Volume and Issues Obtainable at Center for Sustainability Research and Consultancy

Review of Economics and Development Studies
ISSN:2519-9692 ISSN (E): 2519-9706
Volume 4: No. 1, June 2018
Journal homepage: www.publishing.globalcsrc.org/reads

Economic Determinants of Tax Buoyancy in Pakistan: An ARDL Bounds Testing Approach

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ARTICLEDETAILS

History
Revised format: May 2018
Available Online: June 2018

Keywords
Economic Determinants, Tax Buoyancy, Pakistan

JEL Classification
H29, H20

ABSTRACT

Fiscal policy, being the policy of government expenditures and revenues can play an imperative role in mobilization of resources. Tax revenues determine the capability of an economy to finance government spending but tax situation in many developing countries like Pakistan is very unfortunate. This study explores the economic determinants of tax buoyancy in Pakistan for the period of 1996 to 2016. For this purpose, aggregate and disaggregated analyses of various types of taxes have been conducted using the ARDL bounds test technique. The findings of the study demonstrate that various taxes buoyancies have mixed results with various economic factors.

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Recommended citation: Sheikh, M.R., Akhtar, M.H., Abbasi, M.A., Subhani, F., (2018). Economic Determinants of Tax Buoyancy in Pakistan: An ARDL Bounds Testing Approach. *Review of Economics and Development Studies, 4* (1) 11-21
DOI: 10.26710/reads.v4i1.276

1. Introduction

Since last many decades, the fiscal deficit stands as one of the imperative issues across many developing countries due to the imbalance between expenditures and revenues (Ansari, 1982). One can easily understand the escalating demand for public funds to finance the public expenditures in developing countries to achieve the goals of socio-economic development. For this purpose, an effective tax policy needs to be amplified to become a significant tool for the better mobilization of resources (Wawire, 2011). Thus, a government can play a pivot role in stabilization of economy by using different tools of fiscal policy.

Tax is a major source of revenue for any government for administrating its functions. Collection of revenues from different tax sources may support to enhance the speed of development for any country (Haque, 2009). In any country, if tax administration is not performing in an efficient way, it shows that there is some ambiguity in the fiscal system.

Developing countries may increase their economic growth through proper mobilization of their domestic resources which can be attained by the generation of tax revenues (Wilford and Wilford, 1978). Unlike most of the developing countries, Pakistan is blessed with natural, physical and human resources but she is facing the problem of fiscal deficit due to the inappropriate utilization of the resources. Historically, Pakistan is facing the music regarding socio-economic and political spheres. The situation of fiscal deficit has remained flimsy and it is recorded at 3.9 percent of GDP in the current year. There are many reasons for low tax collection including tax evasion, complicated procedure, and narrow tax base. Since last three years, the trends of fiscal indicators have been observed ascendant in Pakistan. Overall public revenues and particularly tax to GDP ratio have mounted from 9.8 percent to 12.6 percent and 13.3 percent to 15.3 percent respectively while public spending to GDP ratio has condensed from 21.5 percent to 19.9 percent (GOP, 2016).

Thus, the country is compelled to rely on developed countries for the financial assistance to finance its development projects. Thus, in a developing country like Pakistan resource mobilization may help to reduce the fiscal deficit and achieve economic development. Rest of the paper is organized as: Section 2 explains the concept and measurement of tax buoyancy. Section 3 discusses the various studies conducted on the subject. Section 4 outlines the model, data and methodology. In section 5, the results and discussions have been explained. Finally, the conclusion and polices have been offered in section 6.

2. Tax Buoyancy: Concept and Measurement

Tax buoyancy is a measure to determine the tax performance of any country and an important ingredient in the fiscal policy of an economy. The concept of tax buoyancy can be used to calculate the sensitivity, responsiveness, proportionate or percentage change in tax revenues or tax receipts to percentage change in GDP. Tax buoyancy is a crude measure and does not differentiate between the discretionary and automatic growth of revenues. The formula of tax buoyancy is given as:

$$\text{Tax Buoyancy} = \frac{\text{Percentage Change in Tax Revnue}}{\text{Percentage Change in GDP}} \times 100$$

A tax will said to be buoyant in which revenues increase by more than one percent for one percent increase in GDP or output or national income. Tax buoyancy explains the growth in tax revenues by adopting the discretionary changes (change in tax base) and automatic changes (increase in number of taxpayer by increase in real income or through tax administration work efficiently).During the economic growth process, tax buoyancy reveals the capability of the tax structure to generate the tax revenues.

