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# Socio Economic Determinants of Tax Revenue in Pakistan: An Empirical Analysis

Hafiz Khalil Ahmad<sup>1</sup>, Shabbir Ahmed<sup>2</sup>, Mansoor Mushtaq<sup>3</sup> and Muhammad Nadeem<sup>4</sup>

<sup>1</sup> Assistant Professor of Economics, Department of Economics, University of the Punjab, Lahore, Pakistan.
<sup>2</sup> Ph. D. Scholar, Department of Economics, National College of Business Administration & Economics (NCBA&E), Lahore, Pakistan.

<sup>3</sup> Lecturer, FAST School of Management, National University of Computer & Emerging Sciences, Islamabad, Pakistan

<sup>4</sup> Ph. D. Scholar, Department of Economics, National College of Business Administration & Economics (NCBA&E), Lahore, Pakistan.

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# ABSTRACT

After 1971, fiscal performance of Pakistan has not been satisfactory at any stage as it has seen huge budget deficit, high non-developmental expenditure and less revenue both in the form of tax and non-tax. At present, it has lowest tax-to-GDP ratio among major developing Asian economies. To handle this issue, the present study is an attempt to highlight the socio-economic determinants of tax revenue in Pakistan. For this purpose, the study has used annual time series data from 1975 to 2012. Auto regressive Distributed lag (ARDL) approach has been applied to estimate long run and short run empirical coefficients of these determinants. Tax-to-GDP ratio has been used as the explained variable while narrow tax base, economic activity, tax compliance, informal economy and government regime are used as explanatory variables. Among socio-economic determinants of tax revenue. However, informal economy and narrow tax base are negative and significant determinants of tax revenue in Pakistan. The study suggests that Pakistan can raise its tax revenue by documenting the informal economy, widening the tax base, improving institutional and political governance and eliminating tax exemption permitted to any particular pressure group.

KEYWORDS: ARDL; Budget Deficit; Per Capita GDP; Tax-to-GDP Ratio

# 1. INTRODUCTION

Governments of developing countries have limited resources and revenues with unlimited need for disbursements and expenditures. Every government has two types of revenue; tax and non-tax i.e. debt, aid and grant etc. This study has focused on first type of revenue. Taxes play a primary role in economic planning and they are the key source of government income. These are considered as a major source of income or revenue for a state to meet its obligations towards the nation. Taxes transfer the resources from citizens to government. It is a fundamental but omitted issue of development policy. Tax is considered as the backbone of government for revenue collection. It is one of the excellent tools to grow the potential for state performance to stabilize the social programs and for the return of external loans. The revenue generation of an economy is mainly due to its adequate ability of tax collection. At the level of development, a government may take other steps like deficit financing<sup>1</sup>, user charging or foreign aid and debt but tax has limited cost and inefficiency than other measures [6]. Improvement of tax system is necessary for a number of reasons. First, the governments of less developed economies have to launch a large number of developmental projects i.e. health, education, public parks and infrastructure etc. The poor who don't have sufficient income to live properly can benefit from these benefits. Second, the state can do its actions to lead the economy and make good desired sector of the economy with a good planning only if it has an effective tax structure. Third, counter-cyclical tax adjustments can offset the fluctuations in income and business cycle [5]. Fourth, taxes also redistribute wealth between taxpayers and individuals who receive public support. Fifth, due to lack of

<sup>&</sup>lt;sup>1</sup> Issuing the money supply without any security and grantee.

<sup>\*</sup> Corresponding Author: Hafiz Khalil Ahmad, Assistant Professor of Economics, Department of Economics, University of the Punjab, Lahore, Pakistan. hafizkhalil62.eco@pu.edu.pk

well-arranged and efficient financial markets and monetary system, mostly less developed economies have to depend for the most part on fiscal measures to regulate the economy [39]. For achieving desirable, sustained and long-run economic growth, the system of a country must be successful and efficient. An effective fiscal position is necessary for gaining suitable economic growth and stable position of a government. However, a sound fiscal approach can be gotten through proper tax system of an economy.

