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The Causality between Revenues and Expenditure of the Federal and Provincial Governments of Pakistan

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1. INTRODUCTION

Large fiscal deficits and a growing debt burden have been a key element of the structural problems faced by the economy of Pakistan. During the last three years, for example, the budget deficit has averaged almost 6 percent of the GDP and the public debt has approached the level of 60 percent of the GDP. Targets agreed with IMF have been seriously violated and the SBA with the Fund has floundered because of the inability to control the fiscal deficit.

There is a growing perception that one of the root causes of inflation is the large borrowing from the Central Bank to finance the deficit. This has resulted in a popular demand for cutting down of unproductive expenditure and observing austerity along with implementation of a strong programme of reforms to raise the low tax to GDP ratio of the country by broad-basing the tax system and eliminating exemptions. The fundamental question is whether measures at reducing the fiscal deficit will have a, more or less, permanent impact. If an increase in tax revenue is accompanied subsequently by a rise in expenditure then the impact on the deficit is likely to be temporary or limited in character. Alternatively, if a cut in expenditure leads to a slackening of the fiscal effort then the gains are also not lasting in nature.

Therefore, a study of the direction of causality between tax revenue and expenditure is essential to determine the optimal strategy for deficit reduction. There is need to understand if governments in Pakistan first tax and then spend or first spend and then tax.

In other words, is there 'fiscal synchronisation' of the type pointed out by Frusternberg, *et al.* (1986)?

The paper is organised as follows: Section 2 reviews the literature on the relationship between taxation and expenditure. Section 3 describes the methodology and the data. Section 4 presents the results for the federal and the provincial governments combined, and Section 5 presents the conclusions and policy recommendations.

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2. LITERATURE REVIEW

Different studies have been undertaken to understand the relationship between government revenue and expenditure. Three hypotheses have been postulated by Aziz, *et al.* (2000), first, a bi-directional relationship between expenditure and revenue, second, a unidirectional causality that runs from revenue to expenditure and, third, the causality from expenditure to revenue. All these hypotheses have important implications for the strategy to solve the budget deficit problem. Some support to the fiscal synchronisation hypothesis is given by Miller and Russek (1990) who concluded that there is bidirectional causality between taxes and government expenditures in the federal, state and local sectors of the USA. Kirchgassner and Prohl observe a bidirectional causality between revenue and expenditure both in the short run and long run for the Swiss federal government. Bohn (1991) shows that 50-65 percent of all deficits are caused by unexpected tax cuts and 65-70 percent are caused by high government expenditures, so there is a significant evidence in favour of both *tax-and-spend and the spend-and-tax hypotheses.* High deficits have been corrected by the combination of tax increase and cuts on expenditure. Payne (1998) shows that among 48 states of the USA, 24 support the tax-spend hypothesis, 8 the spend-tax hypothesis and 15 the hypothesis of fiscal synchronisation, which means revenue and expenditure are jointly determined.

Some of the studies have shown that there is unidirectional causality from government revenues to expenditures. Marlow and Manage (1987) found a unidirectional causality from tax revenues to expenditures on the state data of USA for all almost lag structures. For local governments they find causality from revenues to expenditure for the *shortest lag length* of two years, while for other lags revenue and expenditure appear independent of each other. Moalusi (2007) finds unidirectional causality from revenue to expenditure in Botswana. Owoye (1995) demonstrates that there is bidirectional causality between expenditures and taxes in five countries of G7, but in Italy and Japan causality is from taxes to expenditures.

The third hypothesis of first spend and tax later is also supported by many studies. For example, Barro (1979) indicated that during war and post war periods there is an impact of temporary increase in government expenditures on public debt which eventually leads to a rise in taxes.

The causality between taxes and expenditures for federal and provincial governments combined of Pakistan was studied by Hussain (2005) for the period 1973-2003. The author concludes that there is unidirectional causality from government expenditure to revenue. He offers two simultaneous solutions, first, to expand the tax base and ensure higher collection of taxes and second to cut the excess current expenditures. Further the work of Aisha, *et al.* supported spend and tax hypothesis in case of Pakistan as taxes revenues are determined by government expenditure. The authors performed a co-integration test which suggests that there exists a long run relationship between revenue and expenditure in Pakistan.

