Pakistan Economic and Social Review
Volume XXXIX, No. 1 (Summer 2001), pp. 25-48

RESOURCE MOBILIZATION AND TAX ELASTICITIES IN PAKISTAN

M. ASLAM CHAUDHARY and ABDUL HAMID*

Abstract. The paper is focused to identify shortcomings in the tax revenue collection in Pakistan. For this purpose, elasticities of different taxes were estimated. Partial adjustment and regression models were estimated to quantify the values for these elasticities. Short-run and long-run elasticities for direct and indirect taxes were identified. The results indicated that long-run revenue elasticities were slightly above unity, which is not very satisfactory for a developing country. It should be well above unitary value. Moreover, tax to base elasticities of custom and excise duty was significantly less than unity. Besides, sales tax is also not in full operation. Most of the revenue reliance is on indirect taxes, which is not a very healthy sign for the economic growth and it's burden on the society. It means that main tax burden is on the poor. It is on the face that more than 30% people are living below the poverty line. These findings have important bearings for the policy makers. There is a need to broaden the tax base, improve upon direct taxes, reduce indirect taxes and rationalize sales tax rates.

I. INTRODUCTION

Pakistan is facing a serious problem in raising public revenue. The consistent failure in improving public revenue led the public sector to rely on borrowing. As a result, the public debt was piled up to the tune of over 90% of GDP[1] and budget deficit reached to over 8% of GDP. The budget deficit led to double-digit inflation (Chaudhary and Ahmed, 1996). These imbalances have further effects on the economy. All these problems are interlinked (Chaudhary and Abe, 1999) and their roots are in the failure of

---

*The authors are Associate Professor and Graduate Student, respectively, at Quaid-i-Azam University, Islamabad (Pakistan). The views expressed entirely belong to the authors. The authors are thankful to Dr. G. Mustafa and Dr. S. Y. Jaffri for valuable comments, which helped to improve the study.

[1]For details see *Economic Survey* 1998-99. It includes foreign and domestic debt.

the public sector to generate adequate revenue to match the needed public expenditures. So far *ad hoc* efforts were made to improve taxation, which were not based upon scientific approaches, therefore, the achievement of revenue targets failed again and again.[2] The outcome was failure to fulfill not only demands for financing development projects but it even became difficult to meet the current expenditures. Besides, less than 1% of the population in Pakistan is taxpayer.

Pakistan has experienced respectable economic growth for more than three decades (*Economic Survey* 1998-99), *i.e.* up to 1990. Pakistan's economy grew over 6% per annum, for more than three decades. However, economic performance remained poor in the 1990s. Particularly, the performance of tax collection was continuously unsatisfactory. Wagner's law states that public expenditures' elasticity exceeds well above unity in the early economic growth process.[3] It implies that a country needs more public expenditures to meet the increasing demand for social services and public goods. These excess public expenditures for providing social services also require an increase in public revenue. The underdeveloped countries, including Pakistan, are at an early stage of development, therefore, these countries require higher revenue/GDP ratio, as compared to the developed countries. Failure to achieve this could lead to unsustainable and slow down of the economic growth. In the 1990s, the economic growth of Pakistan did slow down to around 4.5% per annum, which was over 6% in the last three decades. The same was around 3% for some years (*Economic Survey* 1998-99).[4]

Taxes are the most important elements of public revenue. As a country grows, the improvement in the tax revenue to GDP ratio needs to be improved. It also explains the awareness of the people and helps to uplift public and social services. The demand for these services rapidly increases in the early stage of development, since such infrastructure is almost non-existent or poor in the country. Taxes are also the best instruments to check the response to the government policies. The social services structure is extremely poor in Pakistan. Half of the population is deprived of basic health, sanitation facilities and transport infrastructure. One-third of the children find no school to go for basic education. The tax performance,

---

[2]See Yearbook of Central Board of Revenue and Annual Budgets.

[3]See Wagner and Weber (1977).

[4]Also see Chaudhary and Abe (1999).

rather than improving, consistently remained poor. In Pakistan, the tax/GDP ratio decreased from 17% in 1983-84 to 16% in 1985. The same further fell to around 13% in the 1990s. The public expenditures were over 24% of GDP. Therefore, the budget deficit was obvious. The deficit financing turns out to be unsustainable (Chaudhary and Waseem, 1995). Besides, the provision of the social services was also very slow (Chaudhary and Hamid, 1999).

As stated earlier, the emerging severe deficit was the result of the failure of the public sector to raise revenue and savings. These trends indicate that the tax efforts did not generate the needed public revenue. It is also important that Pakistan is far behind in generating tax revenue, as result of the growth in GDP, as compared with other developing countries in the region. The revenue collection is over 25% in several developing countries (*World Development Reports* 1979, 1991 and 1997). Azhar (1996) pointed out that tax revenue targets were fixed without any scientific bases and, therefore, the targets hardly ever materialized. During 1998-99, revenue shortfall was around 20% of the target. All the above indicate the need for a comprehensive study for effective tax reforms, the very reason that the present study is undertaken.