3. Review of Assorted Literature

In this section, we have examined all those empirical studies which are associated with our analysis along with their key results. A number of studies have been conducted to investigate the tax buoyancy across different countries with different results.Table 1 shows the summary of the reviewed empirical literature.

Table 1: Assorted Studies on Tax Buoyancy

Reference(s)	Time	Country	Methodology	Main Results
Naqvi.A.H (2016)	2004-2014	Comparative Performance of States of India	Ordinary Least Squares (OLS)	An aggregate analysis has been done in which general category shows that Haryana, Goa, and Rajasthan having the low buoyancy which is less than one.
Bayu.T (2015)	1974-2010	Ethiopia	Johansson Cointegration	The findings of the study show that value added in the services sector, budget deficit, and import having positive and significant impact while manufacturing sector has insignificant and official development assistance has negative but significant impact.
Krushna.A.V (2015)	1950-2010	India	Log linear Regression	Tax buoyancy is greater than unity. It is very high in 1960s to 1970s and approximately constant in 1980s to 2000s.

Bonga et al. (2015)	2000-2013	Zimbabwe	Ordinary Least Squares (OLS)	Individual tax and Excise duty are significant. Company tax, carbon tax, VAT and custom duty are insignificant impact on GDP.
Belinga.V et al. (2014)	1965-2012	OECD Countries	Error Correction Model	Short Run: Personal income Tax, Social Security Contribution, Excise Tax and Property Tax having the buoyancy coefficient less than one while Corporate Income Taxes and Goods and Services Taxes have buoyancy coefficients greater than one. Long Run: Personal income Tax, Social Security Contribution, Corporate Income Taxes and Goods and Services Taxes having buoyancy coefficients greater than one. Excise Tax and Property Tax having the buoyancy coefficient is less than one.
Yousaf and Haq (2013)	1980-2011	Bangladesh	Johansen Cointegration and Vector error correction technique	Elasticity and Buoyancy coefficients of Total tax revenue, direct taxes, sales tax and value added tax is greater than one. Whereas customs duties elasticity and buoyancy coefficient
Cotton (2012)	1990-2009	Trinidad and Tobago	Least Squares Regression	Buoyancy coefficients of direct and indirect taxes, income tax , company tax, property tax, excise tax and trade tax are less than one while value added tax buoyancy coefficient is greater than one.
Shaikh (2012)	1974-2009	Pakistan	Ordinary Least Squares (OLS) method	Buoyancy estimates are more than unity because of diversification, expansion of tax base and manufacturing sector. Structural changes occur in economy as the size of agriculture has shrink in GDP. Proportion of direct tax is also increasing in the total taxes.
Ahmed and Mohammed (2010)	1998-2008	25 developing countries	Pooled Least Square	Inverse relationship between Grants and tax buoyancy while positive relationship of Import, Manufacturing, Services, Monetization and Budget Deficit with tax buoyancy.
Begum (2007)	1991-2005	Bangladesh	OLS	Tax buoyancy ratio is greater than unity for both direct and indirect taxes.
Rasheed.F (2006)	1980-2004	Pakistan	Cointegration test	Tax buoyancy of GDP, volume of trade and Mo is less than one whereas growth in tax revenue has not significant relationship with investment, credit, inflation and public debt.
Timsina (2006)	1975-2005	Nepal	Ordinary Least Squares (OLS)	Import Tax (inelastic) positively, Income Tax (elastic) positively, VAT (inelastic) positively, Excise Tax (inelastic) positively affect the Tax Revenue.
Mukarram (2001)	1981-2001	Pakistan	Chain Indexing Technique	Elasticity and buoyancy of estimates are higher for direct taxes followed by sales taxes. However, customs and excise duties appear to be relatively rigid, for this the overall tax elasticity is low as well. Further, the estimates of buoyancy are higher than their corresponding elasticities for all the taxes.
Leuthold and N'Guessan (1986)	1970-1979	Ivory Coast	OLS	Value added tax, total consumption tax and import tax are buoyant. Income tax, profit tax, excise duty, gasoline tax, trade tax and export tax buoyancy coefficient is less than one.

