Contribution of Indirect Taxes on Goods to Economic Growth of Pakistan (1972-2022)

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Abstract

Purpose

Economic growth is influenced by the changes in indirect taxes imposed by the government on the production/consumption of goods. This paper aims to identify the empirical relationship between indirect taxes – i.e., federal sales tax, federal excise duty, and customs duty – and the economic growth of Pakistan.

Methodology

For this purpose, annual time series data from 1972 to 2018 are used. The objective of the study is to evidence the long-run and short-run relationships of federal sales tax, federal excise duty, and customs duty with economic growth. The Augmented Dickey-Fuller unit root tests are used to check the stationarity of each variable. The Johansen Cointegration Test is performed to identify the cointegration among variables. The Vector Error Correction Model (VECM) is used to estimate the long-run and short-run relationships among these variables.

Findings

The results of the study show that there are two cointegrating equations among variables. GDP Lag5, GDP Lag6, ST Lag1, ST Lag5, and FE Lag4 possess a positive impact on the economic growth of Pakistan. However, GDP Lag2, FE Lag6, and CD Lag7 have a negative impact on the economic growth of Pakistan. Previous years' deviations from long-run equilibrium are corrected in the current year at an adjustment speed of 33% and 18% for GDP and ST, respectively.

Contribution/Implications

Since the sales tax has a positive impact on economic growth, whereas federal excise duty and customs duty have a negative relation, it is advisable to form policies that contribute to economic growth instead of restricting it. As of the published statistical records of 2018, sales tax, federal excise duty, and customs duty contribute 65 per cent, 9 per cent, and 26 per cent, respectively, to the total indirect taxes. This collection structure is required to be rationalised to boost economic growth.

Keywords: Indirect tax, Federal sales tax, Federal excise duty, Customs duty, GDP, VECM, Economic growth, Pakistan.

Introduction

Governments devise various mechanisms for fund collection to fuel their activities. Taxes are the most exploited mechanism in this respect. In a civilized environment, it is considered a responsibility of citizens to contribute to the government; however, citizens are not excited about the compulsory contribution by means of taxes (Ebiringa and Yadirichukwu, 2012). Nevertheless, government expenditures of OECD member countries are heavily monetized by taxes (Revenue Statistics 2017 – OECD). Taxes imposed by the government can be broadly classified as direct taxes and indirect taxes. The Honourable Supreme Court of Pakistan distinguished between direct and indirect taxes: a direct tax is one that is demanded from the very person who it is intended or desired should pay it. Whereas, indirect taxes are demanded from a person in the expectation and intention that they shall indemnify themselves at the expense of another (M/s Elahi Cotton Mills vs. Federation of Pakistan, 1997). Indirect taxes directly affect household consumption as well as aggregate consumption. When the government decides to increase the tax rate on consumption, it reduces consumption in the short run and has a greater effect in the long run (Alm and Asmaa, 2013). Parker (1999) concluded that if the expected change in tax rates influenced the consumption behaviour, then fiscal stabilization might affect consumption.

Indirect taxes on goods have a very profound effect on the consumption and savings of the economy because they affect household decisions in respect of savings and consumption, production of goods, employment, corporate expansion, research and development, labour supply and human capital development, as well as the choice of saving channels and assets by investors (Johansson, 2008).

Developing countries like Pakistan always try to balance expenditures and revenues by opting for different methods that have an effect on economic growth. Barker, Buckle, and St Clair (2008) concluded that economies with large public sectors grow at a restricted rate compared to economies with smaller public sectors. OECD (2008b) confirms the relationship between the different types of taxes, including indirect taxes on goods, and the economic growth of a country. The Government of Pakistan also uses indirect taxes on goods as a tool to balance its fiscal policy, monitoring and controlling economic activity. Accordingly, it is important to ascertain the impact that indirect taxes on goods have on the economic growth of Pakistan. This will assist policymakers in understanding the role of various indirect taxes in the economic growth of Pakistan.

The overall goal of the study is to assess the impact of indirect taxes on goods – i.e., sales tax, federal excise duty, and customs duty – on the economic growth of Pakistan. This goal is achieved by following objectives:

a. To measure the significance of indirect taxes on goods with respect to the economic growth of Pakistan; and
b. To ascertain the short-run and long-run relationship between various indirect taxes on goods and the economic growth of Pakistan.

