negative impact on GDP, suggesting that Nepal has been experiencing a trade deficit over an extended period. The co-

efficient for Ln GDP (-1) indicates that a 1 percent increase in lagged GDP results in a 0.41 percent increase in current GDP. This positive relationship is significant at the one percent level.

The coefficient of determination (R^2 = 0.99) suggests that 99 percent of the variation in GDP is explained by GFCF, X, VAT, GOVEXP (-1), TOPEN, and GDP (-1). The F statistic (24042.88) also demonstrates a significant joint impact of these explanatory variables on GDP.

Table 3

Diagnostic Tests of Equation 1.2

Test	F-Statistics/ Jarque-bera	Obs*R-squared	P- Value
Heteroscedasticity test: white	1.08	6.60	0.35
Normality	0.97	------	0.61

Source: Researcher's calculation

The residual diagnostic tests equation 1.2 gives White's heteroscedasticity test (corresponding p-value = 0.35) and normality (corresponding p-value = 0.61). The Jarque-Bera test statistic implies the hypothesis that the residuals are normally distributed. However, the model is consistent with homoscedasticity and normally distributed.

Equation 1.3

Estimated impact of macroeconomic variables on VAT

Ln VAT = -2.86+ 0.86***Ln (M) + 0.33*Ln (TCON) -0.25*** Ln (X) + 0.05*** Ln (REM) + μ

| SE | (0.13) | (0.19) | (0.03) | (0.02) |
| T | (6.49) | (1.74) | (-6.90) | (2.77) |

R^2 = 0.99,   F = 5075.191,   DW = 1.01, N = 44

*Note. Author's estimate of two-stage method of regression equation using the data from Appendix I. *significant at 10 %; ** significant at 5 %; *** significant at 1%; standard Error and t-statistics in parenthesis*

In the context of Nepal's value-added tax (VAT) system, several coefficients have been analyzed to understand their impact on VAT revenue. First, the coefficient of Ln M (0.86) indicates that a one percent increase in imports leads to a corresponding 0.86 percent increase in VAT. This positive relationship is statistically significant at the 1 percent level. Nepal follows the destination principle of VAT, where imports are taxed, but exports remain exempt from VAT. Consequently, the VAT revenue increases significantly due to imports. Next TCON suggests that positive and significant association with VAT. This positive impact is significant

at the 10 percent level. This finding aligns with previous studies that highlight the positive relationship between consumption and value-added tax. Conversely, the coefficient of Export (X) negative result in VAT. Since Nepal excludes exports from VAT, the decline in VAT revenue is expected. This negative result is statistically significant at the 5 percent level. Additionally, the coefficient of REM positively contributes in VAT. Remittances, primarily used for consumption purposes, play a role in smoothing total consumption, thereby enhancing VAT revenue. This evidence aligns with similar findings from other studies.

Overall, the coefficient of determination ($R^2 = 0.99$) suggests that 99 percent of the variation in VAT can be described by the variables M, TCON, X, and REM. Furthermore, the F statistic (5075.191) confirms a significant joint impact of these explanatory variables on Nepal's value-added tax system.

Table 4

Diagnostic Tests of Equation 1.3

Test	F-Statistics / Jarque-bera	Obs*R-squared	P- Value
Heteroscedasticity test: White	1.90	7.17	0.12
Normality	3.31	------	0.19

Source: Researcher's calculation

The residual diagnostic tests white's heteroscedasticity test (corresponding p-value = 0.12), and normality (corresponding p-value = 0.19)—report that the equation 1.3 has no heteroscedasticity. The Jarque-Bera test statistic indicates that the residuals are normally distributed.

Equation 1.4

Estimated impact of Ln VAT on Ln M

Ln M = 2.26+ 0.93*** Ln (TOPEN) + 0.29*** Ln (VAT) + 0.42*** Ln (TCON)

SE	(0.04)	(0.06)	(0.05)
T	(18.81)	(4.27)	(7.85)

+ 0.24***Ln (GOVEXP) + μ

SE	(0.07)
T	(3.27)

$\overline{R}^2 = 0.99$,   F = 27270.66,   DW = 1.14,   N = 44

*Note. Author's estimate of two-stage method of regression equation using the data from Appendix I. *significant at 10 %; ** significant at 5 %; *** significant at 1%; standard Error and t-statistics in parenthesis*

