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Abstract

Fiscal decentralization is one of the major policy variables to attain economic efficiency. The present study empirically examines the impact of tax decentralization on the economic growth of Pakistan through different institutional arrangements. Further, this study also investigates the complementarity (efficiency) or substitution (inefficiency) phenomena of tax decentralization and political institutions. Time series data is employed from 1972-2020 with relevant methods such as Kwiatkowski-Phillips-Schmidt-Shin (KPSS) and Ng-Perron unit root tests are used and Autoregressive Distributed Lag Approach (ARDL) is also used for co-integration. The results suggest that tax decentralization is growth promoting while political institutions have negative impact on economic growth. Provincial governments can produce better results while transferring responsibility of collecting tax from federal to provincial level. Further, this study also investigates the complementarity (efficiency) or substitution (inefficiency) phenomena of tax decentralization and political institutions. Results show that tax decentralization and political institutions are substitute in case of Pakistan. For policy, the government has taken initiatives to provide more autonomy towards provinces with more resource allocation finally to get long run economic growth.

Keywords: Tax decentralization, political freedom, economic growth, co-integration

1. Introduction

Over the last three decades, most countries have restructured their institutional settings transferring fiscal sovereignty and political power towards sub-national governments. It is generally accepted that decentralization would enhance productivity, and eventually economic growth through detrimental channels (Filippetti and Sacchi, 2016). However, association between decentralization and performance of the economy is quite multifaceted. Most of the socio-economic researchers have tried to separate it both empirically and theoretically. For theoretical reasons, links between fiscal federalism and performance of the economy is built on a number of direct and indirect channels. It may spur saving, productive and allocative efficiency (Martinez-Vazquez and McNab, 2003). A large number of literature have examined this phenomena empirically with mixed results (e.g. Davoodi and Zou, 1998; Thieben, 2003; Iimi, 2005; Bodman, 2011).

Most of the empirical work (e.g., Enikolopov and Zhuravskaya, 2007) can be illuminated by the element that these contributions ignored in respect of the significance of political institutions. In fact, most studies determine the link between fiscal decentralization and performance of the economy by neglecting the role of political institutions, while, some researchers consider political institutions for exploring the impact of decentralization and economic development (Libman, 2010; Blanchard and Shleifer, 2000; Shahid, et al., 2022). The seminal work on fiscal federalism is done by (Riker 1964) and later on augmented this work by (Lago-Pen˜as et al., 2011; Filippetti and Sacchi, 2016).

Some of the literature conceptualizes interaction between decentralization and the dimensions of regional authority. The interaction term depends on the notion of institutional complementarity which is stated as, the two institutions can be complementary if existence of one enhances the outcome of other (Rodden, 2004). The crux of the research is that the similar institutions existing in different countries may have different results relying on the presence of interdependent institutions. Generally, the process of decentralization involving several institutional dimensions is considered: such as fiscal federalism (taxing system), political accountability and legitimacy and administrative powers may generate different outcomes. Some studies have tried to investigate the role of institutional complementarities concerning different dimensions of decentralization (Lockwood, 2006).

In Pakistan, there takes place two levels of government: federal government and provincial government (Iqbal *et al.* 2013). Taxation system of Pakistan is centralized. The fiscal decentralization mechanism has been made strengthened by the government of Pakistan from time to time. After the Pakistan came into being, the revenue sharing mechanism was established between federal and provincial governments. In this regard, well known awards were initiated by Neimeyer and Raisman in 1947 and 1952 respectively, this was followed by the one-unit Formula in 1961. The National Finance Commission (NFC) was established under the constitution of Pakistan in 1973 for sharing revenue for divisible pool of resources. Seven NFC awards have been announced so far with irregular intervals. The development of 18th amendment in constitution and 7th NFC award with revised revenue sharing formula has shifted more resources to provinces with more fiscal autonomy. The federal government has provided ad hoc allocations and grants to provincial governments to cover their fiscal deficit.

The objective of this study is to fill the gap by examining the link between tax decentralization and economic growth through diverse institutional arrangements in Pakistan for the period of 1972-2020. It explores to what degree the effect of tax decentralization of economic growth depends on institutional structures (complementarity or substitution). There are limited empirical shreds of evidence to explore the impact of tax decentralization and political institutions on the growth rate of Pakistan's economy. The rest of the paper explores the literature review in section II, theoretical framework, methodology, and sources of data are discussed in section III, section IV discusses the empirical outcomes and conclusions discussed in section V.

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2. Literature Review

Large numbers of empirical and theoretical studies explore the link between decentralization and economic growth. There have been used different data sets for both developed and under-developed nations. One of the traditional theoretical arguments done by (Oates, 1972) argues that the public sector plays a very important role to determine the allocation of resources for greater economic efficiency. Starting from this point, different direct and indirect linkages have been determined between decentralization and economic growth via efficiency and productivity (MartinezVazquez and McNab, 2003). Fiscal decentralization contributes to economic growth positively through the high quality of regional public governance (Thanh and Canh, 2020; Shahid and Ali, 2015).