Pakistan's tax to GDP ratio has always remained at a low level since its establishment. In the FY-1960-61, its tax-to-GDP ratio was at 9%. In 1970, this ratio remained 12.5% and it was estimated that in next few years, it would get high tax to GDP ratio. But in 1971, Bangladesh cut off Pakistan which was a period of exam for the economy of Pakistan. After 1970, the budget of Pakistan has always been in deficit due to less revenue generation both in the form of taxes and trade revenue. At whatever time this deficit has been huge, other macro-economic variables have been affected badly as well GDP per capita and growth rate declined while inflation rose at an unexpected rate. At the same time, the economy had to face the problems of deficit in balance of payments due to huge decline in the value of exports. In 1980's, there was the time of war in Afghanistan against Union of Soviet Socialist Republics (USSR). Being a front line state, Pakistan had to face serious issues. Pakistan got huge amount of aid because of this hard stage. That huge aid badly affected the collection of tax revenue in Pakistan. In this period, military was ruling and it avoided imposing new taxes to overcome the anger of people against government. In this era, due to external and internal shocks, Pakistan could not collect required amount in the form of tax revenue. In 1980's, there was a huge reduction in income tax. In 1981-82, it was 21% of tax revenue but in 1985-86, it became 14% only. In the decade of 1990's, Pakistan joined World Trade Organization (WTO) and it switched from import substitution to export promotion polices for economic development. As a result, there was a huge decline in import tariffs due to trade liberalization. So the overall tax-to-GDP ratio of Pakistan fell during this period. However, harmonizing reforms were launched to move up the tax-to-GDP ratio. However, there was a rise in sales tax and income tax due to imposition of conditionalities by the International Monetary Fund (IMF). Because of decline in economic activities, government could not raise tax revenue to a reasonable amount. For that period, fiscal policy of Pakistan became sensitive due to increase in budget deficit which was 6% of GDP. On the other hand, during this era, there was great stress on tax administrations to boost tax revenue through improving the efficiency of tax institutions.

Nowadays, Pakistan's tax-to-GDP ratio is below 10% and it has been diminishing gradually. Although government has tried to enhance it and control the budget deficit with the help of IMF programs and Income Tax Ordinance 2001, yet it is still a difficult task to reduce the developmental and non-developmental expenditure of public sector. A number of developed countries like Belgium, Cuba, Denmark, Finland, France, Italy, Norway, Sweden and Zimbabwe etc. have more than 40% tax-to-GDP ratio which is dreamable and sufficient for a pleasant economy. If we compare Pakistan's tax-to-GDP ratio with that of other South Asian economies, the situation seems worse. Pakistan and Bangladesh have lowest Tax-to-GDP ratios in South Asia, i.e. 9.3 and 8.6 percent, respectively.

The remaining study has been organized as follows: Section 2 describes a critical review of literature. Section 3 explains data sources, model specification and description of variables. Section 4 describes econometric methodology and empirical findings. Section 5 concludes the study and recommends some policies.

### 2. REVIEW OF LITERATURE.

Very few studies have been undertaken to analyze the socio-economic determinants of tax revenue in different countries. Generally, tax as a percentage of GDP has been taken as the dependent variable along with the combination of other independent variables. The critical review of these studies is given below:

[2] investigated the indicators of tax efforts for 11 low income economies such as Bangladesh, Bolivia, India, Indonesia, Jordan, Mongolia, Morocco, Nicaragua, Pakistan, Philippines and Sri Lanka. The author used panel data for 15 years from 1991 to 2005. OLS technique was used and Hausman test was applied to choose between fixed effects and random effects models. Tax-to-GDP ratio was used as the dependent variable whereas sectoral share in GDP, broad money supply, ratio of public debt-to-GDP, GDP per capita and growth rate of population were taken as independent variables. The study highlighted that all of these developing nations did not have an adequate level of tax-to-GDP ratio due to two major reasons. First, narrow tax base and second, institutional and political problems; for instance, corruption, lawlessness, lack of accountability and political instability. Results of the study indicated that money supply, public debt, trade openness and population growth rate had significant impact on tax-to-GDP ratio of these developing

economies. Share of industry in GDP did not have any significant impact on tax collection.

[3] analyzed the effect of corruption and accountability on tax revenue in case of developing nations. They used cross-sectional data with average values for the period of 10 years from 1990-1999. Tax-to-GDP ratio was considered as the explained variable while population, GDP per capita, trade openness, sectoral share in GDP other than agriculture sector, governance index and corruption perception index were considered as explanatory variables. To draw panel econometric outcomes, OLS and 2SLS techniques were applied. The study concluded that due to higher per capita income and political stability, rich economies had more power to enhance the level of taxation by handling the government machinery and institutions. The study suggested that demand side policies and indicators such as institutional quality, control of corruption, accountability and rule of law were more responsible for accomplishing high tax-to-GDP ratio in developing economies than supply side factors.