All the coefficients have an expected sign and all macroeconomic variables

are statistically significant at one per cent significance level. The VAT positively impact imports (M). The result is positive and significant at one per cent level of significance. The coefficient of Ln TOPEN (0.93) implies that one per cent rise in TOPEN leads to a 0.93 per cent rise in imports; thus, the relationship between TOPEN and M is positive and significant so, liberalising economic policy increases the imports of a country. The coefficient of Ln TCON (0.42) implies that a one per cent surge in total consumption to a 0.42 per cent rise in imports; The coefficient of Ln GOVEXP (0.24) implies that a one per cent growth in GOVEXP boost to a 0.24 per cent rise in import. The result is positive and significant.

The coefficient of determination ($R^2 = 0.99$) suggests that 99 per cent of the discrepancy in import (M) has been elucidated by TOPEN, VAT, TCON and GOVEXP; the F statistic (27270.66) also shows a joint significant impact of explanatory variables on value-added tax.

Table 5

Diagnostic Tests of Equation 1.4

	F-Statistics /Jarque-bera	Obs*R-squared	P- Value
Heteroscedasticity test: Harvey	1.12	4.54	0.33
Normality	1.22	------	0.54

Source: Researcher's calculation

The residual diagnostic White's heteroscedasticity (corresponding p-value = 0.33), and normality tests (corresponding p-value = 0.54)—report that the equation 1.4 has serial correlation, no heteroscedasticity, and the Jarque-Bera test statistic implies that the residuals are normally distributed.

Equation 1.5

Estimate impact of VAT on GOVEXP

Ln GOVEXP = 0.89 -0.1 Ln (GDP) + 0.31***Ln (VAT) + 0.75***Ln (GOVEXP (-1)) +μ

SE   (0.10)   (0.099)   (0.11)

T   (-1.12)   (3.11)   (6.79)

$\bar{R}^2 = 0.99$,   F = 9245.686,   DW = 1.40, N = 44

*Note. Author's estimate of two-stage method of regression equation using the data from Appendix I. *significant at 10 %; ** significant at 5 %; *** significant at 1%; standard Error and t-statistics in parenthesis*

All the coefficients are statistically significant with appropriate signs, except for GDP. The coefficient for Ln VAT (0.31) indicates that a one percent rise in VAT results in a 0.31 percent increment in government expenditure. This means that an increase in VAT boosts government spending, and this positive effect is significant at the one percent level.

The GDP negative but insignificant impact on government expenditure (GOVEXP). As the same way one period lag positively contributes in current government expenditure. This positive relationship is also statistically significant at the one percent level, indicating that past government spending has a substantial effect on current spending.

The coefficient of determination ($R^2 = 0.99$) indicates that 99 percent of the discrepancy in government expenditure is explained by GDP, VAT, and previous government expenditure (GOVEXP (-1)). The F statistic (9245.686) also demonstrates a significant joint impact of these explanatory variables on government expenditure.

Table 6

Diagnostic Tests of Equation 1.5

Test	F-Statistics / Jarque-bera	Obs*R-squared	P- Value
Heteroscedasticity test: White	1.36	4.08	0.25
Normality	2.70	------	0.25

Source: Researcher's calculation

The residual diagnostic tests—White's heteroscedasticity test (p-value = 0.25) and normality test (p-value = 0.25)—indicate that equation 1.5 exhibits no heteroscedasticity. Additionally, the Jarque-Bera test statistic supports the hypothesis that the residuals are normally distributed.

Estimation of System with Total Consumption by 3SLS

Results obtained from the use of systems of equation (3SLS) are responded below

Table 7

3SLS Results

Dependent Variables	Ln TCON	Ln GDP	Ln VAT	Ln M	Ln GOVEXP
	(Equation 1)	(Equation 2)	(Equation 3)	(Equation 4)	(Equation 5)
Independent Variables					
Constant	-0.66	2.01	-3.94	2.41	1.01
Ln VAT	-0.20*** (-1.63)	0.23*** (5.23)		0.36*** (6.20)	0.37*** (4.07)
Ln GDP	1.07*** (18.44)			2.44 (1.60)	-0.13 (-1.39)
Ln REM	0.03** (3.13)		0.02 (1.55)		

