

AN APPRAISAL OF FISCAL DECENTRALIZATION IN PAKISTAN

Ihtsham ul Haq Padda

Shabir Hyder

Naeem Akram

Federal Urdu University of Arts, Science, and Technology, Islamabad

ABSTRACT

Fiscal federalism is a controversial issue in Pakistan. Because the major heads of the revenue collection are in the federal government control, from divisible pool, these resources are then distributed between federal government and provinces. Over time, federal government has taken most of the functions that were earlier assigned to provincial governments. This hunger of power has created the controversy between federal government and provincial governments and also among the provinces over distribution of resources. Present study analyzes this issue by using the provincial data of the revenue and expenditure. Study finds that Punjab the most populous province enjoys fiscal decentralization, followed by Sindh. However, the other two smaller provinces Khyber Pakhtoonkhwa and Balochistan are dependent on the central government because of their relatively small population and hence they get low revenue share from the divisible pool. It is suggested that smaller provinces should enhance their efforts to further stimulate the provincial revenue collection; moreover, the federal government should give more control over the natural resources to the provinces.

Key Words: Fiscal Decentralization, Revenue, Expenditure, Co-integration, Granger causality

JEL: H11; H71; H72; C22

Acknowledgement: The authors are highly indebted to Dr Syed Nawab Haider Naqvi for his encouragement and providing research oriented environment at the FSES, FUUAST Islamabad.

INTRODUCTION

Over the years in Pakistan, distribution of powers between the federation and provinces is the most controversial issue. Although the 1940 Lahore Resolution and 1973 Constitution give autonomy to the provinces, but due to political confusion created by military dictatorships and authoritarian democratic regimes it has not been implemented in its true spirit. Lack of provincial autonomy had caused dismemberment of the country in 1971 and latter on eroded the people's trust on the Federation. The distribution of the powers has many dimensions and the distribution of the federal resources is one of them. The eighteenth amendment, in the constitution of

Pakistan, approved by the parliament on April 19, 2010 is also another attempt to enhance the provincial autonomy. Eighteenth amendment enhances provincial autonomy by increasing provinces' fiscal authority, for example, collection of one of the most revenue generating tax i.e. sales tax is transferred from federal to provincial governments.

In any federation; fiscal federalism is a critical issue. Fiscal federalism is defined as “the understanding, which functions and instruments are best centralized and which are best placed in the sphere of decentralized levels of government” (Oates, 1999: 1120). The sub-central governments know better about the demands of voters, therefore, mostly the central government provides share of its revenue to provinces/states to meet their spending requirements. If the provincial authorities are able to arrange its spending requirements through their own resources and the share provided by the central government, it depicts the situation of fiscal decentralization. On the other hand, if they are unable to meet their revenue requirements and seek towards central government for funding of their spending requirements, such a situation would be referred as a situation of fiscal centralization.

Historically, in Pakistan, the only criterion for distribution of resources was population of the provinces. But in the seventh National Finance Commission (NFC) award (current), for the first time, other factors like revenue generation, poverty and inverse population density, are also accounted for, in the distribution of resources among the provincial governments. In Pakistan most of the revenue generating taxes are collected by federal government, while provincial governments besides collecting less revenue generating taxes, mostly rely on the federal government transfers through NFC award. As Ahmed et al (2007) noted that although in principle the federal government is responsible for some major subjects, like defense, communication, debt servicing and foreign policy, but overtime the federal government has also acquired many responsibilities that were falling in the provincial government's domain. These include among others, taking care of industrial development, irrigation, law and order and public welfare programs like health and education and so forth. This practice has resulted in an increase in the federal government size, forcing it to take major chunk of the resources, while provincial governments are left with meager resources. Given these difficulties, provincial governments usually remain under stress from their voters for their inefficiency in the services delivery.

The present study analyzes the centrality of provincial finance system in Pakistan. In this context the study also discusses the scenario of fiscal distribution among the provinces. It is hypothesized that provincial governments are facing demands from its voters to deliver best services. In order to cope with voters demands the provincial governments spend their resources accordingly. In simple words provincial expenditure requirements determines their revenue collection. But given provincial government's limitations in revenue collection, opposite may hold true as its revenue collection may cause its level of expenditure.