[10] organized a panel study of 66 developing countries from 1990 to 2005 for showing the relationship between democracy and public inland tax of less developed countries. He applied generalized method of moments (GMM) for empirical and econometric analysis. Several variables were used such as per capita income, import as a share of GDP, inflation, population, corruption perception index, bureaucratic quality, share of urban population in total population, official development assistance (ODA) and administration quality. Although economic, social and long established variables determined tax revenue, yet there were some political factors and forces such as institutional performance, good governance, voice, accountability and democracy that also improved the tax system and tax collection of less developed countries. Among political factors, democracy was worthful indicator for achieving high tax-to-GDP ratio in less developed countries. The study suggested that democracy was a basis for policy implications and tax reforms in LDCs.

[9] conducted a panel study of 78 less developed economies for the period of 1990 to 2005. He found that in LDCs, not only social and economic factors are important but political factors also play a pivotal role to fluctuate the tax structure. He used variables like corruption, per capita income, inflation, share of imports in GDP and democracy. Two stages least square (2SLS) technique was used to draw panel estimations. The study suggested that democracy has positive, significant and favorable impact on tax revenue. It also highlighted that LDCs have a vast experience with political instability. Therefore, democracy reduces political conflicts and ultimately enhances revenue collection. At the same time, the study concluded that corruption had adverse and unfavorable impact on tax revenue in LDCs.

[4] used a panel of Sub-Saharan African countries over the period of 1990 to 2007 to see the factors affecting tax revenue. For that purpose, he used two stages least squares (2SLS) and generalized method of moments (GMM) for econometric and empirical analysis. Tax revenue was taken as the explained variable while national income, quality of institutions, foreign aid, trade openness, ratio of urban population to total population, inflation, underground economy, share of agriculture, industry and share of services in GDP were the explanatory variables of the model. Major objective of the study was to find political and economic factors affecting the revenue in Sub-Saharan African countries. Factors that caused tax revenue to grow were trade openness and growth of agriculture sector while value added in industry and services were unfavorable indicators of tax revenue. At the same time, bad governance, political instability, corruption, narrow tax base and bad economic conditions such as unemployment and poverty were the elements which were responsible for lower tax-to-GDP ratio in Sub-Saharan African countries. Final remarks of the research indicated that tax-to-GDP ratio can be improved by two major ways; through more resources and income, secondly, by improving the performance of political, social and economic institutions.

[34] conducted a panel study of 26 less developed economies to see the impact of corruption on tax-to-GDP ratio. Panel data was used from 2002 to 2006. Corruption perception index was used to measure corruption. It was the main explanatory variable and other supporting variables were GDP per capita, consumer price index (CPI), share of agriculture sector in GDP, share of industry in GDP, share of services in GDP and trade openness, while tax-to-GDP ratio was taken as the explained variable. Results of the study indicated that the impact of GDP on tax revenue was positive and considerable. Share of agriculture had a negative and significant impact on tax revenue. While openness did not have a considerable impact on revenue collection. Corruption had a downbeat and significant impact on tax-to-GDP ratio, economic growth and national income of developing economies.

[35] analyzed the relationship between tax institutions, tax revenue and government administration for Sub-Saharan Africa. They used a panel data of 45 economies from 1972 to 2005. They found that better quality of institutions increased tax revenue and ultimately led to good governance.

[16] investigated the impact of tax revenue on major macro-economic factors. They used panel data of 120 countries, four type of economies; high income, high middle income, low middle income and poor countries. Panel data was used from 1960 to 2010. They used variables such as tax-to-GDP ratio, inflation, tax on imports, wealth tax, property tax, saving rate, share of FDI in GDP and GDP. OLS technique was applied to find the results. The study emphasized that countries having high national income also had higher tax-to-GDP ratio relative to middle and low income economies. Inflation had significant and direct impact on tax-to-GDP ratio in all types of countries. In advanced economies, results about direct taxes were more considerable than indirect taxes. Similarly, relationship between FDI inflow and tax rate was found to be inverse. Higher rates of tax reduced the influx and profits of multi-national companies (MNC's) and vice versa. An increase in tax rate particularly sales tax led to increased private savings due to less consumption of goods. The study concluded that inflation, FDI and savings had a causal relationship with tax rate in all countries.