Literature Review

The Organisation for Economic Co-operation and Development confirms the relationship between the different types of taxes, including indirect taxes on goods, and the economic growth of a country (OECD, 2008b). Therefore, the theoretical framework of this research article is expressed as economic growth being a function of indirect taxes on goods:

$$Economic\ Growth = f(Indirect\ Taxes\ on\ Goods) \quad \text{... (Eq. 1)}$$

As discussed above, indirect taxes are the sum of sales tax on goods, federal excise duty, and customs duty. Accordingly, Eq. 1 can be rewritten as:

$$Economic\ Growth = f(Sales\ Tax, Federal\ Excise, Customs\ Duty) \quad \text{... (Eq. 2)}$$

The study used secondary source published data from authentic and reliable sources, which had also been used by other scholars. Statistics were taken in the following manner:

Economic Indicator	Abbreviation	Source
Gross Domestic Product *[current market price]*	GDP	Chapter 1.1 – "Handbook of Statistics on Pakistan Economy" *[1972-2015]* Table-2 – "National Accounts" [2016-2022]
Sales Tax	ST	"Federal Tax Receipts" published by State Bank of Pakistan *[1972-2018]* "FBR Year Books" *[2019-2022]*
Federal Excise Duty	FE	
Customs Duty	CD	

Abundant scholars have empirically measured the impact of government taxes on economic growth. Some notable contributions are discussed below:

Saima Saqib et al. (2014) analysed the effect of taxes (direct and indirect taxes) on economic activity in the case of Pakistan during the period from 1973 to 2010 using ARDL. They discovered that taxes have a negative effect on economic activity – i.e., income tax has an inverse relationship with investment, whereas sales tax has negative effects on household consumption.

Shahzad Ahmad et al. (2016) investigated the relationship between total tax revenues and economic growth in Pakistan from 1974 to 2010 using ARDL and concluded that total tax

revenues have a significant negative relation with economic growth in the long run with the ratio of 1:1.25.

Shahzad Ahmad et al. (2018) studied the empirical relationship between indirect taxes and economic growth in Pakistan (1974 to 2010) using ARDL. They reported that in the long run, indirect taxes have a negative and significant effect on the economic growth of Pakistan with the ratio of 1:1.68, whereas they are insignificant in the short run.

Kashif Munir and Maryam Sultan (2013) examined the impact of direct and indirect taxes on the economic growth of Pakistan (1976-2014). Results indicated that in the long run, direct as well as indirect taxes have a significant positive relationship, whereas in the short run, excise duty has a negative relationship with the economic growth of Pakistan.

Muriithi Cyrus Magu (2013) conducted a study on time series data of Kenya for the years from 2003 to 2011. The study tends to identify the relationship of import duty, excise duty, VAT, income tax, and non-tax revenue with the economic growth of Kenya. The study identifies that import duty and excise duty have an inverse relationship with economic growth, whereas income tax, VAT, and non-tax revenue have a direct relationship with economic growth.

Nwadialor, Eugene, and Ekezie, Chineze Abigail (2016) performed OLS regression on time series data pertaining to tax and GDP for twenty years from 1994 to 2013 in the case of Nigeria. It was identified that tax has a significant impact on the economic growth of Nigeria. Furthermore, the study recommended that tax collection should rely more on indirect taxes due to their expansionary and non-distortionary nature.

Nadeem Iqbal et al. (2015) analysed the time series data of Pakistan from 1979 to 2010 to find out the relationship between GDP and various types of taxes, including income tax, sales tax, customs duties, excise duties, worker welfare tax, and surcharges. The study shows that taxes have a significant positive relationship with the economic growth of Pakistan, with the exception of worker welfare tax.