After this introductory section, the rest of the paper conducts a brief review of theoretical and empirical literature with a view to identify the research gaps. Next it gives an overview of

fiscal federalism in Pakistan. Then it presents estimation methodology and empirical findings. The last section gives a few plausible policy prescriptions that emerge from the present study.

LITERATURE REVIEW

Fiscal decentralization may increase economic efficiency. This view is exerted by Oates (1972), he further argued that fiscal decentralization will make the sub-national governments accountable as well as equip them with necessary resources to cope with ever increasing demands of local populace. One of the objectives of fiscal decentralization is to increase the allocative efficiency in the economy. This is because demand for services in various areas may differ considerably and local decisions regarding delivery of those services will allocate resources efficiently, than if those decisions were made at central level. Stein (1998) studied the decentralization process in the Latin America and concluded that decentralization can improve the resource allocation by bringing fiscal decisions in tune with the local demands. The heavy reliance on central government for resources may hamper the sub-national governments' ability.

Llanto (2009) argued in the context of the Philippines that heavy reliance of intergovernmental fiscal transfers by local governments is jeopardizing the sub-national governments' ability to deliver. It is also argued that the more decentralized, a locality is, the more likely it is to grow. Stansel (2005) observed that fiscal decentralization resulted in higher local economic growth in U.S. municipalities. Fiscal decentralization can improve the chances of increase in foreign direct investment (FDI) in a particular region of a country. It is argued that FDI flows to regions where good governance prevails. Thus sub-national governments within a country would try to compete in attracting FDI by provision of services through good governance (World Bank, 2005).

In the context of Pakistan there is scarcity of literature regarding fiscal federalism, two of those studies are discussed next. Shah (1997) considers Pakistan to be comparable to those of failed states in terms of services delivery at local level. Study criticized Pakistan over its high centralized structure of decision making, resulting in lack of fiscal discipline, overburdened private sector in provision of basic facilities like health and education, and lack of public sector accountability due to separation of tax collection and spending duty. However Mushtaq (2009) compared Pakistan with eighteen other countries in terms of degree of fiscal federalism and noted that Pakistan could be bracketed with states having minimum degree of decentralization.

FISCAL FEDERALISM IN PAKISTAN: AN OVERVIEW

Pakistan's Fiscal Structure

Pakistan is a federation, governed by 1973 constitution. Most of the revenue in Pakistan is collected by central (federal) government; latter on it is distributed between federal

government and sub-central (provincial) governments. Distribution of resources between the federal and provincial governments is defined in the Part VI of the constitution. According to the constitution, President of Pakistan constitutes National Finance Commission (NFC), which is responsible for making recommendations regarding distribution of resources between federal and provincial governments. National Finance Commission is responsible to make these recommendations after every five years. Besides, Schedule IV (Article 70(4)) of 1973 constitution defines functions of federal and provincial governments, which are stated in the federal and concurrent legislative lists. Federal legislative list provides details about the functions to be exclusively performed by Federal government while concurrent legislative list gives a list of functions which both federal and provincial governments can perform.

Federal legislative list defines federal government's functions, which include defense, external affairs, currency issue, public debt, shipping, banking and stock exchanges etc. Besides, this list empowers the federal government to collect the custom duties, income tax, corporation tax and sales tax. While, the concurrent list, include the population planning, electricity, social welfare, zakat, tourism, vocational and technical training, etc. Other functions that are not included both in federal and concurrent legislative list, are to be performed by provincial governments (Zaidi, 2005). These functions include highways and urban transport, agricultural extension and secondary and higher education etc. This list also empowers the provincial governments to collect land revenue, urban immovable property tax, stamp duty, excise and electricity duty etc.