In general, the developing countries find themselves in growing fiscal problems when their tax responsiveness remains below the required public expenditure. Research in the field of taxation is essential to improve tax collection and broadening the tax base. Although, the literature is rich on the subject matter, but unfortunately it is limited pertaining to Pakistan. Khan (1993) found that elasticity of total tax revenue to GDP was 1.35 in the period from 1960-61 to 1971-72, whereas elasticity of excise duty to GDP was 2.28. The elasticity for excise duty was found higher than all other elasticities. However, he also mentioned that tax reforms have lowered the responsiveness of the tax revenue. With the emergence of World Trade Organization (WTO) and rapid introduction of market-oriented reforms in Pakistan,[5] the revenue from excise duty and custom duty has started to dry up. As a result, it is expected that tax elasticity may also have decreased for this source of revenue. Thus, alternative means of revenue generation have to be explored to meet the growing demand for social services and development of the country.

Gillani (1986) employed the Divisa Index Method (DIM) and Proportional Adjustment Method (PAM) for estimation of tax elasticities for

[5]See *Economic Survey* 1998-99.

the Bangladesh economy. The empirical evidences suggested that tax elasticity was poor. Therefore, serious efforts should be made for tax collection at the existing rates and tax evasion should be minimized. It was suggested that tax elasticity should be improved. The case of Pakistan could be similar to that of Bangladesh, since both the counties have many common characteristics. These countries were one country before 1971.

Unfortunately, there is not much body of literature pertaining to tax system of Pakistan, which could provide scientific base for policy formulation. In the case of Pakistan, the built-in-elasticity of tax system was found greater than unity (Khan, 1993), which was criticized since revenue targets continuously failed to materialize. The evidence was found in favour of an expansion in the tax base for all categories of taxes, with positive discretionary changes. However, the result of such changes did not bring much improvement in tax collection in Pakistan. Khan also indicated that long-run elasticities of major tax revenue heads are not much different from unity. Hossain (1988) also pointed out that tax-to-base elasticity is low, for an increase in income, and therefore for improvement in tax elasticity, effective reforms are required. Besides, he advocated that partial adjustment model was superior to that of distributive lag model, in estimating revenue elasticity. He suggested this, on the basis of elasticities estimated for Bangladesh for the period 1974-1985.

Chillah (1971, 1975), Mansfield (1972), Bird (1982), Ahmad (1994) and Hussain (1993) have also carried out different studies on taxation, pertaining to developing countries. They all pointed out that effective reforms, broadening tax base, lowering the tax rate, proper documentation of businesses and improvement in assessment techniques are necessary for having a significant increase in revenue, considering the typical problems facing the developing countries. Such efforts were made in Pakistan but those were not much fruitful. Thus, a more in depth study of tax responsiveness is needed for identification of poor revenue collection, the very reason that this study is undertaken. It is aimed to analyze the tax base and tax elasticities in Pakistan so that scientific basis could be provided to improve tax revenue. The study is organized as follows.

The study consists upon four sections. Section I is an introduction, which also contains a review of important relevant literature. Section II provides methodological details. Empirical evidences are presented in Section III and, finally, Section IV consists upon conclusion and policy implications.

II. METHODOLOGICAL FRAMEWORK

This section is divided into three sub-sections, (*a*) tax base, (*b*) specification of model and (*c*) data definitions and sources of data. The aim is to provide details about the taxes and room to its improvement, *i.e.* areas out of tax net.

THE TAX BASE

Government revenue in Pakistan is collected from various sources. Tax revenue in Pakistan contributes about 90% towards total revenue. In Pakistan, indirect taxes have major contribution towards public revenue, with its heads like custom duty, excise duty and sales tax etc. Major kinds of taxes are discussed below.[6]

Income Tax

Income tax is levied on the income of individuals, companies and registered firms. It is charged on the total income of the previous year's earned income. The share of income tax in direct taxes is around 90 percent. It is the major source of direct tax. Over time, there is marginal growth in it. It is levied on previous year's income and Pakistan is earning limited income tax from agriculture sector, although this sector contributes more than 24 percent towards GDP. Recently, it is brought in to the tax net but very insignificant revenue is collected from this sector. It is estimated that, at even a very minimum tax rate, it can contribute more than Rs. 15 billion towards tax revenue.

Customs Duty

Customs duty is levied on international merchandise, *i.e.* on the foreign sector of the economy. It is broadly classified as import and export duties. The average share of customs duty in indirect taxes is 45%, whereas in total revenue collection, it contributes about 35%. The customs duty collection was Rs. 88.92 billion in 1995-96, that is 44% higher than Rs. 61.82 billion in 1991-92. Recently, due to liberalization of the economy and reforms for free trade, it was over 110%, which have been reduced to less than 35%. As a result, it significantly reduced the tax revenue from this source. Thus, there is also a need that the revenue lost has to be made up from other sources.

---

[6]Detail of these taxes and revenue collection (for each year) is given in detail in the CBR Yearbook, annual publication.

Excise Duty

Excise duty is levied on domestic production and services rendered for production purposes. Being an indirect tax, the burden is generally transferred to consumers. As a result of industrial development in the country, the scope of excise duties has been expanded. On average 25% collection of indirect taxes consists of excise duty, whereas its share in total receipts is 18%. The appropriate base for excise duty is manufactured output. The manufacturers are reluctant to maintain business records and ultimately do not contribute the due share towards tax revenue. There is an ample scope for its improvement, if proper documentation is ensured.