A large number of investigation is available that find a significant and positive association between fiscal decentralization and economic growth (Oates, 1993; Iimi, 2005; Gemmell *et al.* 2013; Ganaie *et al.* 2018). Conversely, numerous other studies, have examined even no association or negative link between fiscal decentralization and economic growth (Oates, 1985; Woller and Phillips, 1998; Davoodi and Zou 1998; Martinez-Vazquez and McNab, 2006; Thornton, 2007; Rodriguez-Pose and Ezcurra, 2010; Baskaran and Feld, 2012). Though, these studies come up with inconclusive empirical findings: the possible reason is the use of an inappropriate or wrong measure of decentralization (Akai and Masayo, 2002; Ebel and Yilmaz, 2003).

The possible role of institutions for fiscal decentralization has been taken up by different researchers (Lockwood, 2006; Oates, 2005; Weingast, 1995; Weingast, 2009). They analyze the effectiveness of fiscal federalism contingent with the political institutions. Explicitly, they investigate the behavior of political agents and how the political processes are designed by the spur arrangements personified in political institutions, and how former interrelates with fiscal decentralization. Accordingly, political management efficiency and effective handling has become a more helpful for development and growth (Shahbaz *et al.*, 2008 and Ali *et al.*, 2020). The higher influence of strong institutions, tidy bureaucracy and good governance predicts government effectiveness and upholds the economic sectors in different regions.

The interdependence of institutional role has also been determined in political economy which established the notion of institutional complementarities or substitutes: ‘two institutions can be considered complementary if the presence (or efficiency) of one increase (decreases) the returns (inefficiency) of the other’ (Rodden, 2004; Libman, 2010). They relate these conceptions to the link between fiscal federalism and economic development. Lack of competences and division of power among federal and lower tiers of governments, increasing fiscal autonomy can affect economic growth negatively (Enikolopov and Zhuravskaya 2007; Faguet, 2012). As a matter of growing pressure and voice of local citizens, the quality of subnational governments can be realized positively by strengthening regional authority.

The most recent work done by Hung & Thanh (2022) Mose, 2022, Sima, *et al.*, 2023; Jin and Rider (2022) Hanif *et al.* 2020; Arif and Chasty 2022. They concluded that fiscal decentralization has positive impact on welfare, allocate efficiency and economic growth and development in most of the developed nations. While, this relation may not be exist in case of developing nations (shahid and ali 2015) Zhang and Zou (1998) also found that higher degree of fiscal decentralization lower the economic growth. When we review the previous empirical studies, the results show that inclusive behavior of fiscal decentralization and economic performance. So, in consideration of earlier work, there is a need to explore this link for the case study of Pakistan due to two reasons. One Pakistan moves rapidly towards decentralization after the 18th amendments and 7th NFC award. To bridge the fiscal gap regarding revenue collection and public spending, it is required to address the concern of revenue decentralization. Second, the tax decentralization impact on the economic growth of Pakistan is missing through different institutional engagements or political-institutional arrangements.

3. Theoretical Framework

The above discussion declares a complex association between decentralization and economic growth. There are various channels through which decentralization has an impact on economic development. The fiscal decentralization and growth relationships have been developed in studies with the help of endogenous growth theory. Davoodi and Zou (1998) examine the theoretical framework of endogenous growth to determine the effect of fiscal decentralization on economic growth for China. The model is an extension of Barro’s (1990) endogenous growth theory with the assumption which carries government expenditures at federal, state, and local levels. Afterward, a number of studies employ this analytical model to examine the decentralization-growth nexus (Xie, *et al.*, 1999; Iimi, 2005).

In this study, we examine the impact of decentralization on economic growth of Pakistan by formulating an endogenous growth theory. The model comprises of production function having two inputs (capital and labor).

$$y = \Psi(k, l) \dots\dots 1$$

Where Y indicates the real output, stock of capital is k and the labor l . Following Barro (1990), we include another factor of production i.e. public spending g in the production function:

$$y = \Psi(k, l, g) \dots\dots 2$$

Davoodi and Zou (1998) divide government expenditures into three types by assuming that the government expenditures are executed at federal, state and local level of government and incorporate the concept of fiscal decentralization. In this study, the level of fiscal decentralization is defined as the spending by sub-national governments (state and local) as a fraction of total public spending (federal, state and local). Fiscal decentralization increases if public spending by state and local governments rises relative to spending by the federal government.

There are two levels of government in Pakistan: federal government and provincial government (Iqbal *et al.* 2013). So public spending execution takes place at federal and provincial levels. Hence public spending is bifurcated into federal (f) and provincial (p) public expenditures:

$$g = f + p \dots\dots 3$$

The degree of fiscal decentralization in Pakistan is termed as the part of total public spending which is carried through provincial government. The CES production function of Cobb Douglas is written as:

$$y = [\alpha k^\theta + \beta f^\theta + \gamma p^\theta]^{\frac{1}{\theta}} \dots\dots\dots 4$$

Where y= per capita output

g = per capita total public spending

f = per capita federal government expenditures

p = per capita provincial government expenditures

We also make assumption of constant return to scale

$$0 < \alpha < 1; 0 < \beta < 1; 0 < \gamma < 1 \text{ and } \alpha + \beta + \gamma = 1; -\infty < \theta < 1$$

The share of federal and provincial government spending are defined as ϕ_f and ϕ_p respectively:

$$\phi_f = \frac{f}{g}, \phi_p = \frac{p}{g} \dots\dots\dots 5$$

Where $\phi_f + \phi_p = 1$ and $\phi_i \in (0,1)$ for $i = f, p$.