[23] found the determinants of local tax efforts for 26 European Union economies for the period from 2001 to 2010. The variables used for tax efforts included GDP growth rate, FDI, trade openness, unemployment, government debt and fiscal decentralization both on revenue and expenditure side and different proxies for population and inflation. The study concluded that in the short-run, revenue decentralization was positively related to domestic tax revenue. However, unemployment, financial crises and expenditure decentralization were negatively related to tax revenue. At the same time, two year lagged revenue showed inverse impact on recent tax revenue. The study also found the long-run results which indicated that population other than labor force was inversely related to tax revenue while expenditure decentralization and one year lagged tax collection caused to enhance current tax revenue in the long-run.

[8] found social, demographic, political, structural and economic variables for a panel of 32 Latin American and Caribbean economies for the time period of 1990-2005. Random effect model was applied for econometric results. The results of the study showed that per capita income and trade openness had positive and statistically significant impact on the level of taxation while agricultural share in GDP and informal economy had inverse impact on tax efforts. But fiscal deficit of lagged years did not have any particular impact on tax revenue of current years. Among social and demographic factors, education, rate of labor force participation and size of population had prescribed impact on tax collection while urbanization was negatively related to tax revenue. Among political indicators, fundamental individual rights, political liberty and constancy caused to grow tax revenue in Latin America.

[27] examined the impact of trade openness on tax revenue of trade for Nigerian economy. They used annual data from 1970 to 2009. Johnson Cointegration technique was applied for econometric and empirical findings. For empirical analysis, the study used several explanatory variables such as trade openness, exchange rate, external debt, GDP and labor force participation rate. The explained variable was tax on trade. Findings of the study suggested that GDP, external debt, labor force and trade openness were positively related to trade tax revenue. But exchange rate was inversely related to trade tax revenue. The study also suggested that Nigerian economy should adopt strong macro-economic policies to stimulate tax revenue and trade tax revenue.

[24] found the impact of trade openness on tax revenue of Pakistan. They used annual data from 1975 to 2010 and applied OLS technique to draw empirical results. Findings of the study indicated that trade liberalization, GDP and share of trade in GDP had positive impact on tax revenue. On the other hand, population and exchange rate had adverse impact on tax revenue resulting in less revenue for the economy.

As discussed above, most of the studies have shown the relationship between tax revenue and economic growth, tax buoyancy and tax elasticity. A number of studies are related to panel data for describing the tax performance. The literature on the empirical relationship of socio-economic variables with tax revenue is very rare, particularly, in less developed economies. In case of Pakistan, empirical literature on socio-economic determinants of tax revenue is almost non-existing. So, the present study is intended to fill the gap in empirical literature on long-run analysis of socio-economic determinants of tax revenue in case of Pakistan.

**3. Data Collection.** Annual time series data has been used from 1975 to 2012. Data has been collected from various issues of Economic surveys of Pakistan [14], 50 Years Hand Book of Statistics [17], World Development Indicator (WDI) [41], International Monetary Fund (IMF), International Financial Statics (IFS) [18] and Federal Bureau of Statistics (FBS) [12].

3.1. Model Specification. Following model has been used for empirical analysis:

TX= f (GDP, AGRI, URBN, SER, GREG)

All of the variables which affect the dependent variable cannot be included in the model. However, they affect

dependent variable, so for that purpose, we have to use error term which captures the effect of all other variables which are not included in the model but has negligible effect on the dependent variable. So, in econometric terms, following model was considered:

TX= f (GDP, AGRI, URBN, SER, GREG, ut<sub>i</sub>)

After intercept and error term

$$TX_{t} = \alpha_{0} + \beta_{1}GDP_{t} + \beta_{2}AGRI_{t} + \beta_{3}URBN_{t} + \beta_{4}SER_{t} + \beta_{5}GREG_{t} + \mu_{t}$$

Except government regime, all variables are taken in the form of natural logarithm. The new form of the model will be as below:

 $\ln TX_{t} = \alpha_{0} + \beta_{1}\ln GDP_{t} + \beta_{2}\ln AGRI_{t} + \beta_{3}\ln URBN_{t} + \beta_{4}\ln SER_{t} + \beta_{5}\ln GREG_{t} + \mu_{t}$ 

But in the long run, ARDL model following equation will be used for long-run empirical analysis.