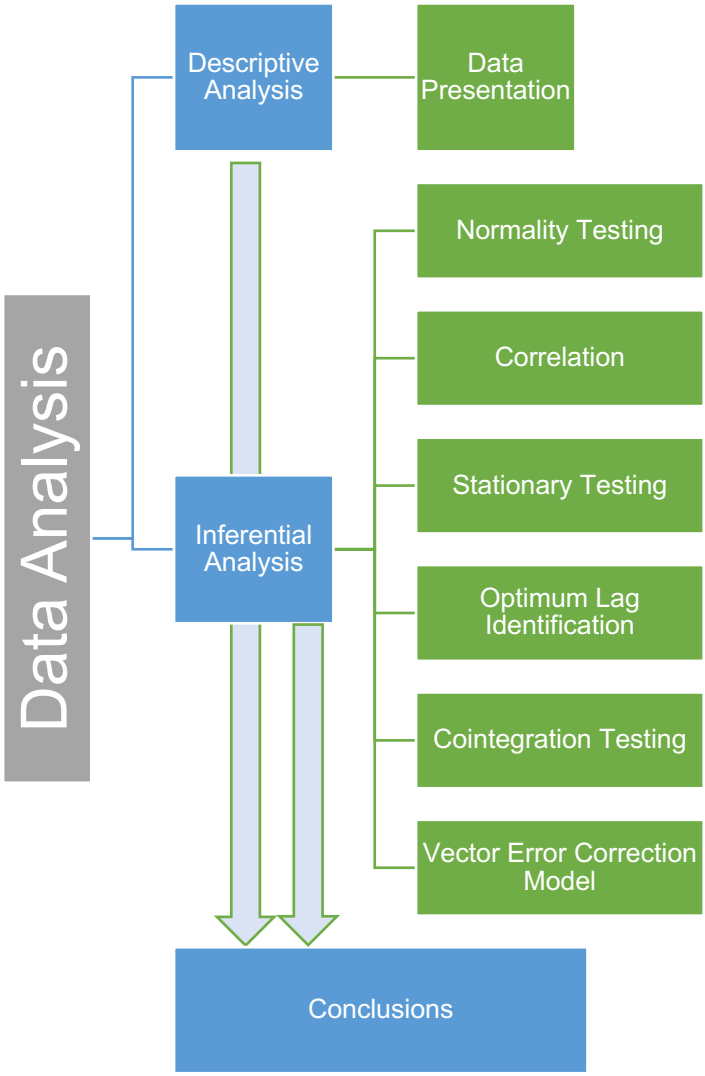
Korkmaz, S., and Korkmaz, Ö. (2023) analysed quarterly data for the period 2006:Q1 - 2022:Q4 for the Turkish economy to identify the existence of a long-term relationship using the ARDL boundary test. The Toda-Yamamoto causality test was preferred for confirmation of a bidirectional causality relationship, which was found between indirect tax, direct tax, and economic growth. The analysis depicts indirect taxes having a positive impact on economic growth, whereas direct taxes accentuate a negative impact on economic growth in the long run.

This study tries to evaluate the nature of the relationship of sales tax, federal excise duty, and customs duty with the economic growth of Pakistan and their significance in the short run as well as in the long run.

Methodology

Time series data of indirect taxes on goods – i.e., sales tax on local and imports, federal excise duty, and customs duty – for the period from 1972 to 2018 is analysed against Gross Domestic Product at market prices. The paradigm of the research is quantitative. As illustrated below, the study uses a quantitative research method. Since time series data is used in the study, therefore, after normality and correlation testing, it is imperative to check the stationary property of the data. For this purpose, the study opted to perform the ADF unit root test with automatic lag length selection using the Akaike Information Criterion (AIC). Cointegration Testing and Vector Error Correction Model (VECM) are used to quantify the long-run as well as short-run relationships among endogenous and exogenous variables.

Figure: Data Analysis Flowchart



Source: Author

The data collected for the study that pertains to the independent variable (i.e., ST, FE, and CD) and the dependent variable (i.e., GDP) was processed using the computer-based statistical application EViews.

To empirically analyse the relationship between economic growth and government revenue, *Eq. 2* is differentiated and hypothesized as *Eq. 3*:

$$GDP = C + \alpha ST + \beta FE + \gamma CD + \mu \quad \text{... (Eq. 3)}$$

In *Eq. 3* above, on the left-hand side, economic growth was taken as the dependent variable, proxied by **GDP** at market price. Independent variables, on the right-hand side of *Eq. 3*, are **ST**, **FE**, and **CD**. All the variables were taken in Pakistani rupees in millions.

In regression analysis, constant error variances are important; a logarithm transformation often results in estimated errors with a constant or near-constant variance, while the corresponding values of the logarithm produce estimated errors with inconstant variance. This most often occurs when the standard deviations of the error are roughly constant in percentage terms but not in absolute terms (Ron Michener, 2003). Furthermore, logarithm transformation is also used to address the issue of heteroscedasticity. Accordingly, *Eq. 3* could be rewritten in logarithmic form as *Eq. 4* below:

$$\ln(GDP) = C + \alpha \ln(ST) + \beta \ln(FE) + \gamma \ln(CD) + \mu \quad \text{... (Eq. 4)}$$

Normality Testing of Data

Normal distribution is one of the main assumptions requiring satisfaction before the application of any statistical technique. Normality exists when the disturbance vector ε is assumed to be normally distributed, and where the assumption of normal distribution fails, the economic model may lead to significantly unfitting results. Jarque and Bera (1980, 1987) is one of the widely recognized and famous techniques. It confirms whether a series is normally distributed or not by measuring the difference between Skewness (S) and Kurtosis (K). *Eq. 5* provides the formula for the calculation of Jarque-Bera (JB):

$$JB = \frac{N}{6}\left(S^2 + \frac{(K-3)^2}{4}\right) \quad \text{...(Eq. 5)}$$

Where the hypothesis is:

$$H_o: \text{normal distribution}$$

$$H_1: \text{not normal distribution}$$

The criterion is, if the *p-value* is greater than 5% (i.e.,) then we cannot reject the null hypothesis of normal distribution, and if the *p-value* is less than 5% (i.e.,) then we accept the alternate hypothesis.