The aggregate government expenditures are financed by flat tax rate τ which remains same over time. Furthermore, we assume that government does not face any deficit or surplus i.e. at balanced growth path:

$$g = \tau y \dots\dots\dots 6$$

We need to determine the investment and consumption choices of individuals to examine the long run economic growth. To address this purpose, we study an individual facing long-lived horizon who is maximizing his discounted utility. It is assumed that the representative agent proceeds as given the declared tax rate of government and public spending through different levels of government. The individual's preferences take place as:

$$U = \int_0^\infty \frac{c^{1-\sigma}-1}{1-\sigma} e^{-\rho t} dt \dots\dots\dots 7$$

In equation (7), c is per capita private consumption and $\sigma > 0$ and $\sigma \neq 1$. $e^{-\rho t}$ is the other multiplier comprises the rate of time preference, $\rho > 0$. The symbol ρ is positive discount rate; it states that utils later they received less they valued. The per capita budget constraint is given as:

$$\dot{k} = \frac{dk}{dt} = (1 - \tau)y - c = (1 - \tau)[\alpha k^\theta + \beta f^\theta + \gamma p^\theta]^{\frac{1}{\theta}} - c \dots\dots\dots 8$$

The equation (8) describes that rise in stock of capital matches the savings which sequentially equivalent to the gap of consumption and output. The individual selects his optimum consumption path $\{c_t; t \geq 0\}$ and his investment path to derive the capital stock level $\{k_t; t \geq 0\}$. To derive the individual's optimum allocation of resources, the Hamiltonian is as:

$$H = \left[\frac{c^{1-\sigma}-1}{1-\sigma} \right] + \lambda [(1 - \tau)[\alpha k^\theta + \beta f^\theta + \gamma p^\theta]^{\frac{1}{\theta}} - c] \dots\dots\dots 9$$

Where the λ is Lagrangian Multiplier demonstrating the present value of shadow price of income and the expression in bracket is substituted from equation (8). By differentiating equation (9) with respect to consumption c and lagrangian multiplier λ and equate them to zero for first order conditions of optimization:

$$\frac{\partial H}{\partial c} = 0 \Rightarrow c^{-\sigma} - \lambda = 0 \dots\dots\dots 10$$

$$c^{-\sigma} = \lambda \dots\dots\dots 11$$

$$\dot{\lambda} = -\frac{\partial H}{\partial k} + \rho \lambda \dots\dots\dots 12$$

Derived from optimal control theory as suggested by Chiang (1992)

The transversality condition is $\lim_{t \rightarrow \infty} k \lambda e^{-\rho t} = 0$

By taking partial derivative of equation (9) with respect to private capital k , we get:

$$\frac{\partial H}{\partial k} = \alpha \lambda (1 - \tau) [\alpha k^\theta + \beta f^\theta + \gamma p^\theta]^{\frac{(1-\theta)}{\theta}} k^{\theta-1} \dots\dots\dots 13$$

Substitute equation (13) into (12), we have:

$$\dot{\lambda} = \rho \lambda - \alpha \lambda (1 - \tau) [\alpha k^\theta + \beta f^\theta + \gamma p^\theta]^{\frac{(1-\theta)}{\theta}} k^{\theta-1} \dots\dots\dots 14$$

To find growth rate of per capita consumption, we take time derivative of equation (11):

$$-\sigma c^{-\sigma-1} \dot{c} = \dot{\lambda} \dots\dots\dots 15$$

$$-\sigma c^{-\sigma} c^{-1} \dot{c} = \dot{\lambda} \dots\dots\dots 16$$

$$-\sigma c^{-\sigma} \frac{\dot{c}}{c} = \dot{\lambda} \dots\dots\dots 17$$

$$\frac{\dot{c}}{c} = \frac{1}{-\sigma} \frac{\dot{\lambda}}{c^{-\sigma}} \dots\dots\dots 18$$

Substitute equation (14) and (11) into equation (18):

$$\frac{\dot{c}}{c} = \frac{1}{-\sigma} \frac{\rho \lambda - \alpha \lambda (1 - \tau) [\alpha k^\theta + \beta f^\theta + \gamma p^\theta]^{\frac{(1-\theta)}{\theta}} k^{\theta-1}}{\lambda} \dots\dots\dots 19$$

By rearranging, we get:

$$\frac{\dot{c}}{c} = \frac{\alpha(1-\tau)}{\sigma} [\alpha k^\theta + \beta f^\theta + \gamma p^\theta]^{\frac{(1-\theta)}{\theta}} k^{\theta-1} - \frac{\rho}{\sigma} \dots\dots\dots 20$$