Sales Tax

Sales tax is chargeable on all goods imported into Pakistan and on goods assembled or produced in the country, except those specifically exempted by the government. Sales tax collection from imports was much less than that collected from domestic goods. Only for a few years, sales tax from imports increased but due to decrease in the duty. This source of revenue is drying up. So manufactured output will be a suitable base for sales tax. Contrary to the rest of the world, there was no general sales tax (GST) in Pakistan. Recently, attempts have been made to introduce GST but these efforts were not very fruitful.

SPECIFICATIONS OF THE MODEL

It is not easy to impose any specific type of equation to derive the relationship of tax base to tax revenue. The specifications of tax equation must be based upon three important elements. First, whether tax equations are stochastic in nature or they are identities. Second, is there any distributive lag effect of tax base on tax revenue and, third, intercept term is to be included in the equation or it should assume that tax equation is to be passed through origin. Considering the above the tax base may be defined as follows:

$$(TR)_i = Ø\,(TV)_t \qquad (1)$$

Where

i = describes the category/type of tax,

TR = total tax revenue,

$Ø$ = tax rate, and

TV = total value of taxable item.

The equation (1) represents that tax revenue is a function of tax base (taxable items). The tax equation is in stochastic form, which is more appropriate for such estimation (Hossain, 1988). The intercept term may also be added for estimation. Following Hossain (1988), distributive lag model may be used for estimation of tax responses. The general form of distributive lag model consists of infinite lag variables. So some conditions should be imposed to make it feasible. The commonly used lag models with restrictions are three, (*i*) the Koyck distributive lag model, (*ii*) the Partial Adjustment lag model and (*iii*) the Polynomial (Almon) distributive lag model. Among these three, the partial adjustment lag model is popular due to its desirable econometric properties. Hossain (1988) also preferred the partial adjustment lag model, due to similar reasons. So, we can also apply partial adjustment lag model to estimate tax and non-tax revenue elasticity for the period from 1960-61 to 1997-98. Following Hossain (1988) and Ashfaq (1993), the revenue may be specified as a function of revenue base.

$$(R^*_i)_t = f(B_i)_t \tag{2a}$$

$$(R^*_i)_t = a\,(B_i)^{al}{}_t \tag{2b}$$

Taking natural logarithm on both sides of the equation (2*b*), this will form the long-run relationship in the following log-linear form:

$$\ln (R^*_i)_t = \ln a + a_1 \ln (B_i)_t \tag{3a}$$

$$\ln (R^*_i)_t = a_0 + a_1 \ln (B_i)_t \tag{3b}$$

where,

R^* = tax revenue,

B = tax base,

i = ith category,

t = time subscript,

a_0 and a_1 = parameters to be estimated, and

U = is an error term.

The partial adjustment equation can be written as:

$$\left(\frac{R_{it}}{R_{it-1}}\right) = \left(\frac{R^*_{it}}{R_{it-1}}\right)^{i_e} \tag{4}$$

Applying natural logarithm on both sides of the equation 4, it can be written as follows:

$$\ln (R_i)_t - \ln (R_i)_{t-1} = i_e \ln (R^*_i)_t - i_e (R_i)_{t-1} + U_{it} \quad (5a)$$

$$\ln (R_i)_t = i_e \ln (R^*_i)_t + (1 - i_e) (R_i)_{t-1} + U_{it} \quad (5b)$$

Substituting the value of $\ln (R^*_i)_t$ from equation (3*b*)

$$\ln (R_i)_t = i_e a_0 + i_e a_1 \ln (B_i)_t + (1 - i_e) (R_i)_{t-1} + U_{it} \quad (6)$$

The estimation of equation (6) will give us the short-run revenue elasticity. Adjustment coefficient can be calculated from the lagged dependent variable. If we divide the short-run coefficient of base variable by one minus the coefficient of lagged dependent variable, we will get the long-run elasticity. Now for getting long-run function, divide the short-run function by $[1 - (1 - i_e)]$ and drop the lagged term. We get the following equation:

$$\ln (R_i)_t = a_0 + a_1 \ln (B_i)_t + U_{it} \quad (7)$$

The estimation of equation (7) will give us long-run revenue elasticity.

DATA DEFINITION AND SOURCES OF DATA

Most of the variables were taken in their first hand form from various publications like *Economic Survey*, *Yearbook of the Central Board of Revenue* (CBR) and *Fifty Years of Pakistan in Statistics*, etc. Few variables were constructed, as given below:[7]

Non-Food Imports

Data on non-food imports (NFM) was not directly available. In order to calculate the non-food imports, the value of food imports (FM) was subtracted from total imports (TM), *i.e.* NFM = TM – FM. The food imports variable was constructed by adding up values of major food imports items for each year, separately.

Non-Agriculture National Income

The non-agriculture income variable (YNA) was calculated by subtracting the agriculture income (YA) from the gross national income (Y) for each year, as follows: YNA = Y – AY.