$$\Delta \ln TX_{t} = \alpha_{o} + \sum_{i=1}^{n} b_{i} \Delta (\ln TX)_{t-i} + \sum_{i=0}^{n} c_{i} \Delta (\ln GDP)_{t-i} + \sum_{i=0}^{n} d_{i} \Delta (\ln AGRI)_{t-i}$$
  
+ 
$$\sum_{i=0}^{n} e_{i} \Delta (\ln URBN)_{t-i} + \sum_{i=0}^{n} f_{i} \Delta (\ln SER)_{t-i} + \sum_{i=0}^{n} k_{i} \Delta (\ln GREG)_{t-i} + \theta_{1} (\ln TX)_{t-1}$$
  
+ 
$$\theta_{2} (\ln GDP)_{t-1} + \theta_{3} (\ln AGRI)_{t-1} + \theta_{4} (\ln URBN)_{t-1}$$
  
+ 
$$\theta_{5} (\ln SER)_{t-1} + \theta_{6} (\ln GREG)_{t-1} + \epsilon_{t}$$

**n** shows the selected lag length

 $\Delta$  denotes the first difference operator

 $\alpha_0$  is the drift component and  $\boldsymbol{\epsilon}_t$  is random term

Error Correction Model for Short Run-Analysis

$$\Delta \ln(TXt)_{t} = \alpha_{o} + \sum_{i=1}^{n} \beta_{1i} \Delta (\ln TX)_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta (\ln GDP)_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta (\ln AGRI)_{t-i}$$
$$+ \sum_{i=0}^{n} \beta_{4i} \Delta (\ln URBN)_{t-i} + \sum_{i=0}^{n} \beta_{5i} \Delta (\ln SER)_{t-i} + \sum_{i=0}^{n} \beta_{6i} \Delta (\ln GREG)_{t-i}$$
$$+ \gamma ECM_{t-1} + \gamma_{t}$$

 $\alpha_0$  is the drift component

**n** shows the selected lag length and  $\gamma$  describes the speed of adjustment towards equilibrium.

**3.2. Description of Variables and Expected Outcomes.** Variables and their expected outcomes have been described as below:

**TX:** TX is the dependent variable that is tax as percentage of GDP. It has been derived by dividing total tax on total GDP and for percentage the ratio is multiplied by 100. Total tax revenue includes both direct and indirect taxes. While GDP is the market value of all the final goods and services produced within a country in a specific time period, say one year. Tax-to-GDP ratio is a proxy for tax revenue. Earlier studies like[25], [3], [4], [6], [34] and [8] have aslo used this proxy.

**GDP:** GDP is per capita GDP in constant local currency units. It measures the level of development and economic activity of an economy. It is an important economic determinant of tax revenue. Per capita GDP can be derived by dividing total GDP on total population. The expected sign of GDP is positive because more economic activity will lead to higher revenue collection in the form of taxes. This proxy has also been used by previous studies such as [36], [32] and [8].

**AGRI:** AGRI is the percentage share of agriculture in GDP. It is also an important economic determinant of tax revenue because it is a proxy to measure narrow tax base of the economy. It can be obtained by dividing total agriculture share on total GDP and ratio is multiplied by 100. The expected impact of narrow tax base is negative because in Pakistan, agriculture sector contributes very less in tax revenue. As the share of agriculture will rise, taxes will reduce and that will reduce tax-to-GDP ratio of Pakistan. This variable has also

been used by [38], [4] and [6].

**URBN:** URBN is the percentage share of urban population in total population. It has been obtained by dividing urban population over total population. It is an important social determinant because it is a proxy for tax compliance. Tax compliance is an assumption or principle that tax payers will meet the terms of tax laws, obey the rules of taxes and accurately report their income and deductions honestly. Expected outcome of tax compliance is positive because as more people obey tax laws and report their income truly, tax-to-GDP ratio will increase. In urban areas, people mostly belong to industrial and services sectors. So, higher share of urban population will increase industrial and services share that will ultimately increase tax-to-GDP ratio. This variable has also been used in different studies such as [15], [9], [4] and [8].

**SER:** SER is the secondary school enrolment ratio as percentage of gross enrollment. It is a social variable and also a proxy for informal economy. Expected outcome of informal economy is negative because more informal economy will lead to more undocumented economy that will reduce tax collection of Pakistan. This variable has also been used by [40], [22] and [8].

**GREG:** GREG is the government regime which has been measured with dummy variable "1" for democracy and "0" for dictatorship. This variable has been used to check whether any kind of government regime in the form of dictatorship or democracy, respectively, can influence the tax-to-GDP ratio of Pakistan. The expected outcome of government regime is indeterminate for Pakistan. This variable has also been used by [22] and [26].