Ln BRATE	0.06 (1.60)				
Ln GOV-EXP (-1)	0.12** (2.10)	0.11*** (3.17)			0.69*** (7.07)
Ln GFCF		0.10** (2.38)			
Ln X		0.15*** (10.25)	-0.29*** (-9.25)		
Ln TOPEN		-0.27*** (-5.95)		0.92*** (20.09)	
Ln GDP (-1)		0.35*** (6.97)			
Ln M			0.73*** (6.37)		
Ln TCON			0.59*** (3.67)	0.39*** (8.21)	
Ln GOV-EXP				0.18*** (3.08)	
R^2	0.99	0.99	0.99	0.99	
N	44	44	44	44	
DW	0.87	1.21	0.89	1.08	1.28

*Source: Author's estimate of three-stage method of regression equation using the data from Appendix I. T value in parenthesis; *significant at 10 %; ** significant at 5 %; *** significant at 1%*

Total Consumption Equation

Ln TCON = -0.66 -0.20*** Ln (VAT) +1.07*** Ln (GDP) + 0.03**Ln (REM) + 0.06Ln (BRATE)+ 0.12** Ln GOVEXP (-1) +μ ………… (Equation 1)

Equation 1 reveals that all coefficients are statistically significant with appropriate signs, except for the interest rate (BRATE). The coefficient for Ln VAT (-0.20) indicates negative impact on total consumption (TCON), highlighting a negative impact of VAT on consumption, consistent with Alm and El (2013). Both Ln GDP and Ln REM have positive and significant coefficients. Specifically, a one percent rise in GDP results in a 1.07 percent increase in TCON, significant at the one percent level, showing a strong positive effect. Similarly, remittances (REM) demonstrate positive effect on TCON, significant at the 5 percent level. The BRATE shows a positive but negligible insignificant effect on TCON. Lastly, the coefficient for lagged government expenditure (Ln GOVEXP (-1)) is indicating positive relation with TCON, suggesting that previous government expenditure

enhances total consumption.

GDP Equation

Ln GDP = 2.01 + 0.10**Ln (GFCF) + 0.15***Ln (X) + 0.23***Ln (VAT) -0.27***Ln (TOPEN) + 0.35***Ln (GDP (-1)) + 0.11*** θ_6 Ln (GOVEXP (-1)) +μ ………………… (Equation 2)

In equation 2, all the coefficients are statistically significant with appropriate signs. VATpositively contributes on GDP. The result is statistically significant in one per cent significant level. The GFCF also positive and significant connotation on GDP. Capital formation in a nation always contributes positively to GDP. The effect is statistically significant on GDP. Ln X and Ln GDP (-1) are positive and statistically significant on GDP. The coefficient of Ln TOPEN on GDP is negative and statistically significant at the one per cent significance level. The coefficient of TOPEN (-0.27) indicates that a one per cent rise in TOPEN results in a decrease of -0.27 per cent in GDP. Nepal's exports are weak and incompetent on the international market. Nepal's high production cost is due to old technology, inefficient labour, imported raw materials, ineffective machinery, etc. The pricing and quality of these items cannot compete with those of other nations. This is also an issue for Nepal's foreign trade; hence, the impact of TOPEN on Nepal's GDP is negative and significant. One period lagged GOVEXP contributes positive and significant impact on GDP.

VAT Equation

Ln VAT = -3.94 + 0.73***Ln (M) + 0.59***Ln (TCON) -0.29***Ln (X) + 0.02Ln (REM) …… (Equation 3)

Equation 3 demonstrates that all coefficients are statistically significant with the expected signs. The REM indicates positive and insignificant relationship with VAT. Conversely, the coefficient for Ln X (-0.29) suggests that a one percent increase in exports results in a 0.29 percent decrease in VAT. This negative impact is statistically significant. Nepal adheres to the destination principle of VAT, where taxes are applied to imports but not exports, explaining this relationship. Similarly, the coefficient for Ln M reveals that a positive and significant impact on VAT. This positive relationship is also significant at the 1 percent level, reflecting Nepal's VAT policy on imports. As the same line TCON significantly positive relation with VAT.

These findings underscore how VAT dynamics in Nepal are influenced by remittances, exports, imports, and total consumption, each playing a significant role in revenue generation under Nepal's VAT framework.