Data for tax and non-tax variables were taken from the Yearbook of the Central Board of Revenue (CBR). The variables like GNP, agriculture income and food imports were taken from Economic Survey of Pakistan. The

---

[7]The lack of such data may have restricted scholars to carry out in depth research in the area. Besides, the quality of public data is poor, there is no other better reliable source of data either.

data on revenues was based upon current prices. It was converted for real values. For the sake of comparison and to know the real changes, the data was deflated and the estimates were based upon both real and current values. The data on non-food imports was deflated by imports deflator, while all other variables were deflated by GDP deflator. The data collected for various variables was also verified by comparing other sources of statistical issues, like International Financial Statistics and 50 Years of Pakistan in Statistics.

III. EMPIRICAL EVIDENCES

The short-run and long-run elasticity of revenue have been estimated by using the Partial Adjustment Model (PAM). Partial adjustment method directly estimates the short-run elasticity, as all variables are used in log form, so the coefficient of the base variables will be the value of short-run elasticity. Long-run revenue elasticity can also be calculated from these values.[8] The adjustment coefficient can be derived from the coefficient of the lagged dependent variable. However, long-run elasticity can also be derived by applying the simple regression model.

The results of short-run elasticity obtained, after applying PAM model, are presented in Table 1. The long-run elasticity obtained by using simple regression model is given in Table 2, whereas the calculated long-run elasticity by using PAM method is presented in Table 3. The short-run elasticity of total revenue is 0.697, which is well below unity (Table 1). The adjustment coefficient is 0.619, which implies that around 62% of the adjustment between the desired and actual levels is achieved in one year's period. The values of other statistical results of the model like R^2 and adj. R^2 are high. The Durbin Watson statistics confirms that it has no autocorrelation. The long-run elasticity derived from the partial adjustment model is 1.120. Similarly, the long-run elasticity from the simple regression model was found 1.119 (Table 2), which is almost the same as calculated by using PAM model. Thus, long-run elasticity under both the models is around unity. It was expected that to raise desirable revenue, it must be well above unitary value. It confirms that revenue collection in Pakistan is not very satisfactory.

The short-run elasticities of tax and non-tax revenue are 0.558 and 0.581, respectively (Table 1). The adjustment coefficients of these two variables are 0.550 and 0.454, respectively. Not only the elasticities are low but also the adjustment process was slow. Their respective long-run

[8]As explained in the last section.

elasticities are found 1.013 and 1.28 (Table 2), respectively. The long-run elasticity is again slightly above the unitary value. The same values derived through simple regression model are 1.019 and 1.197 (Table 2), respectively. The comparison of these elasticities show that the long-run elasticity of non-tax revenue indicated by PAM is slightly greater than the long-run elasticity obtained through simple regression model, although not significantly different from each other. However, these values are not much different from unitary value. The explanatory power of other statistical results is quite high. The Durbin Watson statistics indicated that there is no autocorrelation. The results indicate that the elasticities are not as desired.

The results of short-run elasticity of direct and indirect taxes are quite opposite to each other but describe the exact phenomena of the real situation in Pakistan. The short-run elasticities for the direct and indirect taxes are 0.126 and 0.867, respectively (Table 1). The adjustment coefficients are 0.103 and 0.817, respectively. This shows that the time period involved in adjustment for indirect taxes is less as compared to other taxes. The elasticity for direct tax is very low and not that of much revenue is collected from this source. It is generally believed that these taxes are avoided, as a result of corruption and poor administration. The powerful peer groups hardly pay much taxes. It indicates that there is a need to improve the collection of such taxes. It has been neglected so far and major stress has been on indirect taxes.

The above results indicate that indirect taxes are more responsive to increase in GNP as compared to direct taxes. Theoretically, such taxes should not be very high. However, this may be the reason that Pakistan mainly depended upon indirect taxes, since these taxes were more responsive to changes as compared to direct taxes. However, the dependence upon indirect taxes is not a very healthy sign, since even the poor come under such tax burden. In Pakistan, one-third of the population lives under poverty line and also bearing the burden of taxes.[9] It is against the very basic principle of taxation, *i.e.* capacity to pay the tax. The long-run elasticity of direct taxes obtained through PAM method is 1.22, greater than the value of simple regression model, *i.e.* 1.015 (Table 2). The long-run elasticity, from both methods, exceeds unity but it was not much different from unitary value. The short-run elasticity of direct taxes is quite low and also insignificant (0.12). The most important elements of indirect taxes are income tax and wealth tax. It is estimated that one-third of the economy is underground economy, which

[9]See Chaudhary and Hamid (1999).

is out of tax bracket. The tax collection from wealth tax is marginal. Moreover, there is maximum tax avian in the direct taxes, through bribery and due to non-documentation of the economy. The business class hardly maintains statistics on their income. There is a need that the hidden economic activities must be brought under tax net.

Table 1 also shows that the short-run elasticity of income tax is 0.144, which is very low, much lower than the unitary value. It is also not significant. The adjustment coefficient (1 – 0.78 = 0.122) is also very low. The results of income tax described the phenomena of unsatisfactory performance of this source of tax revenue. The same was observed in the case of other direct taxes, except income tax collected from the salaried class. The long-run elasticity of income tax, from PAM method, is 1.18, which is also not much different from unity (Table 3). The long-run elasticity obtained from simple regression model is 1.011 (Table 2), which is only slightly lower than PAM model. The long-run elasticity also indicated that tax performance for income tax was not satisfactory.