**4. Methodology.** In time series econometrics, for the analysis of any model, we have to check the stationarity of data. A series is called stationary if it has zero mean and constant variance. To check the stationarity of series, we applied unit root test e.g. Augmented Dickey- Fuller test and Phillips-Perron [33] test.

Table 1: A	Augmented	Dickey-Fuller test	

Variables Name		Intercept	Intercept & Tre	nd
	t-Statistic	Probability	t-Statistic	Probability
LnTX			-4.164914*	0.0117
LnGDP	-4.474285**	0.0010	-4.636869**	0.0036
LnAGRI	-5.976524*	0.0000	-11.95482*	0.0000
LnURBN	-5.636265**	0.0000	-5.560974**	0.0003
LnSER	-5.303365**	0.0001	-5.373298**	0.0005
GREG	-5.830952**	0.0000	-5.914869**	0.0001

\* shows stationary at level and \*\* shows stationary at first difference

	Tabl	e 2: Phillips-Perron	test	
Variables Name		Intercept	Intercept & Tre	nd
	t-Statistic	Probability	t-Statistic	Probability
LnTX			-4.146254*	0.0122
LnGDP	-4.506438**	0.0010	-4.610523**	0.0039
LnAGRI	-3.301812*	0.0220	-12.54739*	0.0000
LnURBN	-5.636085**	0.0000	-5.636085**	0.0000
LnSER	-6.413567**	0.0000	-6.562847**	0.0000
GREG	-5.830952**	0.0000	-5.914869**	0.0001

\*means stationary at level and \*\* shows stationary at first difference.

Both tests of unit root, i.e. ADF and PP show that lnTX and lnAGR are stationary at level and all other variables like lnGDP, lnURBN, lnSER and GREG are stationary at first difference.

#### 4.1. Autoregressive Distributed Lagged (ARDL) Approach to Cointegration

In this study, we applied autoregressive distributed lag (ARDL) approach for empirical findings and long-run relationship. It was built by [29] and Pesaran and Shin [30, 31]. Later on, it was further organized by [28].

Earlier approaches of Cointegration like Stock and Watson (1988), Johansen [19, 20] and Johansen and Juselius (1990) show better findings for large samples I(1). At the same time, these techniques can be applied only if they have same order of integration. But in economics, due to shocks and time trend, it is not possible that each time series has the same order of integration. Rather, series have different orders of integration like I(0) and I(1). So in this case, techniques such as Stock and Watson [37], Johansen (1988, 1991) and Johansen and Juselius (1990) cannot be applied. In such a situation, only autoregressive distributed lag (ARDL) approach can give better long-run relationship. It is the combination of both autoregressive models and

distributed lag models. So, a time series is not only a function of its lagged values but also the function of current and lagged values of one or more regressors. ARDL technique has several advantages and it has superiority over other econometric techniques which are used for long-run relationship.

**4.2. Bound Testing Approach to Cointegration.** The procedure of ARDL model begins with bound testing approach. The null hypothesis of bounds testing is that no long-run relationship exists among variables. In other words, cointegration does not exist and alternate hypothesis of bound test is that variables have long-run relationship. To see this relationship, we calculate F-statistic of Wald test. Later on, the estimated value of F-statistic is compared with the critical tabulated values given by Pesaran et al. [28]. If calculated F statistic is greater than critical values of upper bounds, we cannot accept the null hypothesis of "no long-run relationship" and accept the alternative that cointegration exists among series. If calculated F statistic is lower than critical values of lower bound, we can accept the null hypothesis of "no long-run relationship" and reject the alternative that cointegration does not exist among variables. However, if calculated F statistic lies between upper and lower bounds, the results will be inconclusive.

Both unit root tests indicate that all of the variables have not same order of integration. If all variables are stationary at level, the OLS method can be applied to draw econometric results. On the other hand, if all variables are stationary at first difference, then Johansen (1988, 1991) and Johansen and Juselius (1990) techniques can be applied to see long-run relationship. But in this model, series have both types of order of integration; some at level and some at first difference, so autoregressive distributed lag (ARDL) approach has been applied to see long-run relationship.

After checking the stationarity of series, we have to see optimal lag length. Optimal lag length indicates that how many lags should be used in the model.