Intergovernmental Fiscal Relations

Prior to the promulgation of 1973 constitution, revenue sharing arrangements were made in accordance with Niemeyer award, Raisman award, 1961 & 1964 NFC awards. While in 1970 NFC award was not passed unanimously therefore the NFC committee was constituted, and its recommendations regarding revenue sharing arrangements were followed. After promulgation of constitution in 1973, seven NFC awards were announced. Out of those, three NFC awards were adopted in 1974, 1991 and 1997. But other three NFC awards constituted in 1979, 1984 and 2000 failed to reach consensus and ended in a deadlock. While the seventh NFC award has been recently announced in 2010.

During 1979-1996 the share of the central government remained fixed at twenty percent while the provincial governments' share was eighty percent. It is because during that period, many revenue taxes and other non tax options were in the hands of the provinces. But over the time the central government took many additional assignments which resulted in hidden reduction in the provincial shares. For example, in the NFC award of 1997 the inclusion of custom duties in the divisible pool, previously that had been totally in the hands of federal government required an increase in the federal share. Consequently, the share of the federal government in divisible pool was enhanced from 20 percent to 62.5 per cent while the provincial

governments' share was reduced to 37.5 percent from 80 percent. After its expiry in 2002, it remained formally operative until 2009. The federal and inter-provincial revenue sharing arrangements, after promulgation of 1973 constitution are summarized in the table 1.

Table 1.						
Inter-Provincial Revenue Distribution under various NFC Awards (Percentage)						
<i>Years</i>	<i>Fed : Prov.</i>	<i>Punjab</i>	<i>Sindh</i>	<i>Khyber Pakhtoonkhwa</i>	<i>Balochistan</i>	<i>Total</i>
1974	20 : 80	60.25	22.50	13.39	3.86	100
1979	20 : 80	57.97	23.34	13.39	5.30	100
1984	Interim award					
1991	20:80	57.87	23.29	13.54	5.30	100
1997	62.5:37.5	57.88	23.28	13.54	5.30	100
2000	Interim award					
2010	56:44	51.74	24.55	14.62	9.09	100
<i>Source: Ministry of Finance, Pakistan</i>						

Zaidi (2005) criticizes the provincial governments on their inability to finance themselves from their own tax sources. Pasha (1998) has also described that tax collection of the provinces are below their potential and if extended efforts are made then provinces can increase the revenues from their own resources. However, Bahl et al (2008) indicate the difficulties faced by provincial governments in increasing their tax efforts.

Table 2:		
Provincial Tax Revenue and Federal Tax Assignments (Million Rs)		
<i>Years</i>	<i>Provincial Tax Revenue</i>	<i>Federal Tax Assignments</i>
1995	9035	97721
1996	11255	120446
1997	14726	131556
1998	16712	114419
1999	19025	118659
2000	19460	143157
2001	20686	167838
2002	21607	174113
2003	23329	194039
2004	30365	212148
2005	32828	251218
2006	40600	298900
2007	49000	333100
2008	50900	392200
2009	63100	501900
<i>Source: Annual Reports of State Bank of Pakistan (various issues)</i>		

The study depicts that provincial governments' tax base consists of hard to collect taxes and besides their tax collection machinery is inefficient. This can be easily seen from the table 2, which compares provincial tax receipts with federal tax assignments to the provinces. The heavy reliance on the federal tax transfers constrains provinces ability to provide much needed services according to their people wishes as they cannot raise needed resources on their own. Political tension arises, as each province tries to get those necessary funds to finance their expenditure requirements according to their voters' demands. Resultantly provincial governments demand those funds from federal government according to the criteria which best suit them. For example, out of all the four provinces of Pakistan; Punjab requires distribution on the basis of population, Sindh considers that base to be revenue collection capacity, Khyber Pakhtoonkhwa demands that poverty and backwardness should also be taken into account and Balochistan considers area or inverse population density to be the base of revenue distribution in NFC award.