Correlation

Simpson, G., & Kafka, F. (1957) define correlation as the association among variables. However, correlation does not imply causality (Tufte, E. 2006), though where variables are either positively or negatively correlated, the probability of causality increases. Correlation can be calculated using *Eq. 6* and *Eq. 7* as follows:

$$r = \frac{\sum(X-\bar{X})(Y-\bar{Y})}{\sqrt{\sum(X-\bar{X})^2 \sum(Y-\bar{Y})^2}} \quad \text{... (Eq. 6)}$$

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \quad \text{... (Eq. 7)}$$

Where -1 ≤ *t* < +1 and the hypothesis is:

$$H_o: \text{no correlation among variables}$$

$$H_1: \text{correlation among variables}$$

The criterion is, if the *t-value* is equal to zero (i.e.,) then we cannot reject the null hypothesis that states that there is no correlation among variables, and if the *t-value* is not equal to zero (i.e.,) then we accept the alternate hypothesis that states that there exists a correlation among variables. A *t-value* greater than zero (i.e.,) shows a positive correlation, whereas a *t-value* less than zero (i.e.,) shows a negative correlation.

Stationary Property of Data

To check the stationary property of the data – i.e., its mean and autocovariances are independent of its timeline – the Unit Root Test using the Augmented Dickey-Fuller (ADF) unit root test with automatic lag length selection using the Akaike Information Criterion is opted to validate the stationary property of time series data. The ADF unit root test is evaluated using the mathematical expression expressed in *Eq. 8* below:

$$\Delta X_t = \alpha + \beta t_1 + \delta X_{t-1} + \sum_{j=1}^{q} \gamma_t \Delta X_{t-j} + \epsilon \quad \text{... (Eq. 8)}$$

Where the hypothesis is:

$$H_o: variable\ has\ a\ unit\ root$$

$$H_1: variable\ has\ no\ unit\ root$$

The criterion is, if the computed value is greater than the critical value (i.e., $t_\delta > T$), then we cannot reject the null hypothesis, which infers that the variable is non-stationary, and if the computed value is less than the critical value (i.e., $t_\delta < T$), then we accept the alternate hypothesis, which infers that the variable is stationary.

The result of the unit root test helps in selecting the appropriate technique for regression. If all variables become stationary at the first difference, the Error Correction Model (ECM) is best suited, since it's the pre-testing condition for ECM that all variables are stationary at the first difference (Dave Giles, 2017).

Optimal Lag

There are various techniques to identify the optimal lag length; however, the Akaike Information Criterion (AIC) is more suitable when the number of observations is less than 60. Nonetheless, it remains the preference of the researchers to adopt any criterion for optimal lag selection (Liew, V. K-S., 2004). The AIC can be calculated using the expression in *Eq. 9*:

$$AIC = 2\ln(L) + 2k \qquad \text{... (Eq. 9)}$$

where:

L = value of the likelihood

k = number of estimated parameters

The AIC technique suggests that the optimal lag length lies where the value of the AIC is lowest.

Cointegration Testing

When testing multiple series, a linear grouping of multiple non-stationary time series may result in a stationary series (Engle and Granger, 1987). In such circumstances, the non-stationary time series are considered to be *cointegrated*. This stationary linear combination is called the *cointegrating equation* and may be interpreted as a long-run equilibrium relationship among the variables.

For the purpose of this study, we use the Johansen Cointegration Test to identify the cointegration among variables using optimum lags identified at joint significance. The test statistics for cointegration are formulated as:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{g} \ln (1 - \hat{\lambda}_i) \quad \text{... (Eq. 10)}$$

$$\lambda_{max}(r, r+1) = -T \ln (1 - \hat{\lambda}_{r+1}) \quad \text{... (Eq. 11)}$$

The criterion is, if cointegration exists among the variables, then we use the Vector Error Correction Model (VECM) for testing the relationship among variables; otherwise, we use an unrestricted VAR.