Lag	LR	FPE	AIC	SC	HQ
0	NA	8.93e-18	-22.22994	-21.96871	-22.13785
1	448.2181*	2.09e-23*	-35.22460*	-33.39599*	-34.57993*

\* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

#### Table 4: Bound Testing Approach to Cointegration

Test-statistic	Calculated-Value	Lag-order	Significance level	Bound Critical Valu intercer	es(unrestricted)
F-statistic	5.587681	1		I(0)*	I(1)**
			1% 5% 10%	3.15 2.45 2.12	4.43 3.61 3.23

\* shows lower bound value and \*\* shows upper bound value.

As the null hypothesis of the test is "no cointegration" and it can be rejected only if calculated F statistic is higher than upper critical bound value. Calculated F-statistic is 5.587681 which is greater than critical value of upper bound at 1%, 5% and 10%, respectively. So, the null hypothesis was rejected and alternative hypothesis was accepted. So our model has long-run relationship.

ARDL (0, 0, 1, 0, 0, 0) has been selected based on Schwarz Bayesian Criterion (Dependent variable InTX).					
Variable name	Coefficient	Standard Error	t-Ratio	Probability	
LnGDP	2.5184	.54576	4.6144	.000	
LnAGRI	-3.7426	1.0318	-3.6273	.001	
LnURBN	1.5688	.36649	4.2806	.000	
LnSER	56365	.26714	-2.1099	.043	
GREG	018294	.013500	-1.3551	.186	
С	-5.9217	1.8410	-3.2166	.003	

## Table 5: Estimated Long Run Coefficients using the ARDL Approach

The results show that GDP per capita is positively related to tax revenue. Its impact on tax collection is positive and statistically significant at 1 percent level of significance. A 1 percent increase in GDP will lead to 2.518 percent growth in tax-to-GDP ratio. The results indicate that more economic activity and level of development will lead to higher tax-to-GDP ratio. That's why, developed economies have higher tax-to-GDP ratio than developing economies. The results match with those of [36] and [11].

Agriculture share is negatively related to tax-to-GDP ratio. One percent growth in agriculture share will reduce growth of tax-to-GDP ratio by 3.7426 percent. It is statistically significant at 1 percent level and indicates that more share of agriculture sector reduces the tax revenue. Agriculture has almost 21 percent contribution in GDP of Pakistan but its contribution in tax revenue is almost 1 percent because of low tax on the income from agriculture sector. A number of studies support this negative relationship such as [38] and [4].

The sign of coefficient of urbanization or urban population is positive and it is also statistically significant at 1 percent level of significance. The coefficient of tax compliance indicates that 1 percent growth in urban population will lead to 1.568 percent growth in tax-to-GDP ratio of Pakistan. As it is a proxy of tax compliance which is based on the assumption that tax payers will meet the terms of tax laws, obey the rules of taxes and accurately report their income and deductions honestly. So, the obligation of tax laws will lead to an increase in tax revenue. So these results are also according to theory. Moreover, previous studies such as [15] and [4] support this positive relationship.

As secondary school enrolment ratio is a proxy of informal economy, it has negative and statistically significant impact on tax-to-GDP ratio at 5 percent level of significance. The coefficient of informal economy indicates that 1 percent growth in informal economy will reduce growth of tax-to-GDP ratio of Pakistan by .56365 percent. More informal economy will reduce the tax revenue and vice versa.

The coefficient of government regime is negative and it is statistically insignificant. In Pakistan, it does not matter whether there is democracy or dictatorship that can raise the level of tax-to-GDP ratio. However, good governance either in the form of democracy or dictatorship matters to raise tax-to-GDP ratio.

**4.3. Short Run Dynamics Results.** Like long-run, the magnitude of economic activity is positive and statistically significant in the short-run. In the short-run, narrow tax base is insignificant because the imposition of higher tax on agriculture will reduce the output of per worker in agriculture sector and it will reduce national income and hence the tax-to-GDP ratio. The coefficient of tax compliance is positive and statistically significant and it implies that the obligation of tax laws will lead to an increase in tax revenue. The magnitude of informal economy is negative and statistically significant in short-run indicating that higher the informal economy, lower will be the tax-to-GDP ratio. Like the long-run, government regime does not matter in the short-run to affect tax revenue. The magnitude of (ECM) is negative and statistically significant and it shows 100 percent adjustment of the model in next period. If error correction is 100 percent, it means that complete adjustment is being done in the given period.<sup>2</sup> Hundred percent error correction has also been supported by [13] and [7].