These factors led provincial governments to rely more on their shares in federal tax revenue as provided in the NFC award. However political pressure from each of the province along with increased size of federal government level spoils the achievement of consensus on the NFC award. In the current NFC award (2010), besides making population as one of the basis for revenue distribution among provinces, other factors were also taken into consideration to pacify the concerns of provincial governments. According to the seventh NFC award the criteria of population gets eighty two percent weightage, while other basis for revenue distribution i.e. poverty, revenue generation, revenue collection and inverse population density get 10.3, 2.5, 2.5, and 2.7 percent share respectively.

DATA AND METHODOLOGY

This study analyzes fiscal situation of each province of Pakistan (i.e. Punjab, Sindh, Balochistan and Khyber Pakhtoonkhwa) to seek the situation of each province, separately. Time series analysis is conducted because of the fiscal dissimilarities of the provinces. Data for period 1982-2009 of total spending and total revenue of the provinces of Pakistan have been taken from the annual reports of State Bank of Pakistan and Handbook of Statistics on Pakistan Economy 2005.

For fiscal decentralization there should be a long run relationship between the revenue and spending of the provinces. Presence of such relationship would indicate the presence of fiscal decentralization or otherwise. But the existence of such relationship does not show which variable is causing the other. For this purpose causality analysis is performed. There are four competing hypotheses regarding the relationship between tax and spending, i.e. the tax-and-spend hypothesis (Friedman (1978)), the spend-and-tax hypothesis (Roberts (1978) and Peacock and Wiseman (1979)), the fiscal synchronization hypothesis or bidirectional causality (Musgrave (1966) and Meltzer and Richard (1981)) and the institutional separation hypothesis or no causality (Wildavsky (1988)). The case of causality from revenue to spending implies that the

financing system is mostly under the control of the central government. However, in the situation of causality from spending to revenue means that the provinces have more fiscal autonomy. The bidirectional causality between the two means that there is fiscal synchronization between the central and provincial governments and the decisions are made jointly. While if there is no causality between spending and revenue it suggests that the decisions are made independently by the two.

To check the situation of fiscal decentralization in Pakistan, this study seeks the long run relationship between the revenue and expenditure of the provinces. For this purpose co-integration analysis is most commonly used in the literature and present study will also apply the Johansen Co-integration test. However, for the co-integration, the variables should be integrated and be of the same order. To check the order of integration present study conducts Augmented Dicky Fuller (ADF) unit root tests. The variables used in the present analysis are total revenue and total spending of the four provinces of Pakistan.

ESTIMATION RESULTS:

The ADF unit root test results indicate that both revenue and expenditure series are non-stationary at level and first difference. The study finds stationarity in revenue and spending at second difference. Since both types of variables are integrated of order two therefore the co-integration analysis can be conducted for analysis. (Detailed results are presented in Appendix – II)

The Johansen co-integration test results indicate that there is long run relationship between revenue and expenditure for Punjab, Sindh, and Khyber Pakhtoonkhwa. However, no long run relationship is found for the revenue and expenditure of Balochistan. After the co-integration analysis, Granger causality test is performed to check the direction of causality.

Table 1: Johansen Co-Integration Test Results

<i>Province</i>	<i>Punjab</i>	<i>Sindh</i>	<i>Balochistan</i>	<i>Khyber Pakhtoonkhwa</i>
<i>Rank Test</i>	cointegrating eqn(s)	cointegrating eqn(s)	cointegrating eqn(s)	cointegrating eqn(s)
<i>Trace</i>	2	2	No	2
<i>Max. Eigen value</i>	2	2	No	2

Table 2: Normalized Co-Integrating Coefficients (Standard error in parentheses)

<i>Punjab</i>	<i>Sindh</i>	<i>Balochistan</i>	<i>Khyber Pakhtoonkhwa</i>
TE = 0.73TR + e _t (0.065)	TE = 0.92TR + e _t (0.066)	TE = 1.16TR + e _t (0.185)	TE = 0.97TR + e _t (0.051)

The study conducts the Granger causality test individually for data on each of the provinces. The causality analysis for the Punjab shows that only spending causes the revenue.