Vector Error Correction Model

The VEC has cointegration relations built into the specification so that it restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. The cointegration term is known as the error correction term (ECT) since the deviation from the long-run equilibrium is corrected gradually through a series of partial short-run adjustments. The corresponding VEC models are:

The cointegrating equation and long-run model:

$$ECT_{t-1} = [C + \eta \ln (GDP)_{t-1} + \alpha \ln (ST)_{t-1} + \beta \ln (FE)_{t-1} + \gamma \ln (CD)_{t-1}] \quad \text{(Eq. 12)}$$

The cointegrating equation and short-run model:

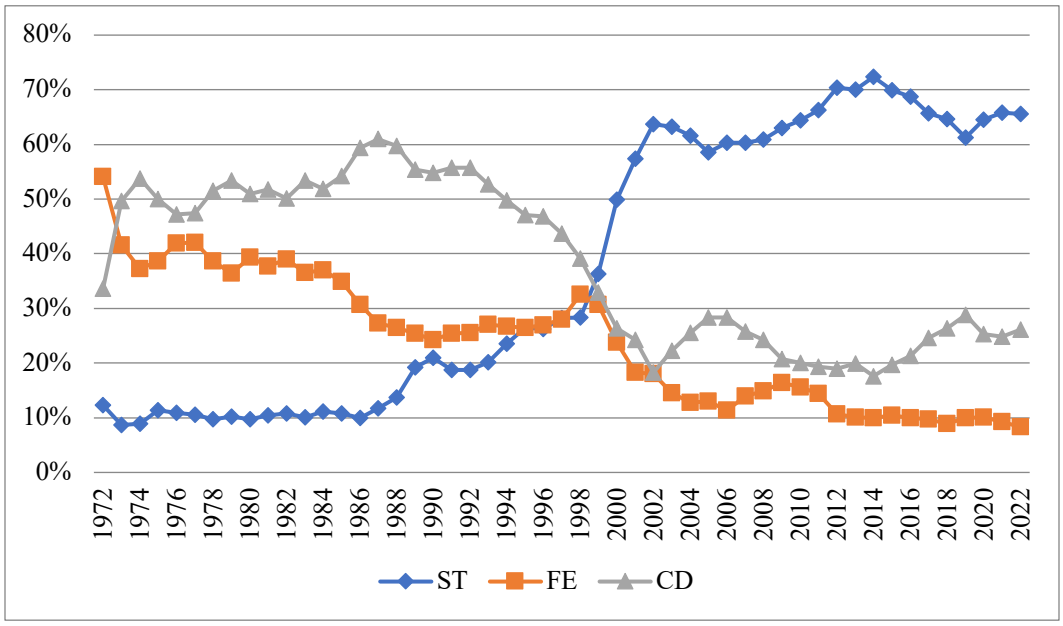
$$\Delta \ln(GDP)_t = C + \delta ECT_{t-1} + \eta \ln(GDP)_{t-1} + \alpha \Delta \ln(ST)_{t-1} + \beta \Delta \ln (FE)_{t-1} + \gamma \Delta \ln (CD)_{t-1} \quad \text{... (Eq. 13)}$$

Results and Discussion

The study sought to find out the trend of sales tax, federal excise duty, and customs duty during the period from 1972 to 2022. In this connection, a graphical presentation of sales tax, federal excise duty, and customs duty in terms of percentage to total indirect taxes on goods is illustrated. This representation of data provides a profound understanding of the changes that occur in indirect taxes on goods over the period under observation. It also enables tracking and comparing the historic trend of indirect taxes on goods.

Such representation is very useful to monitor the contributing share of participants and easily provide a ranking to each participant. Further, it also provides the basis to assume any correlation among participants. Therefore, the figure below encompasses the share of sales tax, federal excise duty, and customs duty in terms of percentage to total indirect taxes on goods:

Figure: ST, FE, and CD as a percentage of total Indirect Taxes on Goods for 1972-2018



Source: Author

In 1972, FE was the major contributor to total indirect taxes on goods, followed by customs duty, and sales tax was the least contributor with shares of 54.06%, 33.60%, and 12.34%, respectively. Immediately after 1972, CD succeeded FE's share, reasoning due to the enactment of the Customs Act of 1969. After that, FE's share continuously declined, and CD's share remained increasing with a few vicissitudes; however, sales tax remained the least contributor. During 1999, there was observed a substantial growth in ST, probably due to the promulgation of the Sales Tax Act of 1990, which introduced a value-added tax (VAT) mechanism for the charging of sales tax. This hiking trend continued until today; however, in 1999, ST secured first place in contributing to total indirect taxes, CD came in second spot, and FE was the last with shares of 36.36%, 32.93%, and 30.71%, respectively.

FE decline continued until 2006, at which point FE's share was 11.32%; however, it increased to 13.98% in 2007. The rationale for this increase was the enactment of the Federal Excise Act of 2005. This law provided steady growth to FE, which only lasted until 2010; afterwards, FE again started decreasing due to the 18th Constitutional Amendment, wherein the service tax was

entrusted to provincial bodies. According to published statistics of Pakistan for the year 2020, the contribution to total indirect taxes on goods in terms of ST, FE, and CD was 64.68%, 8.93%, and 26.39%, respectively.

Upon cursory observation of the figure illustrated above, it is observed that the statistics are moving without any specific trend and with absurd variation; therefore, while testing the stationary property of data, trend selection can be dropped, and the natural log is considered to control the variation.