The indirect taxes comprise of customs duties, sales tax and excise duties. These components have around 70% shares in revenue collection, *i.e.* from indirect taxes. Much of the revenue collection depends upon these taxes too. The elasticity of these indirect taxes is presented below. The short-run elasticity of customs duty is 0.696 (Table 1) and it is statistically significant. The adjustment coefficient is 0.770, which implies that 77% disequilibrium in desired and actual custom duties is adjusted in the period of one year. The long-run elasticity is 0.904 (Table 3), which is below unity value. However, it is slightly higher than that of 0.735 (of simple regression model, Table 2). It again indicates that even these taxes are not very responsive to economic growth. It could be a reason for poor performance of tax collection.

The short-run elasticity of excise duty is lower than both customs duty and sales tax, *i.e.* 0.129 (Table 1). The adjustment coefficient is 0.168, which shows slow adjustment in the value. It is statistically significant. The tax base of excise duty is manufactured output, which shows the same trend as observed in the case of sales tax. The long-run elasticity was 0.9 (Table 3). The long-run elasticity obtained from simple regression model was also found less than unity. It again indicated that the tax is not very responsive, both in the short-run and long-run. It is believed that significant leakage takes places in these revenues, due to deep-rooted corruption and inefficiencies.

TABLE 1

Short-Run Elasticity (Under Partial Adjustment Model)

Regressand	Regressor		Coefficients (1)	Coefficients (2)	Adj. R^2*	F Statistic	D.W.d.	D.W.h.
AR	Y	LAR	0.697	0.380	0.986	9503.2	1.75	1.34
TR	YNA	LTR	0.558 (3.46)*	0.449 (2.81)*	0.976	8132.8	2.03	0.76
NTR	Y	LNTR	0.581 (2.72)*	0.546 (3.20)*	0.973	695.0	1.63	1.11
DT	YNA	LDT	0.126 (0.77)	0.897 (5.53)*	0.987	1630.6	1.96	1.60
IDT	Y	LIDT	0.867 (4.60)*	0.183 (1.01)	0.993	2432.71	2.44	0.95
IT	YNA	LIT	0.144 (0.86)	0.878 (5.26)*	0.985	1533.8	1.95	1.31
CD	NFI	LCD	0.696 (6.62)*	0.229 (1.70)*	0.886	116.4	2.06	1.66
ST	YM	LST	0.306 (2.26)*	0.725 (5.27)*	0.983	1090.8	1.96	0.04
ED	YM	LED	0.129 (2.22)*	0.832 (12.87)*	0.990	3351.2	2.14	1.18

Method: AR1 (Cochrane-Ocrutt) Technique

Note: All the regressands as well as regressors are in logarithmic form, thus, the coefficients express the elasticities. Prefix "L" stands for the lagged dependent variable in the model. Results plugged by autocorrelation have been corrected by using the Cochrane-Ocrutt's iteration procedure. The autocorrelation free results have been reported. Figures in parentheses are the values of t statistic.

*for 1% significance level
**for 5% significance level
***for 10% significance level

Abbreviation: Y = GDP, TR = Tax Revenue, DT = Direct Taxes, IDT = Indirect Taxes, IT = Income Tax, YNA = Non-agriculture income, AR = Aggregate Revenue.

*Due to space limitations only adjusted R^2 is reported in all the tables. R-square is not reported.

TABLE 2

Long-Run Elasticities Under Simple Regression Model
Method: AR1 (Cochrane-Ocrutt) Technique

Elasticity	Adj. R^2	Regres-sand	Regres-sor	F Statistic	D.W.	D.W.h.
1.119 (92.71)*	0.99	AR	Y	7621.6	2.09	1.40
1.019 (107.9)*	0.99	TR	YNA	1060.8	1.96	0.38
1.197 (15.95)*	0.87	NTR	Y	241.3	2.11	0.99
1.016 (20.88)*	0.91	DT	YNA	393.9	1.71	1.61
1.086 (46.35)*	0.98	IDT	Y	2018.5	2.40	1.00
1.011 (20.97)*	0.91	IT	YNA	396.7	1.69	1.54
0.735 (8.73)*	0.69	CD	NFI	45.2	2.02	0.82
1.019 (13.65)*	0.87	ST	YM	245.1	1.69	0.16
0.955	0.69	ED	YM	54.5	1.08	1.11

Note: For definition of variables, see Abbreviations. All the regressands as well as regressors are in logarithmic form, thus, the coefficients express the elasticities. Prefix "L" stands for the lagged dependent variable in the model. Results showing autocorrelation have been corrected by using the Cochrane-Orcutt's iteration procedure. The autocorrelation free results have been reported. Figures in parentheses are the values of t-statistic.

*for 1% significance level
**for 5% significance level
***for 10% significance level

TABLE 3

Short-Run and Long-Run Elasticity under Different Models
Method: AR1 (Cochrane-Ocrutt) Technique

Regressand	Regressor	Partial Adjustment Model		Simple Regression Model
		Short-Run	Long-Run	
AR	Y	0.6970	1.120	1.119
TR	YNA	0.5584	1.013	1.019
NTR	Y	0.5812	1.280	1.197
DT	YNA	0.1260	1.220	1.015
IDT	Y	0.8670	1.061	1.086
IT	YNA	0.1443	1.188	1.011
CD	NFI	0.6964	0.904	0.735
ST	YM	0.3066	1.116	1.019
ED	YM	0.1298	0.77	0.956

Note: All the regessands as well as regressors are in logarithmic form, thus, the coefficients express the elasticity. Results showing autocorrelation have been corrected by using the Cochrane-Orcutt iteration procedure. The autocorrelation free results have been reported.