The equation (20) shows growth rate of per capita consumption which is equivalent to growth rate of capital and output. Hence, the growth rate of economy is stated as:

$$G = \frac{\dot{y}}{y} = \frac{\dot{c}}{c} = \frac{\alpha(1-\tau)}{\sigma} [\alpha k^\theta + \beta f^\theta + \gamma p^\theta]^{\frac{(1-\theta)}{\theta}} k^{\theta-1} - \frac{\rho}{\sigma} \dots\dots\dots 21$$

Simplify the equation (21):

$$G = \frac{\alpha(1-\tau)}{\sigma} [\alpha k^\theta + \beta f^\theta + \gamma p^\theta]^{\frac{1}{\theta}-1} k^{-(1-\theta)} - \frac{\rho}{\sigma} \dots\dots\dots 22$$

$$G = \frac{\alpha(1-\tau)}{\sigma k^{(1-\theta)}} \frac{[\alpha k^\theta + \beta f^\theta + \gamma p^\theta]^{\frac{1}{\theta}}}{[\alpha k^\theta + \beta f^\theta + \gamma p^\theta]} - \frac{\rho}{\sigma} \dots\dots\dots 23$$

$$G = \frac{\alpha(1-\tau)}{\sigma k^{(1-\theta)}} \frac{y}{[\alpha k^\theta + \beta f^\theta + \gamma p^\theta]^{\frac{1}{\theta}}} - \frac{\rho}{\sigma} \dots\dots\dots 24$$

$$G = \frac{\alpha(1-\tau)}{\sigma k^{(1-\theta)}} \frac{y}{y^\theta} - \frac{\rho}{\sigma} \dots\dots\dots 25$$

$$G = \frac{\alpha(1-\tau)y^{1-\theta}}{\sigma k^{(1-\theta)}} - \frac{\rho}{\sigma} \dots\dots\dots 26$$

From equation (4) and (6), we have:

$$k = \left(\frac{y^\theta - \beta f^\theta - \gamma p^\theta}{\alpha} \right)^{\frac{1}{\theta}} \dots\dots\dots 27$$

$$y = \frac{g}{\tau} \dots\dots\dots 28$$

Substitute equation (27) and (28) into (26):

$$G = \frac{\alpha(1-\tau) \left(\frac{g}{\tau}\right)^{1-\theta}}{\sigma \left(\frac{y^\theta - \beta f^\theta - \gamma p^\theta}{\alpha}\right)^{\frac{1}{\theta}(1-\theta)}} - \frac{\rho}{\sigma} \dots\dots\dots 29$$

Substituting equation (4.5):

$$G = \frac{\alpha(1-\tau) \left(\frac{g}{\tau}\right)^{1-\theta}}{\sigma \left(\frac{\left(\frac{g}{\tau}\right)^\theta - \beta(\phi_f g)^\theta - \gamma(\phi_p g)^\theta}{\alpha}\right)^{\frac{1}{\theta}(1-\theta)}} - \frac{\rho}{\sigma} \dots\dots\dots 30$$

$$G = \frac{\alpha(1-\tau) \left(\frac{g}{\tau}\right)^{1-\theta}}{\sigma \left(\frac{(g)^\theta \left[\left(\frac{1}{\tau}\right)^\theta - \beta(\phi_f)^\theta - \gamma(\phi_p)^\theta\right]}{\alpha}\right)^{\frac{1}{\theta}(1-\theta)}} - \frac{\rho}{\sigma} \dots\dots\dots 31$$

$$G = \frac{\alpha(1-\tau)(g)^{1-\theta}(\tau)^{\theta-1}}{\sigma \left(\frac{\tau^{-\theta} - \beta(\phi_f)^\theta - \gamma(\phi_p)^\theta}{\alpha}\right)^{\frac{1}{\theta}(1-\theta)} (g)^{1-\theta}} - \frac{\rho}{\sigma} \dots\dots\dots 32$$

$$G = \frac{\alpha(1-\tau)(\tau^{-\theta})^{\frac{(1-\theta)}{\theta}} (\alpha)^{\frac{(1-\theta)}{\theta}}}{\sigma [\tau^{-\theta} - \beta(\phi_f)^\theta - \gamma(\phi_p)^\theta]^{\frac{(1-\theta)}{\theta}}} - \frac{\rho}{\sigma} \dots\dots\dots 33$$

$$G = \frac{\alpha(1-\tau)}{\sigma} \left[\frac{\alpha \tau^{-\theta}}{\tau^{-\theta} - \beta(\phi_f)^\theta - \gamma(\phi_p)^\theta} \right]^{\frac{(1-\theta)}{\theta}} - \frac{\rho}{\sigma} \dots\dots\dots 34$$

Equation (34) shows the long run economic growth, G, is a function of tax rate τ and spending shares of federal and provincial governments. The derived model introduces explicitly the trade-off between federal and provincial spending a significant outcome of fiscal decentralization. In case of higher value of sub-national spending shares ϕ , a country is said to be more fiscally decentralized.