Source: Author's compilation

4. Model, Data and Methodology

4.1 Model Specification

A number of tax buoyancy models have been proposed with economic variables. The models observe the impact of economic variables further across total tax buoyancy, direct tax buoyancy, indirect tax buoyancy, income tax buoyancy, workers' welfare tax buoyancy, customs duty tax buoyancy, federal

excise duty tax buoyancy and sales tax buoyancy. To investigate the impact of economic variables on tax buoyancy, following econometric models of aggregate taxes and disaggregate taxes have been estimated:

a) Aggregate Models

Model 1: Total Tax Buoyancy Model

$$TBT_t = \beta + \alpha_1 MVA_t + \alpha_2 AVA_t + \alpha_3 SVA_t + \alpha_4 TRADE_t + \alpha_5 ODA_t + \alpha_6 BD_t + \alpha_7 INF_t + \varepsilon_t \quad (1)$$

Model 2: Direct Tax Buoyancy Model

$$TBD_t = \beta + \alpha_1 MVA_t + \alpha_2 AVA_t + \alpha_3 SVA_t + \alpha_4 TRADE_t + \alpha_5 ODA_t + \alpha_6 BD_t + \alpha_7 INF_t + \varepsilon_t \quad (2)$$

Model 3: Indirect Tax Buoyancy Model

$$TBINDT_t = \beta + \alpha_1 MVA_t + \alpha_2 AVA_t + \alpha_3 SVA_t + \alpha_4 TRADE_t + \alpha_5 ODA_t + \alpha_6 BD_t + \alpha_7 INF_t + \varepsilon_t \quad (3)$$

b) Disaggregate Models

Model 4: Income Tax Buoyancy Model

$$TBIT_t = \beta + \alpha_1 MVA_t + \alpha_2 AVA_t + \alpha_3 SVA_t + \alpha_4 TRADE_t + \alpha_5 ODA_t + \alpha_6 BD_t + \alpha_7 INF_t + \varepsilon_t \quad (4)$$

Model 5: Workers Welfare Tax Buoyancy Model

$$TBWWT_t = \beta + \alpha_1 MVA_t + \alpha_2 AVA_t + \alpha_3 SVA_t + \alpha_4 TRADE_t + \alpha_5 ODA_t + \alpha_6 BD_t + \alpha_7 INF_t + \varepsilon_t \quad (5)$$

Model 6: Custom Duty Buoyancy Model

$$TBCD_t = \beta + \alpha_1 MVA_t + \alpha_2 AVA_t + \alpha_3 SVA_t + \alpha_4 TRADE_t + \alpha_5 ODA_t + \alpha_6 BD_t + \alpha_7 INF_t + \varepsilon_t \quad (6)$$

Model 7: Federal Excise Duty Buoyancy Model

$$TBFED_t = \beta + \alpha_1 MVA_t + \alpha_2 AVA_t + \alpha_3 SVA_t + \alpha_4 TRADE_t + \alpha_5 ODA_t + \alpha_6 BD_t + \alpha_7 INF_t + \varepsilon_t \quad (7)$$

Model 8: Sales Tax Buoyancy Model

$$TBST_t = \beta + \alpha_1 MVA_t + \alpha_2 AVA_t + \alpha_3 SVA_t + \alpha_4 TRADE_t + \alpha_5 ODA_t + \alpha_6 BD_t + \alpha_7 INF_t + \varepsilon_t \quad (8)$$

4.2 Description of the variables

Table 2 shows the description of the variables in detail.

Table 2: Variables with description

Variable(s)	Description
TBT	Total Tax Buoyancy (Total Tax as percentage of GDP)
TBD	Direct Tax Buoyancy (Direct Tax as percentage of GDP)
TBINDT	Indirect Tax Buoyancy (Indirect Tax as percentage of GDP)
TBIT	Income Tax Buoyancy (Income Tax as percentage of GDP)
TBWWT	Workers Welfare Tax Buoyancy (Workers Welfare Tax as percentage of GDP)
TBCD	Custom Duty Tax Buoyancy (Custom Duty as percentage of GDP)
TBFED	Federal Excise Duty Tax Buoyancy (Federal Excise Duty as percentage of GDP)
TBST	Sales Tax Buoyancy (Sales Tax as percentage of GDP)
MVA	Manufacturing Value Added (percentage of GDP)
AVA	Agriculture Value Added (percentage of GDP)
SVA	Services Value Added (percentage of GDP)
TRADE	Trade (percentage of GDP)
ODA	Net Official Development Assistance received (percentage of GNI)
BD	Broader Money (percentage of GDP)
INF	Inflation (measured by CPI)
ε	Error Term

4.2 Data and Methodology

The data for dependent variables have been taken from the website of Federal Board of Revenue of Pakistan (FBR) for the period of 1996 to 2008 and for the period of 2009 to 2016from Budget briefs by Ministry of Finance, government of Pakistan. The data on independent variables have been extracted from the World Development Indicators (WDI) for the period of 1996 to 2016. The study has used the ARDL methodology for analysis.