3. METHODOLOGY AND DATA

Various approaches can be adopted to study the relationship between revenues and expenditure, including Co-integration test, Granger causality test, Error correction model and Vector Autoregressive mode (VAR). Granger (1969) argued the revenues may be

explained by past revenues and expenditures. If the past values of expenditure explain current revenues then there exists causality expenditure to revenue. If the opposite is the case then the flow of causation is from revenue to expenditure.

The simple model which tests the causal relationship between revenues and expenditures presented by Granger (1969) is as follows:

$$X_t = \sum_{j=1}^{m_1} a_j X_{t-j} + \sum_{j=1}^{m_2} b_j Y_{t-j} + \varepsilon_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

$$Y_t = \sum_{j=1}^{m_3} c_j X_{t-j} + \sum_{j=1}^{m_4} d_j Y_{t-j} + \eta_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

Here the error terms, ε_t and η_t are uncorrelated series with means that $E\ [\varepsilon_t, \eta_t]=0$. The *ms* are the given lag lengths. In the above equations if *bj* is not equal to zero it implies that direction of causality is from *Y* to *X* and similarly if *cj* is not equal to zero than the causality is from *X* to *Y*. If both *bj* and *cj* are not equal to zero there is a bi-directional causality between *X* and *Y* and if both *bj* and *cj* are equal to zero there exist no causal relationship between *Xt* and *Yt*.

For our research, *X* corresponds to expenditure and *Y* to tax revenues. The expenditure variable is designated as *EXP* and the revenue variable as *REV*.

Lag lengths, m, of the above equations are determined through Akaike Information Criterion (1969) and Schwarz Criterion (1978). Initially Equation 1 of expenditure is regressed on the lagged variables of expenditure, excluding revenue. Appropriate lag is selected where AIC are SC are minimum. Keeping this lag fixed, lags for the revenue have been introduced until AIC and SC are minimised. Same procedure is applied to Equation 2 for the determination of the optimal lag lengths of expenditure and causing revenue.

The null and alternate hypotheses for the equation 1 are as follows:

Ho: REV does not Granger Cause EXP.

H1: REV does Granger Cause EXP.

For the Equation 2 null and alternate hypotheses are as follows:

Ho: EXP does not Granger cause REV.

H1: EXP does Granger Cause REV.

If $bj = 0$ of Equation 1 and $cj \neq 0$ of Equation 2, it implies there is a unidirectional causality from expenditure to revenue. Similarly if $bj \neq 0$ of Equation 1 and $cj = 0$ of Equation 2 implies unidirectional causality from revenue to expenditure. If both $bj \neq 0$ of Equation 1 and $cj \neq 0$ of Equation 2 implies a bidirectional causality, finally if $bj = 0$ of Equation 1 and $cj = 0$ of Equation 2 implies no link between expenditure and revenue. We also expect that $\Sigma\ aj < 1$, $\Sigma\ bj < 1$, $\Sigma\ cj < 1$ and $\Sigma\ dj < 1$**.** OLS regression is applied to both the Equations 1 and 2 to check the significance of estimates, at the 5 percent significance level.

Data on federal and provincial tax revenues, current and development expenditure have been taken for the period, 1980-81 to 2009-10, from Pakistan

Economic Survey and the State Bank of Pakistan. Revised estimates for the last year have been obtained from the website of fiscal operations maintained by the Ministry of Finance, Islamabad. Non-tax revenues, which include interest income, profits and dividends and miscellaneous receipts, have been excluded from the analysis as they are mostly exogenous in character. The series have been converted into real percapita magnitudes in order to avoid problems of non-stationarity, and are presented in Table 1.