The measures of productivity of public spending at different tiers of government are interpreted by the shares on the total productivity of consolidated government expenditures (Xie *et al.* 1999). The derived model shows that restructuring and distribution of public spending can have an effect on economic development. By selecting different shares at provincial and federal levels, the government can affect the economic growth.

The significant application of the model is that growth maximizing shares of government budget are proportionate to comparative shares of federal and provincial governments for a specific share of aggregate government expenditures to GDP regarding the growth effects of fiscal decentralization. The existence of too much decentralization can be specified through the derived per capita growth equation on steady state balanced path (Imi, 2005). The fiscal decentralization has a positive impact on economic growth rate if the public spending share is comparatively large at lower level related to public spending at federal level. Conversely, keeping the relative productivity constant at different levels of government, an excessive fiscal decentralization can have negative impact on economic performance. It is because of the transfer of public resources to the less developed government can cause low economic efficiency and hence falling overall growth rate of the economy. Fiscal decentralization would not be considered being good if inefficiency and deficiency prevails at lower level government to provide public goods and services (Iqbal *et al.* 2013).

3.1. Growth Maximizing Shares

We assume that the objective of government is growth maximizing shares of government expenditures by examining the long run growth economic growth with respect to different public spending shares. For this purpose, we consider the equation (34) through selecting the federal and provincial shares ϕ and ϕ respectively. We aim to optimize the equation of growth rate regarding provincial and federal shares of public spending subject to constraint $\phi + \phi = 1$. The Lagrangian equation is formulated as:

$$L(\phi_f, \phi_p, \lambda) = \frac{\alpha(1-\tau)}{\sigma} \left[\frac{\alpha\tau^{-\theta}}{\tau^{-\theta} - \beta(\phi_f)^\theta - \gamma(\phi_p)^\theta} \right]^{\frac{(1-\theta)}{\theta}} - \frac{\rho}{\sigma} - \lambda(\phi_f + \phi_p - 1) \dots\dots\dots(35)$$

The first order conditions for ϕ_f , ϕ_p , and λ are given:

$$\frac{\partial L}{\partial \phi_f} = 0 \dots\dots\dots(36)$$

$$\frac{\alpha(1-\tau)}{\sigma} \frac{(1-\theta)}{\theta} \left[\frac{\alpha\tau^{-\theta}}{\tau^{-\theta} - \beta(\phi_f)^\theta - \gamma(\phi_p)^\theta} \right]^{\frac{(1-\theta)}{\theta}-1} \frac{(-\alpha\tau^{-\theta})}{[\tau^{-\theta} - \beta(\phi_f)^\theta - \gamma(\phi_p)^\theta]^2} (-\beta\theta\phi_f^{\theta-1}) - \lambda = 0 \dots\dots(37)$$

By simplifying, we get:

$$\frac{\alpha^{1/\theta} \beta(1-\tau)\tau^{\theta-1}\phi_f^{-(1-\theta)}}{[\tau^{-\theta} - \beta(\phi_f)^\theta - \gamma(\phi_p)^\theta]^{1/\theta}} = \lambda \dots\dots\dots 38$$

$$\frac{\partial L}{\partial \phi_p} = 0 \dots\dots\dots 39$$

$$\frac{\alpha(1-\tau)}{\sigma} \frac{(1-\theta)}{\theta} \left[\frac{\alpha\tau^{-\theta}}{\tau^{-\theta} - \beta(\phi_f)^\theta - \gamma(\phi_p)^\theta} \right]^{\frac{(1-\theta)}{\theta}-1} \frac{(-\alpha\tau^{-\theta})}{[\tau^{-\theta} - \beta(\phi_f)^\theta - \gamma(\phi_p)^\theta]^2} (-\gamma\theta\phi_p^{\theta-1}) - \lambda = 0 \dots\dots(40)$$

Similarly:

$$\frac{\alpha^{1/\theta} \gamma(1-\tau)\tau^{\theta-1}\phi_p^{-(1-\theta)}}{[\tau^{-\theta} - \beta(\phi_f)^\theta - \gamma(\phi_p)^\theta]^{1/\theta}} = \lambda \dots\dots\dots(41)$$

$$\phi_f + \phi_p - 1 = 0 \Rightarrow \phi_f^* + \phi_p^* = 1 \dots\dots(42)$$

From equations (38) and (41), we have:

$$\beta(\phi_f^{-(1-\theta)})^* = \gamma(\phi_p^{-(1-\theta)})^* \dots\dots\dots(43)$$

$$\phi_f^* = \left[\frac{\beta}{\gamma} \right]^{1/1-\theta} \phi_p^* \dots\dots\dots(44)$$

Put equation (44) into (42):

$$\left[\frac{\beta}{\gamma} \right]^{1/1-\theta} \phi_p^* + \phi_p^* = 1 \dots\dots(45)$$

$$\phi_p^* = \frac{1}{\left[\frac{\beta}{\gamma} \right]^{1/1-\theta} + 1} \dots\dots\dots(46)$$

With the Cobb Douglas technology, $\theta = 0$. The growth maximizing provincial government share will be as under:

$$\phi_p^* = \frac{\gamma}{\beta + \gamma} \dots\dots\dots(47)$$

Similarly, growth maximizing federal government share will be:

$$\phi_f^* = \frac{\beta}{\beta + \gamma} \dots\dots\dots(48)$$

These growth maximizing equations of federal and provincial government shares recommend that the growth rate can always be influenced without changing the aggregate public expenditure shares in GDP as far as the real public spending shares differ from growth maximizing.