5. Results and Discussions

5.1 Unit Root Analysis

Table 3 describes unit root test results at level. The results of ADF represent that variables have mixed order of integration.

Table 3: ADF Test Results

ADF Unit Root Test at Level							
Variables	**Intercept**	**Lags**	**Intercept and Trend**	**Lags**	**None**	**Lags**	**Conclusion**
TBT	-1.4464 (0.2020)	0	-1.2993 (0.1180)	1	0.1552 (0.7184)	2	I(1)
TBD	-2.5475 (0.1216)	1	-3.4326 (0.0783)	1	-0.3354 (0.5508)	0	I(1)
TBINDT	-1.2041 (0.4644)	0	-1.9706 (0.3303)	1	-0.4110 (0.5200)	2	I(1)
TBIT	-1.5865 (0.1028)	0	-1.4355 (0.0779)	1	-0.4157 (0.5198)	0	I(1)
TBWWT	-1.4129 (0.2336)	0	-1.9231 (0.4565)	3	-1.3309 (0.2633)	4	I(1)
TBCD	-0.6072 (0.1359)	0	-1.6329 (0.4538)	0	-1.1637 (0.3433)	0	I(1)
TBFED	-1.7360 (0.3984)	0	-1.6441 (0.4115)	4	-1.3886 (0.1480)	0	I(1)
TBST	-1.7448 (0.3927)	2	-1.0081 (0.1583)	2	-0.9171 (0.3049)	2	I(1)
MVA	-2.4242 (0.1487)	0	-3.0835 (0.1378)	0	-0.5481 (0.4661)	0	I(1)
AVA	-1.4013 (0.5597)	0	-1.4300 (0.8173)	0	-0.5370 (0.4708)	0	I(1)
SVA	-1.4808 (0.5153)	4	-2.8742 (0.1949)	3	1.4708 (0.9575)	4	I(1)
TRADE	-3.1984 (0.0361)	0	-2.9976 (0.1580)	0	-0.8617 (0.3288)	1	I(1)
ODA	-3.1544 (0.0393)	0	-4.3088 (0.0163)	1	-0.7359 (0.3827)	2	I(0)
BD	-1.6998 (0.4154)	0	-1.5641 (0.7687)	0	-0.6412 (0.4260)	0	I(1)
INF	-4.4763 (0.0026)	0	-4.3456 (0.0143)	0	-1.0201 (0.2647)	1	I(0)

Source: Authors' calculations

5.2 Bounds Analysis

Table 4 shows the results of Wald test of the tax buoyancy models for economic variables. The calculated value of F-Statistics in each tax buoyancy model is more than the values of upper bound at 5 percent and 10 percent levels of significance. Therefore, a long run relationship exists in all the tax buoyancy models.

Table 4: The F-test for Cointegration

		At 5% Significance Level		**At 10% Significance Level**	
Models	**F-Statistics**	**Lower Bound**	**Upper Bound**	**Lower Bound**	**Upper Bound**
Model 1	3.9502	1.97	3.18	1.7	2.83
Model 2	4.7497	2.32	3.5	2.03	3.13

Model 3	3.3483	2.32	3.5	2.03	3.13
Model 4	13.3016	2.32	3.5	2.03	3.13
Model 5	4.2444	2.69	3.83	2.38	3.45
Model 6	10.7365	2.32	3.5	2.03	3.13
Model 7	9.2554	2.32	3.5	2.03	3.13
Model 8	5.0315	2.69	3.83	2.38	3.45

Source: Authors' calculations

5.3 Long-Run Estimating Results

The next step is to conduct the detail investigation of long-run relationships and detect the long-run coefficients of ARDL models. Table 5 and 6 display the estimated long run results of aggregate models and disaggregate models respectively. Firstly, we explain Table 5 in which the long-run results of aggregate analysis of overall, direct, and indirect tax buoyancy models have been shown. The dependent variables are overall tax buoyancy, direct tax buoyancy and indirect tax buoyancy in model 1, 2 and 3 respectively.