This designates that the spending requirements of the Punjab are being fulfilled through its own resources and funding from the central government. Such a situation favors the strong fiscal decentralization. The situation of the Sindh is different from Punjab. The analysis shows that both revenue and spending cause each other. Such results indicate the fiscal synchronization behavior. This illustrates that the spending and revenue decisions are made jointly by Sindh and the central government and both regard the limitations of each other. Such a situation connotes the weak fiscal decentralization.

The cases of Balochistan and Khyber Pakhtoonkhwa are different from the other two provinces. The causality analyses for these two provinces show that both spending and revenue do not cause each other. The situation indicates the independence of fiscal decisions between the provincial requirements and the provision of funds by the central government... revealing the non existence of fiscal decentralization. These two provinces have very limited own revenue collection; therefore, they have to rely on the federal government for financing of their expenditures. However, the central government is not providing the resources to these governments according to their requirements. It is worthwhile to mention here that Punjab and Sindh enjoys their greater revenue generation capacities as compared to the rest of two provinces that is why fiscal decentralization is happening in the Punjab and Sindh. But due to lack of revenue generation capacities fiscal decentralization is not taking place in Khyber Pakhtoonkhwa and Balochistan.

CONCLUSION AND POLICY IMPLICATIONS

The main objective of the study was to analyze the existence of the fiscal decentralization in Pakistan. It briefly described the resource distribution between federal and provincial governments in Pakistan through NFC award mechanism, indicating the heavy reliance of provincial governments on federal government. In the analysis the co-integration and causality tests were applied by using the Pakistan's provincial data for the period 1982-2009.

The time series analysis shows the existence of fiscal decentralization in Punjab and Sindh. However, Balochistan and Khyber Pakhtoonkhwa are facing more central control over finances. The plausible explanation may lie in the higher provincial revenue collection by Punjab and Sindh as compared to Balochistan and Khyber Pakhtoonkhwa. Moreover, Punjab and Sindh also get greater shares from the central government due the formula laid down in NFC awards, because, till the seventh NFC award, distribution of funds was solely based on their population. Punjab is the most populous province, followed by Sindh, Khyber Pukhtoonkhwa and Balochistan, respectively.

The two most backward provinces i.e. Khyber Pakhtoonkhwa and Balochistan although have hard working labor force. But most of the labor force is illiterate. Due to unavailability of trained labor force, investors hesitate to invest in these provinces. The low investment, results in lower tax collection in both the provinces. Similarly the services sector----the major source of the

provincial revenue, is also comparatively underdeveloped in these provinces. Both these provinces are rich in physical resources, for example Balochistan and Khyber Pakhtoonkhwa have most of oil and gas reservoirs along with other mineral resources in the country, but since most of the revenue of these resources is collected by central government, therefore provincial governments are left with little incentive to enhance their interest and investment in development of oil and gas resources, thus little tax revenue is collected. It is also worthwhile to point out that insurgency in both of these provinces has halted the developmental activities that has also reduced the revenue collection in the provinces.

It is suggested that Balochistan and Khyber Pakhtoonkhwa should enhance their fiscal effort. In this regard a key role would be of federal government which may give more control to the provinces over their natural resources. Greater fiscal responsibility would give more incentive to extend their efforts in extraction of the mineral resources. Besides decentralized decision making over resource exploration may result in greater efficiency. Major share of the tax revenue is collected at federal level. It is because federal government has control over major tax bases. It is therefore suggested that distribution of tax bases between federal and provincial governments should be rationalized.

The study has found fiscal decentralization in Punjab and Sindh over time but its level is not clear; whether it is optimal or not. However this analysis is beyond the scope of present paper and needs further investigation. It is worth mentioning here that in all of the provinces few districts are relatively more developed and they also reap the major shares in the revenues so it is also suggested that fiscal decentralization in the context of the districts may also be analyzed. The focus of the present was just to analyze whether the fiscal decentralization is taking place in the provinces of Pakistan or not. However, the consequences of the fiscal decentralization for the poverty reduction, inclusive economic growth and social development in Pakistan remain unexplored. Therefore, it is suggested that a comprehensive study may also be conducted that may analyze the role of fiscal decentralization in the economic development of the country.