Import Equation

Ln M= 2.41 + 0.39***Ln (TCON) + 0.92***Ln (TOPEN) + 0.36***Ln (VAT) + 0.18***Ln (GOVEXP) + μ ……………… (Equation 4)

In equation 4, it is demonstrated that the values of VAT and TOPEN are positively significant with import. The result is positive and significant at the one per cent significance level. This is consistent with Semanková's (2016) claim that trade openness opens the avenues of the free market and promotes the economic growth of a country. In the same way, TCON and GOVEXP imply positive significance to import.

GOVEXP Equation

Ln GOVEXP = 101 -0.13 Ln (GDP) + 0.37***Ln (VAT) + 0.69***Ln (GOVEXP (-1)) + μ ……………… (Equation 5)

All the coefficients are statistically significant with appropriate sign. The coefficient of Ln VAT (0.37) implies that a one per cent increment in VAT leads to a 0.37 per cent rise in government expenditure. It means a VAT boost in government expenditure. The result is positively significant on a one per cent significance level. GDP infers insignificantly negative impact on GOVEXP. The GOVEXP (-1) is boost in current government expenditure. This coefficient is positively significant at the one per cent level, signifying that past government spending has a significant effect on current expenditure.

Conclusion

The study indicates that implementing a value-added tax (VAT) offers benefits for both the overall economy and government revenue. However, it leads to a reduction in total consumption (TCON), with each one percent increase in VAT resulting in a 0.20 percent decrease in TCON. Additionally, Nepal's foreign trade (TOPEN) negatively impacts the country's GDP, while government expenditure (GOVEXP) contributes positively. There is also a positive relationship between VAT and TOPEN, suggesting that introducing VAT can enhance government revenue. For every one percent increase in VAT, government expenditure rises by 0.37 percent, which is significant at the one percent level. In summary, VAT can boost government revenue and spending while reducing total consumption. Similarly, imports (M), TCON, and remittances (REM) positively impact VAT, whereas exports (X) show a negative relationship.

Based on the study's findings, several recommendations can be made. Firstly, the government should consider carefully managing the implementation of VAT to maximize its positive effects on revenue while minimizing its adverse impact on total consumption (TCON). Efforts to educate the public and businesses

about the VAT system and its benefits could help mitigate any negative perceptions and encourage compliance. Additionally, policies aimed at enhancing foreign trade (TOPEN) should be complemented with strategies to boost domestic production and consumption, thereby balancing the adverse impact of foreign trade on GDP. It is also crucial for the government to allocate VAT-generated revenue effectively towards productive expenditures, as the positive relationship between government expenditure (GOVEXP) and GDP suggests that well-targeted spending can stimulate economic growth. Finally, considering the positive impacts of imports (M), TCON, and remittances (REM) on VAT, policies should support these areas while also addressing the challenges posed by the negative relationship with exports (X). This balanced approach will help ensure that the VAT system contributes effectively to the country's economic development.

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Appendix 1

Gross Domestic Production (GDP), Lagged GDP (GDP (-1) Value Added tax (VAT), Remittance (REM), Gross Fixed Capital Formation (GFCF), Total Consumption (TCON), Export(X), Import (M), Bank Rate (BRATE), Government Expenditure (GOVEXP), Lagged GOVEXP (-1) and Trade Openness (TOPEN) over forty-five years incurrentprice (Rs. in millions)