Table 1

Percapita Real Tax Revenue and Expenditure of the Federal and Provincial Governments Combined (At Constant Prices of 1999-2000)

Years	Per Capita Real Total Rev (PCRTTR)	Per Capita Real Total Exp (PCRTE)	Per Capita Real Current Exp (PCRTCE)	Per Capita Real Dev Exp (PCRTDE)
1981	2182	4104	2851	1254
1982	2088	3767	2616	1152
1983	2184	4025	2852	1172
1984	2186	3971	2935	1037
1985	2020	4139	3029	1110
1986	2157	4617	3243	1373
1987	2230	4987	3731	1256
1988	2420	5424	4019	1405
1989	2536	5323	4050	1273
1990	2650	5355	4001	1354
1991	2470	5494	4119	1375
1992	2776	5969	4273	1696
1993	2739	5748	4491	1256
1994	2630	5275	4242	1033
1995	2951	5344	4316	1027
1996	3088	5699	4663	1037
1997	2852	5194	4373	821
1998	2714	5518	4612	906
1999	2693	5229	4420	809
2000	2786	5579	4814	765
2001	2926	5132	4599	533
2002	2852	5209	4722	487
2003	3111	5732	5052	680
2004	3291	5721	4638	1083
2005	3401	6005	4647	1357
2006	3681	6853	5058	1795
2007	3676	8020	6128	1892
2008	3864	8899	7244	1655
2009	3832	8046	6496	1550
2010	3879	8518	6954	1563

4. EMPIRICAL RESULTS

4.1. Tax Revenue and total Expenditure

The regression results of causality between total tax revenues and total expenditures of the federal and provincial governments combined are given below. Total tax revenue consists of federal total tax and provincial total tax revenues. Total expenditure is the sum of federal and provincial current and total development expenditure. The results show that there does not exist any causal relationship between total government revenue and total expenditure. The null hypothesis that total revenue does not Granger cause total expenditure is accepted against the alternate that total revenue does Granger cause total expenditure at 5 percent significance level. Similarly, the null hypothesis that total tax expenditure does not Granger cause total revenue is also accepted against the alternate that total expenditure does Granger cause total revenue.

One of the principal reasons for the lack of responsiveness of expenditure to changes in revenue is the downward rigidity in major expenditure heads like defense, debt servicing, costs of civil administration, etc. Development expenditure is more discretionary in character but in the presence of a large throwforward of on-going development schemes it is difficult to cut back the size of the PSDP in the short run.

On the taxation size the inability to mobilise revenue quickly in the event of slippages on the expenditure side is due to the absence of a tax culture given the large size of the informal economy, presence of strong lobbies, low efficiency of tax administration and low elasticity of the tax system.

The failure in raising tax revenues in the presence of a rapidly growing trend in expenditure is vividly demonstrated by the experience after 2003-04 when the fiscal deficit was at its historically lowest level of 2.4 percent of the GDP. The emergence of the War on Terror and the resulting rise in security spending along with more recent problem of large subsidies to public sector enterprises and introduction of transfer payments have increased public expenditure by almost three percentage points of the GDP in the last six years. But the tax- to -GDP ratio has remained stagnant at about 10 percent of the GDP and, consequently, the fiscal deficit has risen to 6.3 percent of the GDP by 2009-10.

Results of the Granger Causality test between total tax revenues and total expenditures are given in Table 2. The underlying regressions are presented in Table 3.

Table 2

Results of the Granger Causality between Tax Revenues and Total Expenditure

	Independent Variables		p-values			
Dependent Variable	Lag of Expenditure	Lag of Revenue	Lag Exp	Lag Rev	Inference	Causality
Percapita Real Exp	1	1	0.0001	0.115	Accept null hypothesis	No causation
Percapita Real Rev	1	1	0.611	0.000	Accept null hypothesis	

Table 3

Results of the Regressions between Tax Revenues and Total Expenditure

Dependent Variable: PCRTE
Sample (Adjusted): 1982 to 2010
Included Observations: 29 after Adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	–220.685	448.894	-0.492	0.627
PCRTE (-1)	0.761	0.166	4.587	0.0001
PCRTTR(-1)	0.606	0.371	1.633	0.115
R-Squared	0.888	Mean dependent var		5682.454
Adjusted R-Squared	0.879	S.D. dependent var		1281.317
S.E. of Regression	445.170	Akaike info criterion		15.132
Sum Squared Resid	5152586.000	Schwarz criterion		15.274
Log Likelihood	–216.421	Hannan-Quinn criter		15.177
F-statistic	102.982	Durbin-Watson stat		1.918
Prob(F-statistic)	0.000			