The regression equation to be regressed for estimations is as under:

$$Y = \beta + \beta TD + \beta PF + \beta TD * PF + \beta LF + \beta GFCF + \beta AID + \beta PD + \gamma \dots\dots\dots 49$$

Where, TD= Tax Decentralization, TD*PF= Interaction term of tax decentralization and political freedom, LF= Measure of Total Labor Force, GFCF= Gross fixed capital formation, AID= Foreign aid. PD= Political Decentralization.

4. Methodology and data

The long-run relationship between FD and per capita GDP (Log) will be addressed by Auto-Regressive Distributive Lag (ARDL) approach after defining problem of unit root. This approach is apposite for lesser set of data with mixed order of integration (Pesaran *et al.* 2001). This methodology has two main advantages on other methods of co-integration. One, this approach is more favorable for mixed order of stationarity level of variables. Second, ARDL is more appropriate for shorter period of time series data. Long run associations among concerned variables are established with the help of simple F-statistic. For projected F-statistic, value will be ranged out the upper critical bound, the long run association between predictors and outcome. The estimation of long run association and long run coefficients will be made with the help of equation defined below:

$$\Delta Y = \delta + \delta Y + \delta Dec + \delta PF + \delta X + \sum \delta \Delta Y + \sum \varphi \Delta PF + \sum \vartheta \Delta X + \varepsilon \quad (1)$$

Where the symbol Δ displays change in variables.

Vector Auto Regression (VAR) estimates are not steady when it is pragmatic on the set of data converted into first difference (Engle and Granger, 1987). Consequently; for efficient but significant estimates, the error term of first lagged period should be incorporated in the ARDL equation. Hence the modified Vector Error Correction Model (VECM) is presented below:

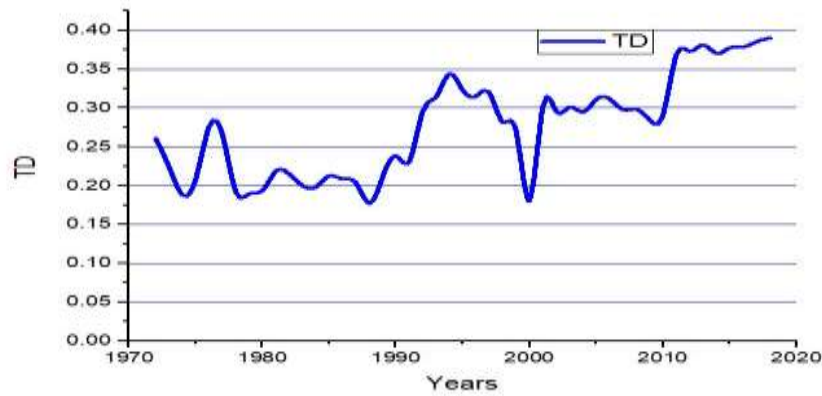
$$\Delta Y = a + \sum \beta \Delta Y + \sum \gamma \Delta PF + \sum \delta \Delta X + \theta ECT + \varepsilon \quad (2)$$

4.1. Construction and Description of Variables

4.1.1. Tax Decentralization

It is measured by portion of provincial government's income tax pool on tax revenues of general government.

$$TD = \text{PTR} / (\text{PTR} + \text{FTR})$$



The measurement of tax decentralization is calculated by dividing the provincial tax revenue to combined tax revenues of federal and provincial governments.

$$TD = \frac{\text{Provincial Tax Revenue}}{\text{Federal Tax Revenue} + \text{Provincial Tax Revenue}}$$

Pakistan Statistical Year Book (various issues) have been used to collect data on tax decentralization. The graph shows that tax decentralization has increasing trend since 1990. It has increased from 23 to 38 percent from 1990 to 2020.

Where TD, PTR and FTR are ‘Tax Decentralization’, ‘Provincial Tax Revenue’ and ‘Federal Tax Revenue’, respectively. The data is collected from various issues of Pakistan Statistical Year Book.

4.1.2. Political Freedom

The index of political freedom has been developed by averaging political rights and civil liberty. This index is used as proxy for institutions. The value of index ranges from 0 to 7, where 0 means full freedom and 7 no freedom. A number of studies investigated political rights, civil liberty and economic growth (Aixalá & Fabro, 2009). Freedom house is the source of data.

4.1.3. Human Capital

Total labor force is used as proxy of human capital. The source of data is Economic Survey of Pakistan (various issues). Human capital is fundamental factor of production and hence contributes to economic growth.

4.1.4. Physical Capital

The physical capital is considered to be an important factor of economic growth. The production function employs both labor and capital. A positive association is established between physical capital and economic growth. The log of gross fixed capital formation is used as proxy of physical capital. The data source is World Development Indicators.