Fiscal Year	GDP	VAT	REM	GFCF	GDP(-1)	TCON	X	M	BRATE	GOVEXP	GOVEXP(-1)
1975	16571	206.7	90.7	2223	0	14909	889.6	1814.6	15	1513.7	0
1976	17394	181.9	97.7	2443	16571	15354	1185.8	1981.7	15	1913.3	1513.7
1977	17280	247.3	125.4	2580	17394	14949	1164.7	2008	15	2330.4	1913.3
1978	19732	306.2	120	3294	17280	17192	1046.2	2469.6	15	2674.9	2330.4
1979	22215	397.3	146.3	3263	19732	19630	1296.8	2884.7	15	3020.5	2674.9
1980	23351	443.2	150.3	3681	22215	20760	1150.5	3480.1	15	3470.7	3020.5
1981	27307	604	216.8	4299	23351	24333	1608.7	4428.2	15	4092.3	3470.7
1982	30988	678.7	205.5	5465	27307	27910	1491.5	4930.3	15	5361.3	4092.3
1983	33761	825.1	292.5	6576	30988	30874	1132	6314	15	6979.2	5361.3
1984	39390	907.5	280	6907	33761	35504	1703.9	6514.3	15	7437.3	6979.2
1985	46587	1012.6	275.4	9386	39390	40348	2740.6	7742.1	15	8394.8	7437.3
1986	55734	1173	346.7	9431	46587	49847	3078	9341.2	15	9797.1	8394.8
1987	63864	1363	478.7	11825	55734	56543	2991.4	10905.2	15	11513.2	9797.1
1988	76906	1612.5	589.8	13414	63864	69302	4114.5	13869.6	15	14105	11513.2
1989	89270	1698.9	602.1	16392	76906	79120	4195.3	16263.7	11	18005	14105
1990	103416	1953.8	676.8	17002	89270	95273	5156.2	18324.9	11	19669.3	18005
1991	120370	2354.4	549.7	22780	103416	108856	7387.5	23226.5	13	23549.8	19669.3
1992	149487	3283.6	423.6	29277	120370	133280	13706.5	31940	13	26418.2	23549.8
1993	171474	4007.7	549.7	37278	149487	148302	17266.5	39205.6	13	30897.7	26418.2
1994	199272	5380.9	223	42032	171474	170052	19293.4	51570.8	13	33597.4	30897.7
1995	219175	6857.1	2906.7	48370	199272	186710	17639.2	63679.5	13	39060	33597.4
1996	248913	7429.3	2660.2	56081	219175	214487	19881.1	74454.5	13	46542.4	39060
1997	280513	8162.9	2938	60794	248913	241351	22636.5	93553.4	9	50723.7	46542.4
1998	300845	8020.6	4084.2	65375	280513	259407	27513.5	89002	9	56118.3	50723.7
1999	342036	8765.9	6520.6	65269	300845	295473	35676.3	87525.3	9	59579	56118.3
2000	379488	10259.7	6031.4	73324	342036	321911	49822.7	108504.9	7.5	66272.5	59579
2001	441519	12382.4	9797.6	84750.6	379488	390017	55654.1	115687.2	7.5	79835.1	66272.5
2002	459443	12267.3	14859.8	89889.3	441519	415845	46944.8	107389	5.5	80072.2	79835.1
2003	492231	13459.7	41630	98072.8	459443	450090	49930.6	124352.1	5.5	84006.1	80072.2
2004	536749	14478.9	56629.8	109181.3	492231	473685	53910.7	136277.1	5.5	89442.6	84006.1
2005	589412	18885.4	61784.8	117538.9	536749	521301	58705.7	149473.6	5.5	102560.4	89442.6
2006	654084	21610.7	92748.6	135532	589412	595327	60234.1	173780.3	6.25	110889.2	102560.4
2007	727827	26095.6	107417.4	153336.9	654084	656374	59383.1	194694.6	6.25	133604.6	110889.2
2008	815658	29815.7	139421.5	178445.5	727827	735470	59266.5	221937.7	6.25	161349.9	133604.6
2009	988272	39700.9	194215.6	211039	815658	895040	67697.5	284469.6	6.5	219662	161349.9
2010	1192774	54920.9	213998.9	264887.5	988272	1056185	60824	374335.2	6.5	259689	219662
2011	1366954	61663.6	225909.4	292730.4	1192774	1176030	64338.5	396175.5	7	295361	259689
2012	1527344	70930.4	333366.8	317184.6	1366954	1359539	74261	461667.7	7	339168	295361
2013	1695011	83418.4	394348.7	382971.8	1527344	1516129	76917.1	556740.3	8	358638	339168
2014	1964540	101104.6	490302.5	462013.4	1695011	1730312	91991.4	714365.8	8	435052	358638
2015	2130150	112521.8	540053.2	595822.6	1964540	1934046	85319.1	774684.2	8	531558	435052
2016	2253163	122411.9	594588.3	647293.9	2130150	2161519	70117.1	773599.1	7	601016	531558
2017	2674493	161068.3	602497.4	840692.7	2253163	2315287	73049.1	990113.2	7	837247.8	601016
2018	3044927	206809.8	654003.1	1051957	2674493	2538509	81359.8	1245103	7	1087280	837247.8
2019	3458793	240121.3	750690	1164939	3044927	2802558	97109.5	1418535	6.5	1110456	1087279.8

Sources: Various Issues of Economic Surveys and NRB Quarterly Economic Bulletin.