The results of MVA indicate that it has a positive and significant impact on overall tax, direct tax, and indirect tax buoyancies. It suggests that when manufacturing sector grows, government revenues from this sector would escalate as in the case of Pakistan, the government collects 68% of the tax revenues from this sector (GoP, 2016). So, the revenues from the direct taxes and indirect taxes increase the total tax revenues of the government. So, manufacturing sector growth leads to increases in the volume of GDP and tax revenues of the government by the manufacturing sector. Thus, the values of the overall tax, direct tax, and indirect tax buoyancies coefficients will increase that might be beneficial for the economy. Qazi (2010) exhibited that manufacturing sector is significant and positively related with total tax buoyancy, direct tax buoyancy and indirect tax buoyancy for selected developing countries. So, through the tax revenues of the manufacturing sector, the economy will be more fuelled by this sector. These results are consistent with the studies by Mawejje and Munyambonera (2016), Karagoz (2013) and Chaudhry & Munir (2010).

The variable of agricultural value added (AVA) has a positive impact on total tax, direct tax, and indirect tax buoyancies. The positive impact of AVA reveals that as agriculture sector grows, revenues of this sector will also grow which may contribute to GDP significantly. Thus the government income from the agriculture sector in the form of direct taxes and indirect taxes will increase, leading to an increase in total or overall tax revenues. Most of the incomes of agriculture sector are exempt from tax in Pakistan. Due to the strong political lobbies in developing countries, the agriculture sector is exempted from tax-net (Qazi, 2010). So, the agriculture sector is leading to the lesser contribution to the national exchequer. Qazi (2010) asserted that agriculture sector is insignificant and positively related to total tax buoyancy, direct tax buoyancy and indirect tax buoyancy for selected developing countries. These results are in line with Karagoz (2013), Chaudhry and Munir (2010) and Ghura (1998).

Table 5: Long Run Estimates of Tax Buoyancy Models (Aggregate)

Variables	Model 1	Model 2	Model 3
	Overall Tax Buoyancy Model Dependent Variable: TBT ARDL (1, 1, 1, 1, 1, 1, 1, 1)	**Direct Tax Buoyancy Model** Dependent Variable: TBD ARDL (1, 0, 1, 0, 0, 0, 1, 0)	**Indirect Tax Buoyancy Model** Dependent Variable: TBINDT ARDL (1, 0, 0, 0, 0, 1, 1, 1)
MVA	0.0913 (0.0312)	0.5854 (0.0226)	0.6567 (0.0746)
AVA	0.0529 (0.4928)	0.3888 (0.0256)	0.4022 (0.1312)
SVA	0.1231 (0.0064)	0.5938 (0.0025)	0.5007 (0.0557)
TRADE	0.1462 (0.0798)	0.0184 (0.6446)	0.2052 (0.0041)

ODA	-0.1452 (0.5003)	-0.0321 (0.7736)	-0.5100 (0.0127)
BD	0.0035 (0.0930)	0.1396 (0.0002)	0.0222 (0.5088)
INF	-0.0821 (0.0119)	-0.0094 (0.0347)	-0.0273 (0.0332)
C	-----	-50.2849 (0.0052)	-38.7964 (0.1021)

Source: Authors' calculations

Services value added (SVA) demonstrates a positive impact on overall tax, direct tax and indirect tax buoyancies for Pakistan. With the growing services sector in the country, government revenues in the form of direct and indirect taxes will also increase. Qazi (2010) has revealed that services sector is significant and positively related to the total, direct and indirect tax buoyancies for selected developing countries. Bayu (2015) reported that services sector has a positive impact on total tax buoyancy for Ethiopia. So, through the tax revenues of the services sector, the economy will be more stimulated. Our results are supported by the studies of Samir et al. (2016) and Chaudhry &Munir (2010).

Trade openness (TRADE) reveals that it has a positive impact on the total, direct and indirect tax buoyancies. TRADE is significant for total tax and indirect tax buoyancies while insignificant for direct tax buoyancy. As this sector grows, the contribution of this sector in the national income may also increase. So, the government income from the international trade in the form of direct taxes and indirect taxes may increase as well. It has been noted that tax on trade is historically an integral source of revenues for the government because it is easy to collect (Farhadian-Lorie and Katz, 1989). So, through the tax revenues of international trade, the economy will be more triggered. The results are matched with the studies of Karagoz (2013), Chaudhry and Munir (2010), Gupta (2007) and Ghura (1998).