TABLE 4

Short-Run Elasticity under Partial Adjustment Model
Method: AR1 (Cochrane-Ocrutt) Technique

Regres-sand	Regressor		Coefficients (1)	Coefficients (2)	Adj. R^2	F Statistic	D.W.d.	D.W.h.
AR	Y	LAR	0.85 (3.54)*	0.345 (1.90)**	0.980	1762.9	1.73	0.96
TR	YNA	LTR	0.316 (2.68)*	0.672 (5.86)*	0.986	3847.6	2.02	1.45
NTR	Y	LNTR	0.877 (2.04)*	0.481 (1.89)**	0.909	162.7	1.63	1.02
DT	YNA	LDT	0.086 (0.47)	0.933 (5.22)	0.955	317.5	1.94	1.34
IDT	Y	LIDT	0.349 (2.43)*	0.683 (5.84)	0.983	2631.5	2.04	1.06
IT	YNA	LIT	0.104 (0.55)	0.915 (4.86)	0.946	292.1	1.92	0.85
CD	NFI	LCD	0.413 (4.17)*	0.706 (9.34)*	0.92	208.0	1.71	0.09
ST	YM	LST	0.248 (1.91)**	0.788 (5.67)*	0.93	248.4	1.97	1.16
ED	YM	LED	0.065	0.816 (16.1)*	0.978	794.8	2.11	1.33

Note: For definition of variables, see Abbreviations. Figures in parentheses are the values of t statistic.

*for 1% significance level
**for 5% significance level
***for 10% significance level

TABLE 5

Long-Run Elasticities (Simple Regression Model)
Method: AR1 (Cochrane-Ocrutt) Technique

Elasticity	Adj. R^2	Regres-sand	Regres-sor	F Statistic	D.W.d.	D.W.h.
1.295 (50.39)*	0.98	AR	Y	2260.4	2.04	1.17
1.021 (44.69)*	0.98	TR	YNA	1707.6	1.94	1.30
1.47 (8.20)*	0.80	NTR	Y	135.8	2.13	1.00
0.942 (8.72)*	0.89	DT	YNA	299.4	1.69	1.09
1.206 (23.9)*	0.98	IDT	Y	1546.8	2.35	1.14
0.938 (8.86)*	0.89	IT	YNA	295.5	1.67	1.11
0.363 (4.39)*	0.68	CD	NFI	49.7	1.55	0.39
0.953 (6.03)*	0.89	ST	YM	288.1	1.73	1.40
0.90 (6.96)*	0.92	ED	YM	378.4	1.42	0.99

Note: All the regressands as well as regressors are in logarithmic form, thus, the coefficients express the elasticities. Prefix "L" stands for the lagged dependent variable in the model. Results showing autocorrelation have been corrected by using the Cochrane-Orcutt's iteration procedure. The autocorrelation free results have been reported. Figures in parentheses are the values of t-statistic.

*for 1% significance level
**for 5% significance level
***for 10% significance level

TABLE 6

Short-Run and Long-Run Elasticities under Different Models
Method: AR1 (Cochrane-Ocrutt) Technique, Data Type

Regressand	Regressor	Partial Adjustment Model		Simple Regression Model
		Short-Run	Long-Run	
R	Y	0.851	1.300	1.290
R	YNA	0.316	0.964	1.020
NTR	Y	0.877	1.690	1.478
DT	YNA	0.087	1.300	0.942
IDT	Y	0.3494	1.101	1.206
IT	YNA	0.1045	1.230	0.938
CD	NFI	0.4133	0.400	0.363
ST	YM	0.2485	1.170	0.953
ED	YM	0.0654		0.900

Note: All the regessands as well as regressors are in logarithmic form, thus, the coefficients express the elasticities. Results showing autocorrelation have been corrected by using the Cochrane-Orcutt's iteration procedure. The autocorrelation free results have been reported.

In addition to the above, we have also estimated short-run and long-run elasticity by using the real values of all these taxes, to see whether there exists any significant different between real and nominal values' estimates. The short-run elasticity for real variables is given in Table 4. The long-run elasticity estimated by simple regression model is presented in Table 5. The calculated values of elasticities under PAM and Simple Regression are given in Table 6. The results obtained for real values of the variables show that the short-run elasticities estimated of all taxes, except total revenue and non-tax revenue, were less compared to the elasticities estimated from nominal data. It is important to note that non-tax revenue has performed better in both

values.[10] On the other hand, the results of long-run elasticities calculated from PAM method were quite interesting. The long-run elasticities of few variables were higher, while all others were rather close to or lower than that elasticities estimated from the nominal values, as discussed earlier. While the estimates of simple regression model have shown almost all elasticities lower than those obtained from nominal values. It indicates that the revenue collection in nominal terms shows an unclear picture of the story, whereas the real values capture the effect of inflation and real growth in explanatory variables. As indicated by the empirical evidence that short-run and long-run elasticities have higher values in nominal terms, the revenue response is even poorer in real terms. No wonder that there is consistently poor revenue collection in Pakistan.