4.1.5. Foreign Aid

Foreign aid is considered to be stimulus for economic growth conditioned with good fiscal, monetary and trade policies for less developed nations (Burnside and David, 2000). Net official development assistance and official aid received is taken as proxy of foreign aid and data is collected from WDI.

4.1.6. Political Decentralization

It is measured on the basis of national and local elections (Schneider, 2003). The index is constructed by assigning values of 0 to 6. It takes the value 1 if National assembly members take oath in a year, 0.25 for each provincial assembly members. It takes value 1 if local body members take oath in each province. The maximum value is 6 in case the national and local body members take oath in a year. Minimum value of 0 in case of no national/provincial assembly neither local body representatives.

5. Empirical Results and Discussion

In this study, the dependent variable is Log of GDP per capita with tax decentralization, political freedom, labor force, gross fixed capital, foreign aid and political decentralization as independent variables. The descriptive statistics shows that average value of log GDP per capita is 2.6878. All the variables are in log form excluding decentralization ratios.

Table 1: Descriptive Statistics

Variables	Obs.	Max	Min	Mean	Median	Std. Dev.
Tax Decentralization	45	0.381111	0.177263	0.270688	0.284403	0.059667
GDP Per Capita	45	3.120756	2.278345	2.687837	2.651236	0.226444
Political Freedom	45	6.000000	3.000000	4.794872	4.500000	0.824924
Labor Force	45	1.780605	1.333246	1.560375	1.533772	0.134740
Gross Fixed Capital Formation	45	10.51286	9.361728	9.986509	9.971117	0.322629
Foreign Aid	45	9.557736	8.789426	9.097433	9.030199	0.214161
Political Decentralization	45	1.0000	0.0000	0.472868	0.33333	0.318998

Various econometric approaches are used to test the relationship among variables. The empirical estimation of economic theory is providing meaningless without testing unit root status of the variables. We use Kwiatkowski-Phillips-Schmidt-Shin (1992)

(KPSS) unit root test. This test gives more robust results for small number of observations and considers best unit root test for time series data. We also use Ng-Perron (2001) unit root test which based on the Monte Carlo simulations. The simulations provide information that neglecting the residual dynamics can have impact on tests performance. The empirical results of both tests are reported in table2. Political decentralization and political stability are stationary while all others variables are stationary at first difference in both tests.

Table 2: Unit Root Test Results

Variables	KPSS		Ng-Perron	
	LM-Stat At Level	LM-Stat At 1 st Difference	MZa At Level	MZa At 1 st Difference
LGDPPC	0.792121	0.076395*	1.64746	-7.72015***
TD	0.648841	0.130076*	-6.17904***	-20.2423*
LPF	0.082986*	0.083891	-7.01124***	-20.4153*
LTDPF	0.583556	0.270225*	-7.43586***	-19.8038*
LF	0.823920	0.101896*	-0.16290	-20.4145*
LGFCF	0.801892	0.132047*	1.22268	-7.94004***
LAID	0.753483	0.245095*	0.73543	-39.5224*
LPD	0.088557*	0.114087*	-10.6803**	-20.5000*

(* , ** , *** show stationarity at 1% , 5% and 10% respectively)

Schwarz information and Akaike information Criterion is used for lag selections in this study. The optimum lags of the variables (1, 2, 2, 2, 1, 2, 2, 1) is selected for co-integration investigations. For the long run co-integration ARDL bounds test developed by (Pesaran *et al.* 2001) based on F-Statistics. The empirical result shows that linear combinations exist in the concerned variables over the longer period of time. Table 3 shows that F-statistic and W-statistic calculated values are greater than the upper bound.

Table 3: ARDL Bounds F-statistic

Critical Value	Dependent Variable LPPC			
	F-Statistics	5.9955	W-statistic	29.7130
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
95%	2.323	3.5430	18.3749	25.6283
90%	2.4690	3.6944	16.8143	21.5352

Table 4: Long-run Results, ARDL (1, 2, 2, 2, 1, 2, 2, 1)

Variable	Dependent variable= GDPPC		
	Coefficient	t-Statistic	p-value
TD	5.7692 (1.2692*)	4.051229	0.0007
PF	0.32289 (-0.00016*)	4.339076	0.0004
TDPF	-1.340871	-4.033840	0.0008
LF	0.592820	1.930618	0.0694
GFCF	0.252409	2.097314	0.0504
AID	0.616795	5.185793	0.0001
PD	0.037806	1.241165	0.2305

* Indicates adjusted coefficient when interaction term is included

The long run empirical results are reported in Table 4 that shows significance of tax decentralization at 1% level. While, the adjusted coefficient with positive sign shows that it has growth promoting impact on the economy. The adjusted coefficient of political freedom has negative sign which indicates positive impact on economic growth as low value of PF shows more politically free economy. The interaction term of TD and PF has negative sign which shows that tax decentralization and political freedom are substitute to each other. It means tax decentralization is not required with strong political institutions for economic growth in Pakistan. Conversely, political institutions are required to enhance economic growth in the absence of tax decentralization. The findings of current study contradict results of previous studies that tax decentralization and institutions are complementary

(Filippetti and Agnese, 2016). The possible reason of this complementarity might be the sample of 21 OECD countries in which most of the countries have unitary political system.