Net Official Development Assistance (ODA) has a negative impact on all tax buoyancies. ODA is insignificant for total tax buoyancy and direct tax buoyancy while it is partially significant for indirect tax buoyancy. As official development assistance increases, GDP growth increases but tax revenues will not boost up. In such a situation the government might not adopt the discretionary or the automatic measures for enhancing tax revenues. Hence, the buoyancies coefficients of total tax, direct tax, and indirect tax might not be increased. Qazi (2010) came up with the findings that official development assistance is negatively related with total tax buoyancy, direct tax buoyancy and indirect tax buoyancy for selected developing countries. As official development assistance of any country increases in the form of foreign aid or external borrowings, the dependence of the government on internal revenue sources will decrease. Bayu (2015) discovered that official development assistance has a negative impact on total tax buoyancy for Ethiopia. Moreover, our results are at par with Ayenew (2016), Chaudhry and Munir (2010) and Ghura (1998).

Now we turn the results of broad money (BD). It explains that broader money has positive impact on total, direct and indirect tax buoyancies. BD is found significant for total tax buoyancy and direct tax buoyancy while insignificant for indirect tax buoyancy. The positive sign on BD reveals that the greater the degree of monetization and financial depth exists in the country, the more will be the economy documented. Board money may be a large tax collecting revenue source for Pakistan contributing significantly to the GDP. The government may collect the taxes from banking transactions. Qazi (2010) found the positive association between the broad money tax buoyancies for selected developing countries. Furthermore, the sign of BD is quite similar as in the studies by Karagoz (2013) and Chaudhry and Munir (2010).

Inflation is a core macroeconomic variable that has a strong bearing on tax revenues. The values on the coefficient of INF depict a negative and significant impact on overall, direct and indirect tax buoyancies. The inverse relationship between inflation and tax buoyancies shows that with an increase in inflation, the

purchasing power of people may decrease. According to the Musa (2016) total tax revenues may decrease due to the high prices and less utilization of goods and services. Therefore, the values of the overall tax, direct tax, and indirect tax buoyancies coefficients will decrease and the government has to hinge on internal or external borrowings to meet the expenditures. The sign of this variable is justified through studies by Wijayanti and Firmansyah (2017), Mawejje and Munyambonera (2016), Muibi and Sinbo (2013) and Ghura (1998).

Table 6: Long Run Estimates of Tax Buoyancy Models (Disaggregate)

Variables	Model 4	Model 5	Model 6	Model 7	Model 8
	Income Tax Buoyancy Model Dependent Variable: TBIT ARDL (2, 1, 1, 1, 1, 1, 1, 1)	**Workers Welfare Tax Buoyancy Model** Dependent Variable: TBWWT ARDL(1, 1, 1, 1, 0, 0, 0, 1)	**Custom Duty Buoyancy Model** Dependent Variable: TBCD ARDL(1, 0, 1, 0, 1, 1, 0, 1)	**Federal Excise Duty Buoyancy Model** Dependent Variable: TBFED ARDL(2, 1, 1, 1, 1, 1, 1, 1)	**Sales Tax Buoyancy Model** Dependent Variable: TBST ARDL(1, 0, 1, 1, 1, 0, 1, 0)
MVA	0.5889 (0.0431)	16.2426 (0.0116)	2.5308 (0.0421)	0.3166 (0.0702)	1.9007 (0.1006)
AVA	0.3978 (0.0416)	10.3420 (0.0106)	1.7799 (0.0541)	0.0342 (0.0361)	1.8517 (0.0446)
SVA	0.5748 (0.0280)	10.1135 (0.0134)	2.0250 (0.0255)	0.7160 (0.0186)	1.6029 (0.0613)
TRADE	0.0410 (0.0905)	1.4846 (0.0124)	0.2452 (0.1129)	0.3080 (0.0120)	1.1775 (0.0017)
ODA	-0.1254 (0.1232)	-0.6630 (0.0374)	-3.5522 (0.0056)	-0.7051 (0.0151)	-3.1679 (0.0015)
BD	0.0995 (0.0132)	0.0947 (0.0195)	0.2185 (0.0778)	0.3563 (0.0050)	0.1241 (0.1404)
INF	-0.01341 (0.0390)	-0.0676 (0.0489)	-0.2337 (0.0151)	-0.0109 (0.0606)	-0.1434 (0.0570)
C	-50.2492 (0.0327)	-976.3142 (0.0130)	-180.9086 (0.0382)	-55.0631 (0.0239)	-107.8521 (0.1356)
T	-----	-0.4512 (0.0086)	-----	-----	-0.3258 (0.0026)