#### Table 6: Error Correction Representation for the Selected ARDL Mode

ARDL(0,0,1,0,0,0) sele	ected based on	ı Schwarz Baye	esian Criterion
Deper	ndent variable	is dLNTAX	

Regressor	Coefficient	Standard Error	T ratios	Prob
Dngd	2.5184	.54576	4.6144	0.000
Dlnagr	24.5746	15.5687	1.5785	0.125
dLNBAN	1.5688	.36649	4.2806	0.000
dLNSER	56365	.26714	-2.1099	0.043
dGREG	018294	013500	-1.3551	0.186
dC	-5.9217	1.8410	-3.2166	0.003
ecm(-1)	-1.00	000		
R-Squared	.637	36		
R-Bar-Squared	564	83		

DW-statistic

ecm=LNTAX-2.5184\*NGD+3.7426\*LNAGR-1.5688\*LNBAN+.56365\*LNSER+.018294\*GREG+5.9217\*C

2.0122

<sup>&</sup>lt;sup>2</sup> [1] Asteriou, Dimitrios, and Stephen G. Hall. Applied Econometrics: a modern approach using eviews and microfit. New York: Palgrave Macmillan, 2007

**Diagnostic Tests** 

Table 7: Test of Serial Correlation, Functional Form and Heteroscedasticity					
Lagrange multiplier test for serial correlation	.017926	[.893]			
Ramsey's RESET test for functional form	.51967	[.471]			
White Heteroscedasticity test	11378	[.736]			

The diagnostic tests indicate that model has no serial correlation, no misspecification of functional form and no heteroscedasticity.

**Stability Test.** Stability of the long-run coefficients has been shown with the help of cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUM SQUARE) tests.



As CUSUM and CUSUM Squares tests verify that estimated lines are inside the critical lines at 5 percent level of significance, so it shows the stability of the model. If calculated lines do not lie between critical bounds, then model will not be stable. In other words, model has no structural break and it can be applied for policy options.

**5.1. Conclusion.** Like other indicators of economic growth, tax-to-GDP ratio is also a better measure to judge the economic position of a nation. The sovereignty of Pakistan acts upon the capability of the government of Pakistan to raise revenue collection in the form of taxes. Unfortunately, tax-to-GDP ratio in Pakistan is below 10 percent. [21] described that for a developing nation, it should have a minimum of 10-15 percent tax-to-GDP ratio. The study has given a comparison of Pakistan with developed and developing nations and showed that Pakistan's tax-to-GDP ratio is the lowest, even in South Asia. Study has examined the determinants which are causing stagnation of tax-to-GDP ratio in Pakistan. For this purpose, time series data has been used from 1975 to 2012. Augmented Dickey-Fuller (ADF) test and Phillips-Perron Test (PP) were used to check the stationarity of the series. Two series are integrated of I(0) and four series have order of integration as I(1). So, autoregressive distributed lag approach was applied to draw empirical long-run relationship. For checking long-run relationship among series, bound testing approach was applied. Long-run empirical results suggested that per capita GDP has positive and significant impact on tax-to-GDP ratio of Pakistan. Tax compliance also has positive and statistically significant impact on tax revenue of Pakistan, while informal economy and narrow tax base have negative and statistically significant impact on tax

performance of Pakistan. The present study concludes that Pakistan can raise its tax revenue by enhancing economic activity, tax compliance and reducing informal sector and narrow tax base.

**5.2. Policy Recommendations.** On the basis of long-run empirical relationship, some polices are given below to achieve the desirable level of tax-to-GDP ratio in Pakistan. The relationship of economic activity and tax-to-GDP ratio is positive and direct. It is the need of hour to increase more economic activity in all sectors of the economy to raise tax-to-GDP ratio. As informal economy is negatively related to tax efforts, so energetic operations for documentation of economy should be initiated. School enrolment ratio is negatively related to tax-to-GDP, as education increase in developing economies, people learn more ways to tax evasion and corruption. So, suitable education system should be launched to reduce such type of informal activities. As narrow tax base has negative impact on tax collecting very less tax revenue from agriculture sector. At the same time, the share of other sectors should be increased because a major portion of tax is collected from industry and services; 51 and 34 percent of total tax, respectively. Tax compliance has positive and direct impact on tax-to-GDP ratio, so to raise the level of tax compliance, civil awareness movements should be launched on normal basis.

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