Normality Testing of Data

Before applying any statistical technique, it is of vital importance to confirm the assumption of a normal distribution of variables. The table below summarizes the results of the Jarque-Bera (JB):

H_o: normal distribution

Table: Results of Jarque-Bera

	JB	p-value
ln(GDP)	3.001212	0.222995
ln(ST)	3.731657	0.154768
ln(FE)	2.133688	0.344093
ln(CD)	1.154253	0.561510

Source: Author's Calculation

Since the null hypothesis states that the disturbance vector ε of the series is normally distributed, a *p-value* of JB greater than 5% in respect of all variables indicates that we cannot reject the null hypothesis of normal distribution. Accordingly, we confirm that the disturbance vector ε of the series is normally distributed, and the study can be comfortably continued for further testing.

Correlation

The table below provides the correlation matrix that narrates the extent to which variables fluctuate together:

H_o: no correlation among variables

Table: Correlation Matrix

	ln(GDP)	ln(ST)	ln(FE)	ln(CD)
ln(GDP)	1.000000			
ln(ST)	0.997530	1.000000		
ln(FE)	0.985176	0.980338	1.000000	
ln(CD)	0.971744	0.963240	0.984996	1.000000

Source: Author's Calculation

Since the null hypothesis is that there exists no correlation among variables, however, test results indicate that all the variables are significantly positively correlated with each other; i.e., ln(GDP) is significantly positively correlated with ln(ST) [i.e., 0.998], ln(FE) [i.e., 0.985], and ln(CD) [i.e., 0.972]. Therefore, we can reject the null hypothesis and confirm that ln(GDP) moves in the same direction as ln(ST), ln(FE), and ln(CD) during the period from 1972 to 2018.

These results also indicate that ln(FE) and ln(CD) are also correlated with ln(ST), and ln(CD) is also correlated with ln(FE), which emphasises that there exists multicollinearity among independent variables. However, due to the significance of all variables, none of them can be dropped.

Unit Root Test

Due to observations made in the descriptive analysis above, the trend is not considered while performing the ADF unit root test. The table below summarises the results of the test:

H_o: *variable has a unit root*

Table: Results of ADF Unit Root Tests at Level with Intercept and No Trend

Variables	Results at Level		Test critical values	
	t-Statistic	Prob.	1%	5%
ln(GDP)	-2.065471	0.2591	-3.568308	-2.921175
ln(ST)	-1.351692	0.5983	-3.568308	-2.921175
ln(FE)	-1.779815	0.3859	-3.571310	-2.922449
ln(CD)	-2.462397	0.1307	-3.568308	-2.921175

Source: Author's Calculation

The ADF unit root test reveals that all variables are non-stationary at the level; therefore, we cannot reject the null hypothesis that the variables have a unit root. Since the variables have a unit root at the level or are non-stationary at the level, the OLS technique cannot be employed to study the relationship between indirect taxes on goods and the economic growth of Pakistan because if OLS is applied to non-stationary variables, then it is prone to providing biased and unreliable results. Accordingly, we perform the ADF unit root test at the 1st difference. The table below summarises the results of the test:

H_o: *variable has a unit root*

Table: Results of ADF Unit Root Tests at 1st Difference with Intercept and No Trend

Variables	Results at 1st Difference		Test critical values	
	t-Statistic	Prob.	1%	5%
ln(GDP)	-6.592691*	0.0000	-3.571310	-2.922449
ln(ST)	-6.088325*	0.0000	-3.571310	-2.922449
ln(FE)	-4.398750*	0.0009	-3.571310	-2.922449
ln(CD)	-5.837767*	0.0000	-3.571310	-2.922449

Source: Author's Calculation

The null hypothesis is that the series has a unit root at the 1st difference. The results of the ADF unit root test for all variables are lower than the critical value, which suggests that the variables are stationary at the 1st difference of the ADF unit root test at the confidence level of 1%. Therefore, we decisively reject the null hypothesis.

The ECM has a pre-testing condition that all variables should be stationary at the 1st difference, which is met in the current circumstances. Accordingly, we employ the VECM technique to ascertain the relationship between indirect taxes on goods and the economic growth of Pakistan. However, before employing VECM, optimal lag identification is mandatory.

Optimal Lag Selection

Since the number of observations is relatively small – i.e., 52 – the study chooses to perform the Akaike Information Criterion (AIC) for the identification of the optimum lag for the model. The table below summarises the result of the AIC at different lag lengths:

Lag	AIC
1	-7.591117
2	-7.401165
3	-7.707353
4	-7.370801
5	-7.990268
6	-8.796151

7	-9.593622
8	-11.95011*

Source: Author's Calculation

As the result reveals, the optimum lag lies at Lag 8 [-11.95011*] where the AIC value is the lowest. Therefore, while performing VECM, the maximum lag of *p-1* [i.e., Lag 7] is used.