Source: Authors' calculations

Now we explain the long-run results of disaggregate tax buoyancies. In Table 6, we have five disaggregate tax buoyancies models in which income tax buoyancy, workers welfare tax buoyancy, custom duty buoyancy, federal excise duty buoyancy and sales tax buoyancy are the dependent variables respectively. These models have the same economic explanatory variables as explained in Table 4.

It can be observed that we have the same signs of explanatory variables with income tax buoyancy and workers welfare tax buoyancy as these variables have similar signs with direct tax buoyancy. Moreover, we have found the same resemblance of explanatory variables with federal excise duty buoyancy, customs duty buoyancy, and sales tax buoyancy as economic variables have with indirect tax buoyancy.

5.5 Error Correction Results

Having investigated the long-run relationship between variables used in our models, now we explain the error correction estimates of these variables. The coefficient of ECM shows how slowly or quickly, a variable move towards the equilibrium path. Tables 7 and 8 show the error correction results of all tax buoyancy models.

Table 7 shows the coefficient values of error correction terms of model 1, model 2 and model 3 are -1.0293,-1.4805 and -1.4541 respectively. The negative signs of error correction coefficients confirm the existence of a convergence trend towards the equilibrium. The results show that in model-1 the error will be corrected in one year and approximately two weeks, in model 2, it will be corrected approximately in one and a half year and in model 3, the error will also be corrected in a year and approximately five months.

Table 7: Error Correction Results of Tax Buoyancy Models (Aggregate)

Variables	Model 1	Model 2	Model 3
	Overall Tax Buoyancy Model Dependent Variable: TBT ARDL (1, 1, 1, 1, 1, 1, 1, 1)	**Direct Tax Buoyancy Model** Dependent Variable: TBD ARDL (1, 0, 1, 0, 0, 0, 1, 0)	**Indirect Tax Buoyancy Model** Dependent Variable: TBINDT ARDL (1, 0, 0, 0, 0, 1, 1, 1)
D(MVA)	0.7938 (0.0246)	0.8667 (0.0253)	0.9549 (0.0584)
D(AVA)	0.7943 (0.0321)	0.7276 (0.0224)	0.5848 (0.0971)
D(SVA)	0.8259 (0.0121)	0.8791 (0.0041)	0.7281 (0.0371)
D(TRADE)	-0.2309 (0.0185)	0.0273 (0.6376)	-0.2983 (0.0022)
D(ODA2)	-0.4187 (0.1856)	0.0476 (0.7697)	-0.5033 (0.0847)
D(BD)	-0.2140 (0.0122)	-0.0053 (0.9076)	-0.1597 (0.0265)
D(INF2)	-0.0513 (0.0445)	-0.0139 (0.3757)	-0.0052 (0.8233)
CointEq(-1)	-1.0293 (0.0151)	-1.4805 (0.0001)	-1.4541 (0.0001)

Source: Authors' calculations

Table 8 shows the error correction coefficient values of model 4, model 5, model 6, model 7 and model 8 are -2.6267,-1.1190, -1.0840, -1.2434 and -1.9203 respectively. The negative signs of error correction coefficients show that there is convergence trend towards the equilibrium. The results demonstrate that in model-4 the error will be corrected in two years and six months, in model-5 it will be corrected in one year and one month, in model-6 this time will be one year and approximately one month, in model-7 the error will be corrected in one and more than two months, in model-8 the error will also be corrected in one year and more than nine months.