REFERENCES:

- Ahmed, I., Mustafa, U., & Khalid, M. (2007). National Finance Commission Awards in Pakistan: A Historical Perspective. *PIDE Working Papers No.33* .
- Bahl, R., Wallace, S., & Cyan, M. (2008). The Challenges of Intergovernmental Fiscal Relations in Pakistan: The Property Tax Dimension. *International Studies program Working Paper 08-25* .
- Dickey, D. A., & Fuller, W. (1979). Distribution of Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association*, 74, 427-431.
- Engel, R. F., & Granger, C. W. (1987). Co-integration and Error Correction: Representation, Estimation, and Testing. *Econometrica*, 55, 251-276.

- Friedman, M. (1978). The Limitations of Tax Limitation. *Policy Review*, 7–14.
- Johansen, S. (1991). Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models. *Econometrica*, 59, 1551-1581.
- Llanto, M. G. (2009). Fiscal Decentralization and Local Finance Reforms in the Philippines. *Philippine Institute for Development Studies Discussion Paper Series No. 2009-10*.
- Musgrave, R. A. (1966). *A Study in Public Economy*. New York: McGraw Hill.
- Mushtaq, M. (2009). Managing Ethnic Diversity and Federalism in Pakistan. *European Journal of Scientific Research*, 279-294.
- Oates, W. E. (1999). An Essay on Federal Fiscalism. *Journal of Economic Literature*, 37 (3), 1120-1149.
- Padda, Ihtsham ul Haq & Akram, Naeem (2010) Fiscal Policy and Growth Nexus: Scenario of Developing Economies. *The Empirical Economics Letters*, 9(4), 405-412.
- Pasha, H. A. (1998). Hyperlink "<http://www.spdc.org.pk/pubs/cp/cp3.pdf>" Provincial Government Resource Mobilisation, available online at www.spdc.org.pk/pubs/cp/cp3.pdf
- Peacock, A. T., & Wiseman, J. (1979). Approaches to the Analysis of Government Expenditure Growth. *Public Finance Quarterly*, 7, 3–23.
- Roberts, P. C. (1978). Idealism in Public Choice Theory. *Journal of Monetary Economics*, 603-616.
- Shah, A. (1997). Federalism Reform Imperatives, Restructuring Principles and Lessons for Pakistan. *Pakistan Development Review*, 36 (4), 499-536.
- Stansel, D. (2005). Local Decentralization and Local Economic Growth: A Cross-Sectional Examination of US Metropolitan Areas. *Journal of Urban Economics*, 55-72.
- Stein, E. (1998). Fiscal Decentralization and Government Size in Latin America. *Inter-American Development Bank Working paper No. 368*.
- Wildavsky, A. (1988). *The New Politics of Budgetary Process*. Scott Foresman: Glenview, IL.
- World Bank. (2005). *World Development Report*. Washington D.C.
- Zaidi, A. S. (2005). *Issues in Pakistan Economy (2nd Edition)*. Karachi: Oxford University Press.

Appendix -I Empirical Time Series Methodology Co-integration:

In order to test co-integration among variables, the procedure developed by Johansen (1988) is used. This technique depends on direct investigation of co-integration in the vector autoregressive (VAR) representation. It yields maximum likelihood estimators of the unconstrained co-integration vectors and it allows one to explicitly test for number of co-integration vectors.

If there is a VAR of order p

$$y_t = \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + \dots + \alpha_p y_{t-p} + \beta x_t + \epsilon_t$$

Where y_t is a k -vector of non-stationary $I(1)$ variables, x_t is a d -vector of deterministic variables, and ϵ_t is a vector of innovations. We may rewrite this VAR as,

$$\Delta y_t = U y_{t-1} + \sum_{i=1}^{p-1} V_i \Delta y_{t-i} + \beta x_t + \epsilon_t$$

Where

$$U = \sum_{i=1}^p A_i - I$$

$$V_i = - \sum_{j=i+1}^p A_j$$

Granger's representation theorem asserts that if the coefficient matrix U has reduced rank r, k then there exists $k \times r$ matrices α and β each with rank r such that $U = \alpha\beta'$ and $\beta'y_t$ is $I(0)$. r is the number of cointegrating relations (the cointegrating rank) and each column of β is the cointegrating vector. The elements of α are known as the adjustment parameters. Johansen's method is to estimate the matrix from an unrestricted VAR and to test whether we can reject the restrictions implied by the reduced rank of U .