Cointegration Testing

The null hypothesis of the Johansen Cointegration Test states that there is no cointegration between variables. The Trace and Max-eigenvalue tests of cointegration indicate that there is 1 cointegrating equation at the 1% significance level. Therefore, the null hypothesis of no cointegration is rejected against the alternative of a cointegrating relationship in the model. While performing VECM, the number of cointegrations is set at 1.

Vector Error Correction Model

The table below presents the result of VECM with a lag length of *p-1* [i.e., Lag 7]:

Table: Results of VECM with Adjusted Sample of 1980-2022

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.574268	0.425381	1.350008	0.2001
CointEq	-0.352696	0.319574	-1.103646	0.2898
d_ln(GDP(-1))**	-0.680265	0.259622	-2.620217	0.0212
d_ln(GDP(-2))**	-0.931391	0.361403	-2.577154	0.0230
d_ln(GDP(-3))	-0.629432	0.490215	-1.283992	0.2216
d_ln(GDP(-4))	-0.845665	0.610612	-1.384946	0.1894
d_ln(GDP(-5))	-0.358717	0.665215	-0.539249	0.5988
d_ln(GDP(-6))	-0.101788	0.526750	-0.193238	0.8498
d_ln(GDP(-7))	0.120349	0.327227	0.367785	0.7190
d_ln(ST(-1))	-0.180275	0.260263	-0.692665	0.5007
d_ln(ST(-2))	-0.104132	0.231217	-0.450362	0.6599
d_ln(ST(-3))	-0.020756	0.167286	-0.124073	0.9032
d_ln(ST(-4))	-0.066573	0.104924	-0.634484	0.5368
d_ln(ST(-5))	0.029949	0.097368	0.307584	0.7633

Variable	Coefficient	Std. Error	t-Statistic	Prob.
d_ln(ST(-6))	0.066569	0.092918	0.716429	0.4864
d_ln(ST(-7))	0.036654	0.088178	0.415685	0.6844
d_ln(FE(-1))	-0.045764	0.120162	-0.380850	0.7095
d_ln(FE(-2))	0.100580	0.109683	0.917009	0.3758
d_ln(FE(-3))	0.054696	0.117605	0.465082	0.6496
d_ln(FE(-4))	0.190432	0.108809	1.750152	0.1036
d_ln(FE(-5))	0.221114	0.157460	1.404257	0.1837
d_ln(FE(-6))	0.072981	0.241742	0.301897	0.7675
d_ln(FE(-7))	-0.056455	0.180469	-0.312825	0.7594
d_ln(CD(-1))	0.120199	0.125442	0.958207	0.3554
d_ln(CD(-2))	-0.180685	0.121377	-1.488624	0.1604
d_ln(CD(-3))	-0.096757	0.105859	-0.914019	0.3773
d_ln(CD(-4))	0.013565	0.110329	0.122951	0.9040
d_ln(CD(-5))**	0.205257	0.092013	2.230740	0.0439
d_ln(CD(-6))	0.052537	0.106339	0.494046	0.6295
d_ln(CD(-7))	-0.010400	0.087014	-0.119521	0.9067

Source: Author's Calculation

The significance level is indicated by (*). One (*) indicates a significance level of 10%, two (**) indicates a significance level of 5%, and three (***) indicates a significance level of 1%.

As the result indicates, GDP Lag 1, GDP Lag 2, and CD Lag 5 are significant at a 5% level of confidence for the economic growth of Pakistan.

CD Lag5 possesses a positive impact on the economic growth of Pakistan. However, GDP Lag1 and GDP Lag2 possess a negative impact on the economic growth of Pakistan. Accordingly, equations 12 and 13 can be rewritten as:

The cointegrating equation and long-run model:

$$ECT_{t-1} = \begin{bmatrix} -7.12 + 1.00\ln(GDP)_{t-1} & -0.80\ln(ST)_{t-1} \\ -0.03\ln(FE)_{t-1} + 0.13\ln(CD)_{t-1} & \end{bmatrix} \quad \text{... (Eq. 14)}$$