In short, the empirical findings regarding short-run elasticity of the total tax revenue, non-tax revenue, direct and indirect taxes indicated that their values are well below unitary level. The short-run elasticities of customs duty, sales tax and excise duty were very low. However, the long-run elasticities of all the variables, except customs duties and excise duties, were slightly above unity. The responsiveness of sales tax and excise duties was quite low in both short-run and long-run. The same trend was found for these taxes both in real and nominal terms. Actually, the elasticities for real values of the variables were rather lower than nominal values, which implies that tax performance was even poorer in real terms. The adjustment of short-run values was also very slow. It indicates that the desired values were not achieved even after one year's lag. Such a situation confirms the poor performance of revenue collection. Thus, significant efforts are needed to improve the tax collection. There is a need to control the leakage of tax revenue, improvement in tax administration, rationalization of tax rates and exploring other avenues to customs duties.

IV. CONCLUSION AND POLICY IMPLICATIONS

The study is focused to identify shortcomings in the tax revenue collection in Pakistan. For this purpose elasticities of different taxes were estimated to observe their behaviour. Based upon the empirical evidence, policy implications were to be suggested. To achieve this objective, Partial Adjustment Model (PAM) and simple regression model were utilized, to

[10]We have not used the figures of Tables 4, 5 and 6. Only conclusions are discussed. The figures may be seen in the relevant tables. The pattern of tax elasticities almost remains the same as far as the nominal figures.

obtain empirical evidences, for tax elasticities. Short-run and long-run elasticities were estimated. Besides, the same were estimated based upon real and nominal values of the variables.

The short-run elasticities of aggregate revenue heads like total revenue, tax revenue and non-tax revenue elasticities are found to be less than unity. Similarly, the elasticities of other components of revenues like direct taxes, indirect taxes, custom duties, excise duties and sales tax were also estimated. The short-run elasticities of all taxes were found to be well below unity. It indicates poor performance of tax response, as a result of an increase in income. Besides, some values were found statistically insignificant, which implies that the revenue collection under these heads was not satisfactory or there was very poor response of the revenue in this regard.

The long-run elasticities were also computed by using both the techniques of estimation, *i.e.* PAM and simple regression model. The PAM performed much better than the simple regression model, as also indicated by Hossain (1988). Thus, our study also supports the view of Hossain (1988), which he indicated for Bangladesh. Our results indicated that the long-run elasticities of most of the revenue components were slightly above unity. When the magnitude of the elasticity significantly exceeds unity, it indicates that the tax performance is satisfactory. However, in the case of Pakistan there was no value of tax elasticity, which was much above unitary value, except very few values. Our results do not confirm the findings of earlier studies, which indicated that tax elasticity was well above unitary value. It may be the case that, the results are different due to different time framework and sample size. Our study is based upon large sample than earlier studies and it also includes the period of 1990s. The economic performance in the 1990s was relatively poor as compared to the last three decades. Most of these values were almost close to unitary value, *i.e.* slightly above than unitary value. In a growing developing country like Pakistan, the tax elasticity should be much above unitary value so that adequate funds could be collected for development activities. Pakistan's failure to do so resulted in heavy deficit and other economic problems like poor provision of social and public services.

Our estimated long-run elasticities of aggregate revenue, tax and non-tax revenue, indirect tax and sales tax were not significantly different from unitary value. However, the tax-to-base elasticities of customs duty and excise duty were significantly less than unitary value. The adjustment period showed that any change in tax base would have slow response. Thus, there is a need that efforts should be made in such a way which could lead to

improve the collection of tax revenue as well as reduction in the adjustment period so that any new policy can produce positive results. The growth in foreign sector (imports) has positive influence on the growth of tax revenue, but only in the short-run. Due to the introduction of market oriented trade policies, the custom duties have been curtailed and as a result the loss of revenue from this source has to be made up from other sources. For this purpose general sales tax and tax on agricultural income is unavoidable. Substantial revenue may be raised from these sources. The industrial sector also needs to be mobilized to fully documentation so that the due tax may be collected from the sector. In other words, there is a need to improve the tax base.

The empirical evidence pertaining to tax elasticities have important bearings for policy makers. As the short-run revenue elasticities in Pakistan are less than unity, it is suggested that strong efforts should be made to check this tendency. To achieve the goal of increasing tax revenue, there is a need that existing tax base should be utilized effectively and efficiently for optimal revenue collection. For this purpose documentation of the economy and strict accountability is essential. In other words, not only the tax response needs to be improved but also the tax base must be broadened, as stated above. The poor performance of tax response could be a result of significant leakage from the revenue and having large portion of the economy out of tax net, *i.e.* underground economy. Besides, the tax revenue administration should be given short-term revenue collection targets. In the case of failures to achieve the given targets, strict accountability must be ensured. Such a culture is absent in the bureaucracy. Moreover, as stated above, GST needs serious consideration for its implications, but caution is needed that it may not be imposed across the board, since significant portion of the population is poor, they need not suffer from such taxes. Present system of taxes is not differentiating the poor group. Introduction of GST will not only bring substantial revenue but it will also help to document the economy. By doing so, the tax collection from the industrial sector will also improve.