Dependent Variable: PCRTE
Sample (Adjusted): 1982 to 2010
Included Observations: 29 after Adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	48.577	156.293	0.311	0.758
PCRTTR(-1)	0.945	0.129	7.313	0.000
PCRTE(-1)	0.030	0.058	0.514	0.611
R-Squared	0.928	Mean dependent var		2851.148
Adjusted R-Squared	0.922	S.D. dependent var		556.236
S.E. of Regression	154.996	Akaike info criterion		13.022
Sum Squared Resid	624620.200	Schwarz criterion		13.164
Log Likelihood	–185.825	Hannan-Quinn criter		13.067
F-statistic	167.303	Durbin-Watson stat		2.182
Prob(F-statistic)	0.000			

Where

PCRTE = Real percapita expenditure,
PCRTTR = Real percapita tax revenues.

It may be noticed that, although not statistically significant, there appears to be some evidence of weak causation from tax revenues to expenditure. Hussain (2005) had concluded that there was causality from expenditure to revenue in the Pakistani context for an earlier period upto 2002-03. Clearly, the relationship has broken down due to the developments thereafter as described above.

4.2. Tax Revenue and Current Expenditure

We now test for the relationship between total tax revenue and total current expenditure. The results clearly show that there does not exist a causal relationship between total tax revenue and total current expenditures. The null hypothesis that total revenue does not Granger cause total current expenditure is accepted against the alternate that total revenue does Granger cause total current expenditure at 5 percent level of significance. Similarly the null hypothesis that total current expenditure does not Granger cause total revenue is also accepted against the alternate that total current expenditure does Granger cause total revenue.

Results of the Granger Causality test between total tax revenues and current expenditures are given in Table 4. The underlying regressions are presented in Table 5.

Table 4

Results of the Granger Causality Test Between Revenues and Current Expenditure

	Independent variables		p-values			
Dependent Variable	Lag of Expenditure	Lag of Revenue	Lag exp	Lag rev	Inference	Causality
Percapita Real Current Exp	1	2	0.005	0.239	Accept null hypothesis	No causation
Percapita Real Rev	1	1	0.430	0.000	Accept null hypothesis	

The results of regressions are given in Table 5.

Table 5

Results of Regressions of Tax Revenue and Current Expenditure

Dependent Variable: PCRTE
Sample (Adjusted): 1982 to 2010
Included Observations: 29 after Adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	–502.572	402.829	–1.248	0.224
PCRTCE(-1)	0.529	0.172	3.070	0.005
PCRTTR(-1)	0.397	0.487	0.815	0.423
PCRTTR(-2)	0.587	0.486	1.207	0.239
R-Squared	0.904	Mean dependent var		4561.522
Adjusted R-Squared	0.892	S.D. dependent var		1079.009
S.E. of Regression	354.477	Akaike info criterion		14.711
Sum Squared Resid	3015693	Schwarz criterion		14.901
Log Likelihood	–201.950	Hannan-Quinn criter.		14.769
F-statistic	75.391	Durbin-Watson stat		1.900
Prob(F-statistic)	0.000			

Continued—

Dependent Variable: PCRTE Sample (Adjusted): 1982 to 2010 Included Observations: 29 after Adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	87.083	163.671	0.532	0.599
PCRTTR(-1)	0.901	0.140	6.418	0.000
PCRTCE(-1)	0.057	0.071	0.801	0.430
R-Squared	0.929	Mean dependent var		2851.148
Adjusted R-Squared	0.923	S.D. dependent var		556.236
S.E. of Regression	153.894	Akaike info criterion		13.008
Sum Squared Resid	615767.100	Schwarz criterion		13.150
Log Likelihood	–185.618	Hannan-Quinn criter		13.052
F-statistic	169.896	Durbin-Watson stat		2.142
Prob(F-statistic)	0.000			

Where PCRTCE = Real percapita current expenditure

4.3. Tax Revenue and Development Expenditure

The results of the Granger Causality Test of the relationship between total tax revenue and development expenditure is shown below.