Table 8: Error Correction Results of Tax Buoyancy Models (Disaggregate)

Variables	Model 4	Model 5	Model 6	Model 7	Model 8
	Income Tax Buoyancy Model Dependent Variable: TBIT ARDL (2, 1, 1, 1, 1, 1, 1, 1)	**Workers Welfare Tax Buoyancy Model** Dependent Variable: TBWWT ARDL(1, 1, 1, 1, 0, 0, 0,1)	**Custom Duty Buoyancy Model** Dependent Variable: TBCD ARDL(1, 0, 1, 0, 1, 1, 0, 1)	**Federal Excise Duty Buoyancy Model** Dependent Variable: TBFED ARDL(2, 1, 1, 1, 1, 1, 1, 1)	**Sales Tax Buoyancy Model** Dependent Variable: TBST ARDL(1, 0, 1, 1, 1, 0, 1, 0)
D(TBIT(-1))	0.6502 (0.0306)	-----	-----	-----	-----
D(TBFED(-1))	-----	-----	-----	-0.2491 (0.0139)	-----
D(MVA)	1.2074 (0.0609)	10.5182 (0.0056)	2.7434 (0.0265)	1.0709 (0.0176)	3.6499 (0.0793)
D(AVA)	0.7713 (0.0535)	6.8053 (0.0040)	0.6915 (0.2511)	0.4204 (0.0316)	5.7405 (0.0102)
D(SVA)	1.1513 (0.0488)	6.7519 (0.0070)	2.1952 (0.0121)	0.9285 (0.0134)	3.7838 (0.0325)
D(TRADE)	0.0519 (0.1530)	-1.6615 (0.0053)	-0.5914 (0.0095)	0.0966 (0.0387)	-1.4280 (0.0193)
D(ODA)	-0.1127 (0.2226)	-0.7420 (0.3867)	1.3625 (0.0628)	-0.4943 (0.0256)	-6.0833 (0.0177)
D(BD)	-0.0250 (0.1968)	-0.0010 (0.9950)	-0.2369 (0.0428)	0.0265 (0.0800)	-1.0305 (0.0064)
D(INF)	-0.0032 (0.3942)	-0.1345 (0.0787)	-0.0259 (0.4794)	0.0225 (0.0336)	-0.2754 (0.0088)
D(T)	-----	-0.5049 (0.0069)	-----	-----	-0.6255 (0.0191)
CointEq(-1)	-2.6267 (0.0291)	-1.1191 (0.0004)	-1.0840 (0.0002)	-1.2435 (0.0040)	-1.9203 (0.0155)

Source: Authors' calculation

6. Conclusion and Policy Implications

The present study investigates the impact of economic determinants on different dimensions of tax buoyancies in Pakistan. The study has used the time series data for the period of 1996-2016 to estimate the eight models for examining the relationship between economic determinants of tax buoyancy. The analysis has been done by aggregate and disaggregates levels. Three models are related to aggregate levels while five models are associated to disaggregate levels.

All the economic determinants are positively related to tax buoyancies in aggregate and disaggregate levels except official development assistance and inflation. The results of the study have alluded to some important policy implications for policy makers and future research.

- Firstly, the manufacturing sector has a positive relationship with the tax buoyancies which reveals that it is the biggest source of the government revenue collection and it has a large share in the total tax revenues. Thus, with the government and policymakers need to put good policies in place that we will and ensure on increase in tax collection by this sector.
- Secondly, the agriculture sector has a positive relation with tax buoyancies. But it can be observed that contribution of this sector in tax revenues is very low. So, there is need to impose some taxes in this sector for revenue-enhancing which might lead to an increase in tax buoyancy as well.
- Thirdly, the Services sector has a positive impact on tax buoyancies. Services sector has a significant contribution in GDP. Hence, the government can widen the tax base for this sector and may increase its tax revenues.
- Fourthly, the Trade Openness has a positive relationship with tax buoyancies. For increasing the tax revenue there must be increased in the tax base on trade in the form of customs and federal excise duty to augment buoyancy coefficient.
- Fifthly, evidence on official development assistance has a negative relation with tax buoyancies. Implying of the government depends on the foreign aid and external borrowings; it will not impose further taxes in order to generate revenue in the country. That's why total tax revenues will be decreased and value of tax buoyancy will decrease as well. So, government should less rely on foreign assistance.
- Sixthly, monetization and financial depth need to be expended in the economy. As the economy becomes more documented, each transaction tax gets collected. This will increase tax revenues and value of tax buoyancy would also increase.
- Finally, the negative relationship of inflation with tax buoyancies demonstrates that government needs to avoid the internal or external borrowings which might be the cause of future inflation. Hence, the government needs to generate its own revenues and resources.

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