There are four different steps involved while testing cointegration, in the first step order of stationarity is determined and variable must be stationary at same level. We have already found that variables are stationary at first difference i.e. series of the model are $I(1)$. Therefore, the cointegration can be determined between the variables. Second step involves choosing the optimal lag length. To determine the lag length VAR model is used. According to AIC criteria, we determine the lag length of one for the model. Next step deals with determining the number of cointegrating vectors. In the study, both trace statistic and eigenvalue statistic are used.

Granger Causality:

Bivariate regression regarding the granger causality test will get the following form:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + \dots + \alpha_p y_{t-p} + \beta_1 x_{t-1} + \beta_2 x_{t-2} + \dots + \beta_p x_{t-p} + \epsilon_t$$

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \alpha_2 x_{t-2} + \dots + \alpha_p x_{t-p} + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \dots + \beta_p y_{t-p} + \mu_t$$

This equation is for all possible pairs of series in the group. The reported F -statistics are the Wald statistics for the joint hypothesis:

$$\beta_1 = \beta_2 = \beta_3 = \dots = \beta_p = 0$$

for each equation. The null hypothesis is that x does not Granger-cause y in the first regression and that y does not Granger-cause x in the second regression.

Appendix-II
Table A-1: ADF Test Results

	Test at	Exogenous	Punjab	Sindh	Balochistan	Khyber Pakhtoonkhwa
Revenue	Level	Constant	9.27407	6.3623	3.6282	2.8454
		Constant & Trend	5.53473	2.5980	0.9806	0.4576
		None	11.8931	9.0275	6.1318	3.5995
	First Difference	Constant	3.20318	0.5050	-2.4851	0.6962
		Constant & Trend	1.71812	-4.2099	-4.0465	-3.2756
		None	3.71215	1.3986	-0.7418	1.5834
	Second Difference	Constant	-8.4782*	-7.0106*	-10.205*	-7.3372*
		Constant & Trend	-9.1083*	-7.3611*	-10.001*	-7.7275*
		None	-8.0237*	-6.6377*	-10.331*	-2.2982
Spending	Level	Constant	6.3328	4.5874	2.0117	2.9400
		Constant & Trend	2.5794	0.9371	-0.6851	0.9533
		None	9.1144	2.1035	4.1419	4.4371
	First Difference	Constant	-1.4470	0.9113	-2.7087	-3.5682
		Constant & Trend	-2.6528	-0.6962	-3.7549	-2.8355
		None	-0.7433	1.8606	-2.2199	0.6735
	Second Difference	Constant	-5.6544*	-9.1059*	-3.8646*	-4.8751*
		Constant & Trend	-5.8400*	-9.6876*	-3.4702*	-4.8987*
		None	-5.4015*	-8.5229*	-3.8856*	-4.7916*

Critical values for constant, constant and trend and none are -3.769597, -4.440739 and -2.674290 respectively. * indicates the stationarity of the series.

Table A-2: Granger Causality Test Results

	Null Hypothesis:	F-test
Punjab	Revenue does not Granger Cause Spending	4.478
	Spending does not Granger Cause Revenue	10.105*
Sindh	Revenue does not Granger Cause Spending	6.977*
	Spending does not Granger Cause Revenue	4.895*
Balochistan	Revenue does not Granger Cause Spending	0.845
	Spending does not Granger Cause Revenue	4.027
Khyber Pakhtoonkhwa	Revenue does not Granger Cause Spending	2.808
	Spending does not Granger Cause Revenue	1.111
* Indicates the significance at 1% level.		