Table 6

Results of the Granger Causality Test between Revenues and Development Expenditure

	Independent variables		p-values			
Dependent Variable	Lag of Expenditure	Lag of Revenue	Lag Exp	Lag Rev	Inference	Causality
Percapita Real Development Exp	1	1	0.000	0.564	Accept null hypothesis	No causation
Percapita Real Rev	1	1	0.848	0.000	Accept null hypothesis	

Null hypothesis that total revenue does not Granger cause total development expenditure is accepted against the alternate that total revenue does Granger cause total development expenditure at 5 percent level of significance. Similarly, the null hypothesis that total development expenditure does not Granger cause total revenue is also accepted against the alternate that total development expenditure does Granger cause total revenue. The underlying regressions between total tax revenues and development expenditure are presented in Table 7.

Table 7

Results of Regressions Between Tax Revenues and Development Expenditure

Dependent Variable: PCRTE
Sample (Adjusted): 1982 to 2010
Included Observations: 29 after Adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	84.698	217.407	0.390	0.700
PCRTDE (-1)	0.832	0.114	7.268	0.000
PCRTTR(-1)	0.044	0.076	0.584	0.564
R-Squared	0.702	Mean dependent var		1188.028
Adjusted R-Squared	0.679	S.D. dependent var		360.107
S.E. of Regression	203.970	Akaike info criterion		13.572
Sum Squared Resid	1081700	Schwarz criterion		13.713
Log Likelihood	-193.787	Hannan-Quinn criter		13.616
F-statistic	30.637	Durbin-Watson stat		1.514
Prob(F-statistic)	0.000			

Dependent Variable: PCRTE
Sample (Adjusted): 1982 to 2010
Included Observations: 29 after Adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	55.537	165.926	0.335	0.741
PCRTTR (-1)	1.008	0.058	17.420	0.000
PCRTDE(-1)	–0.017	0.087	-0.194	0.848
R-Squared	0.927	Mean dependent var		2851.148
Adjusted R-Squared	0.922	S.D. dependent var		556.236
S.E. of Regression	155.670	Akaike info criterion		13.031
Sum Squared Resid	630064	Schwarz criterion		13.173
Log Likelihood	–185.950	Hannan-Quinn criter		13.075
F-statistic	165.745	Durbin-Watson stat		2.223
Prob(F-statistic)	0.000			

Where PCRTDE = Real percapita Development expenditure.

Contrary perhaps to expectations, even the relatively discretionary part of expenditure on development is not related to tax revenues. As highlighted in Table 1, development expenditure has shown a steady declining trend in real percapita terms from 1992 to 2002, and thereafter a rising trend. This trend has proceeded independently of the trend in tax revenues.

5. CONCLUSIONS AND RECOMMENDATIONS

The Granger Causality test between total tax revenues and total expenditure of the federal and provincial governments combined has revealed the absence of any significant relationship. Extension of the test to determine the causality between tax revenues and the two major components of expenditure, viz., current expenditure and development expenditure, has also been unsuccessful.

The implication of these findings is that successive governments of Pakistan have been unstable to control the size of the fiscal deficits during the periods when public expenditure has been rising sharply, as happened, for example, after 2003-04 by responding with efforts at mobilising additional resources through the tax system. Alternatively, when revenues were stagnant in the late 90s adequate efforts were not made to control the level of public expenditure. These failures highlight the weaknesses in fiscal management in country.

However, there is a positive downside to the findings. The absence of any causality between tax revenues and expenditure does indicate that if vigorous efforts are made now to raise the tax-to-GDP ratio then this need not translate into increase in expenditure and there is, therefore, the likelihood of success of this strategy in reducing the fiscal deficit. Alternatively, if expenditure, especially on the current side, is curtailed then this is unlikely to be accompanied by any slackening of the fiscal effort. It is clear that the time has come for containing the fiscal deficit on both the revenue and expenditure front and thereby reducing inflationary pressures in the economy.

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