For the long run, strong policy decisions are needed to improve the situation. It is suggested that government should improve its direct tax effort index and the entire dependency upon indirect taxes is not a healthy sign. Pakistan, like other developing countries, relies on indirect taxes to meet its ever-increasing expenditures. Consistent increase in indirect taxes is continuously putting an upward pressure on prices. The present level of inflation as well as deficit is not sustainable. Therefore, alternative sources of revenue must be explored. The findings of this study could also be useful for

other countries, too. A similar situation was prevalent in Bangladesh. Our results are consistent with Hussain's (1988) for Bangladesh. Thus, detailed study of developing countries regarding tax elasticities could provide useful information for improvement in specific tax revenue collection and therefore helpful for effective policy formulation. Besides, further research in the subject area could provide additional information for sound fiscal reforms.

REFERENCES

Ahmad, E. and Stren (1986), "Tax reforms for Pakistan: Overview and effective taxes for 1975-76". *The Pakistan Development Review*, Volume 25, No. 1, pp. 43-72.

Ahmad, Q. M. (1994), "The determinants of tax buoyancy: An experience from the developing countries". *The Pakistan Development Review* (Papers and Proceedings), Volume 33, No. 4, pp. 1089-1098.

Azhar, B. A. (1996), "Tax pilferage: Causes and cures". *The Pakistan Development Review* (Papers and Proceedings), Volume 35, No. 4 (Part II), pp. 659-667.

Bird, R. (1987), "A new look at indirect taxes in developing countries". *World Development*, Volume 15, No. 9, pp. 1151-1162.

Chaudhary, M. A. (1996), "The bomb of foreign debt: Is there a way to escape?" *Pakistan Journal of Applied Economics*, Volume XII, No. 1, pp. 67-86.

Chaudhary, M. A. and Abe, K. (1999), "Pakistan economy: Past trends, current situation and future prospects". *Chiba University Economic Journal*, Volume 14, No. 1, pp. 49-85.

Chaudhary, M. A. and Ahmed, Naveed (1996), "Sources and impacts of inflation in Pakistan. *Pakistan Economic and Social Review*, Volume XXXIV, No. 1, pp. 21-40.

Chaudhary, M. A. and Ali, S. (1993), "Pakistan's foreign dependency and its capacity of debt repayment". *Pakistan Economic and Social Review*, Volume XXXI, No. 1, pp. 39-62.

Chaudhary, M. A. and Hameed, A. (1999), *Human Resource Management and Development in Pakistan*. Lahore: Ferozsons.

Chaudhary, M. A. and Waseem (1996), "Macroeconomic policies and management of debt, deficit and inflation in Pakistan". *The Pakistan Development Review*, Volume 35, No. 4, pp. 773-785.

Chilliah, R. J. (1971), "Trends in taxation in developing countries". *IMF Staff Papers*, Volume 18, No. 2, pp. 254-331.

Chilliah, R. J. *et al.* (1975), "The ratios and tax efforts in developing countries". *IMF Staff Papers*, Volume 22, No. 1, pp. 187-205.

Gillani, S. F. (1986), "Elasticity and buoyancy of federal taxes in Pakistan". *The Pakistan Development Review*, Volume 25, No. 2, pp. 163-174.

Haq, Mahboobul (1999), *A Poverty Profile of Pakistan*. Islamabad: Mahboobul Haq Human Development Centre.

Hossain, Akhtar (1988), "Tax and non-tax revenue elasticities in Bangladesh, 1974-85". *The Singapore Economic Review*, Volume 33, No. 2, pp. 79-99.

Jaffari, S. M. Younis (1999), "Child labour in Pakistan". See in Chaudhary and Hamid (1999).

Khan, A. (1993), "Determinants of public revenue, expenditures and resource mobilization in Pakistan". M. Phil. thesis, Department of Economics, Quaid-i-Azam University, Islamabad.

Khan, A. (1993), "Presumptive tax as an alternative income tax base: A case study of Pakistan". *The Pakistan Development Review* (Papers and Proceedings), Volume 32, No. 4 (Winter), Part II, pp. 991-1003.

Khan, M. Z. (1973), "The responsiveness of tax yields to increase in national income". *The Pakistan Development Review* (Papers and Proceedings), Volume 12, No. 4, pp. 416-432.

Mansfield, C. Y. (1972), "Elasticity and buoyancy of a tax system: A method applied to Paraguay". *IMF Staff Papers*, Volume 19, No. 2, pp. 425-443.

Pakistan (1995), *CBR Yearbook*. Islamabad: Central Board of Revenue, Ministry of Finance and Government of Pakistan.

Pakistan (1995-96), *Economic Survey* 1995-96. Islamabad, Economic Advisor's Wing, Ministry of Finance.

Radhu, G. M. (1965), "The relation of indirect tax changes to price changes in Pakistan". *The Pakistan Development Review* (Papers and Proceedings), Volume 5, No. 1, pp. 54-63.

Wagner, R. E. and Webber, W. E. (1977), "Wagner's law, fiscal institutes and the growth of government". *National Tax Journal*, Volume 30, No. 1, pp. 59-68.

World Bank, *World Development Report*, different issues. Oxford University Press.