The cointegrating equation and short-run model:

$$\begin{aligned}\Delta\ln(GDP)_t = {} & -0.57 + 0.35ECT_{t-1} - 0.68\Delta\ln(GDP)_{t-1} - 0.93\,\Delta\ln(GDP)_{t-2} - \\ & 0.63\Delta\ln(GDP)_{t-3} - 0.85\Delta\ln(GDP)_{t-4} - 0.36\Delta\ln(GDP)_{t-5} - \\ & 0.10\Delta\ln(GDP)_{t-6} + 0.12\Delta\ln(GDP)_{t-7} - 0.18\Delta\ln(ST)_{t-1} - 0.10\Delta\ln(ST)_{t-2} - \\ & 0.02\Delta\ln(ST)_{t-3} - 0.07\Delta\ln(ST)_{t-4} + 0.03\Delta\ln(ST)_{t-5} + 0.07\Delta\ln(ST)_{t-6} + \\ & 0.04\Delta\ln(ST)_{t-7} - 0.05\Delta\ln(FE)_{t-1} + 0.10\Delta\ln(FE)_{t-2} + 0.06\Delta\ln(FE)_{t-3} + \\ & 0.19\Delta\ln(FE)_{t-4} + 0.22\Delta\ln(FE)_{t-5} + 0.07\Delta\ln(FE)_{t-6} - 0.06\Delta\ln(FE)_{t-7} + \\ & 0.12\Delta\ln(CD)_{t-1} - 0.18\Delta\ln(CD)_{t-2} - 0.10\Delta\ln(CD)_{t-3} + 0.01\Delta\ln(CD)_{t-4} + \\ & 0.21\Delta\ln(CD)_{t-5} + 0.05\Delta\ln(CD)_{t-6} - 0.01\Delta\ln(CD)_{t-7}\end{aligned}$$

… (Eq. 15)

This infers that previous years' deviations from the long-run equilibrium are corrected in the current year at an adjustment speed of 35% for GDP.

Conclusion

Trace and Max-eigenvalue tests of cointegration indicate that there is 1 cointegrating equation among variables. CD Lag5 possesses a positive impact on the economic growth of Pakistan. However, GDP Lag1 and GDP Lag2 possess a negative impact on the economic growth of Pakistan. Previous years' deviations from the long-run equilibrium are corrected in the current year at an adjustment speed of 35% for GDP.

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Appendices

GDP at market prices, Sales Tax, Federal Excise Duty, and Customs Duty (all values are in million)

Years	GDP	ST	FED	CD
1972	54,673	482	2,111	1,312
1973	67,492	461	2,211	2,641
1974	88,102	692	2,895	4,175
1975	111,183	1,074	3,670	4,746
1976	130,364	1,200	4,585	5,164
1977	149,748	1,363	5,429	6,138
1978	176,334	1,590	6,299	8,390
1979	194,915	1,935	6,916	10,124
1980	234,179	2,410	9,701	12,572
1981	278,196	2,893	10,413	14,276
1982	324,159	3,251	11,740	15,074
1983	364,387	3,489	12,675	18,510
1984	419,802	4,624	15,387	21,532
1985	472,157	4,674	15,053	23,371
1986	514,532	4,928	15,149	29,343
1987	572,479	6,409	14,960	33,364
1988	675,389	8,743	16,840	38,001
1989	769,745	14,700	19,399	42,362
1990	855,943	18,574	21,433	48,584
1991	1,020,600	17,008	23,087	50,528
1992	1,211,385	20,799	28,305	61,821
1993	1,341,629	23,521	31,546	61,400
1994	1,573,097	30,379	34,520	64,240
1995	1,865,922	43,574	43,691	77,653
1996	2,120,173	49,841	51,115	88,916
1997	2,428,312	55,668	55,265	86,094
1998	2,677,656	53,942	62,011	74,496
1999	2,938,379	72,105	60,905	65,292
2000	4,243,393	116,711	55,784	61,659
2001	4,627,582	153,565	49,080	65,047
2002	4,920,549	166,561	47,186	47,818
2003	5,374,415	195,139	44,754	68,836
2004	6,203,725	219,167	45,552	91,045
2005	7,126,194	238,537	53,104	115,374

Years	GDP	ST	FED	CD
2006	8,216,160	294,798	55,272	138,384
2007	9,239,786	309,396	71,804	132,299
2008	10,637,772	377,430	92,137	150,663
2009	13,199,707	451,744	117,455	148,403
2010	14,866,996	516,348	124,784	160,273
2011	18,276,440	633,357	137,353	184,853
2012	20,046,500	804,899	122,464	216,906
2013	22,385,657	842,528	120,964	239,460
2014	25,168,805	996,382	138,084	242,810
2015	27,443,022	1,087,790	162,248	306,220
2016	32,725,049	1,302,371	188,055	404,572
2017	35,552,819	1,328,965	197,911	496,772
2018	39,189,810	1,491,297	205,877	608,324
2019	43,798,401	1,459,200	238,200	685,600
2020	47,540,409	1,596,800	250,400	626,400
2021	55,795,515	1,981,400	279,600	747,300
2022	66,949,907	2,532,200	320,700	1,010,700