The control variable Labor force is positively and significantly associated with economic growth. From the classical economist to modern economist, the labor is considered the input for economic growth. Solow (1956) takes total labor force as the measure of Labor. The physical capital has significant and positive impact on economic growth of Pakistan at 10% level. Foreign aid is positively and significantly associated with economic growth at 1% level. The results are in line with previous studies that foreign aid is growth promoting for low income countries in the presence of strong institutions (Qayyum & Haider, 2012). Political decentralization is insignificantly associated with economic growth.

In the short run, tax decentralization and political institution have no significant impact on economic growth. Labor force, capital formation and foreign aid have positive and significant effect on economic growth. The long run and stable equilibrium can be attained through speed of adjustment by introducing first period lagged term of Error Correction Model (ECM) as suggested by Bannerjee *et al.*, (1998). The convergence towards long run equilibrium with negative and significant coefficient of ECM (-1). The reported results in Table-5 exhibits that the coefficient of ECM (-1) is negative and significant and confirms convergence hypothesis. The values of error term show that the model of economic growth has 42 per cent speed of adjustment towards equilibrium.

Table 5: Short-run Results

Variable	Dependent variable= dGDPPC		
	Coefficient	t-Statistic	p-value
dTD	0.245714 (0.01730) *	0.447939	0.6595
dTD(-1)	-1.728027	-3.611890	0.0020
dPF	0.025357 (0.00342) *	0.909433	0.3751
dPF(-1)	-0.078748	-3.394065	0.0032
dTDPF	-0.096370	-0.858540	0.4019
dTDPF(-1)	0.324136	3.253238	0.0044
dLF	0.722126	1.784382	0.0912
dLF(-1)	0.580777	1.243465	0.2296
dGFCF	0.546734	6.714500	0.0000
dAID	0.097252	3.628649	0.0019
dAID(-1)	-0.089492	-3.661438	0.0018
dPD	-0.010129	-0.778537	0.4464
Ecm (-1)	-0.418286	-4.908510	0.0001

* Indicates adjusted coefficient when interaction term is included

The equations structural stability is detected through cumulative sum (CUSUM) and cumulative sum of squares (CUSUMQ) while the systematic changes in the regression coefficients are identified through diagnostics. The CUSUM and CUSUMQ detect the quick changes in the underlying regression coefficients. The figures show that the graphs lie between 5 percent confidence interval bands. This confirms the stability of model to be estimated over time.

The results of different diagnostic tests are reported in table 6. Jarque-Bera test confirms the normality of the data for model. Similarly, there is no problem of multicollinearity and heteroskedasticity through LM test and Breusch-Pagan-Godfrey test respectively and the models are correctly specified.

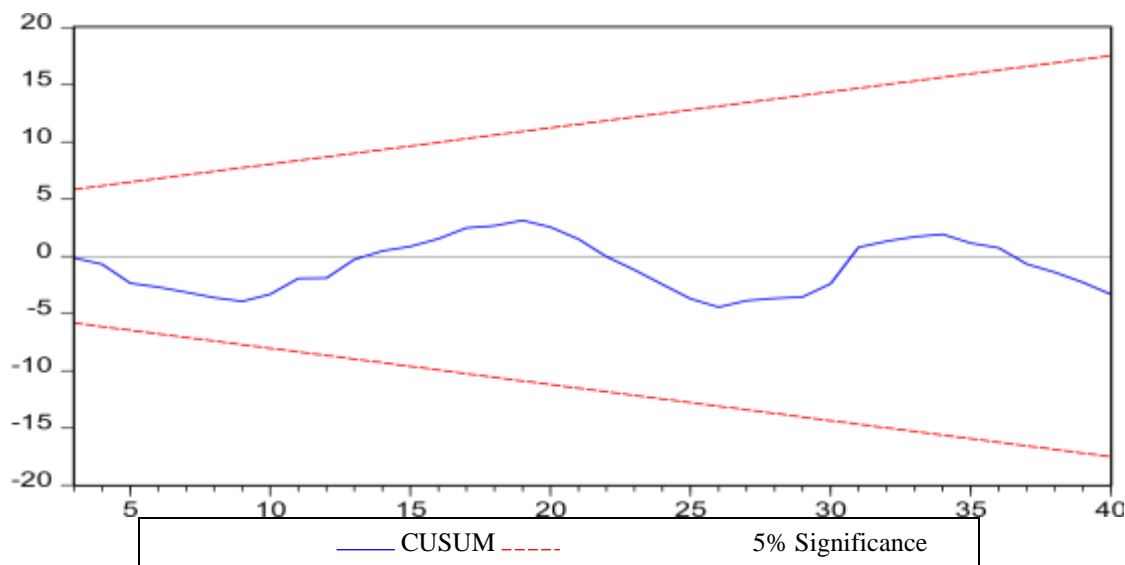


Figure-1 Cumulative Sum (CUSUM)

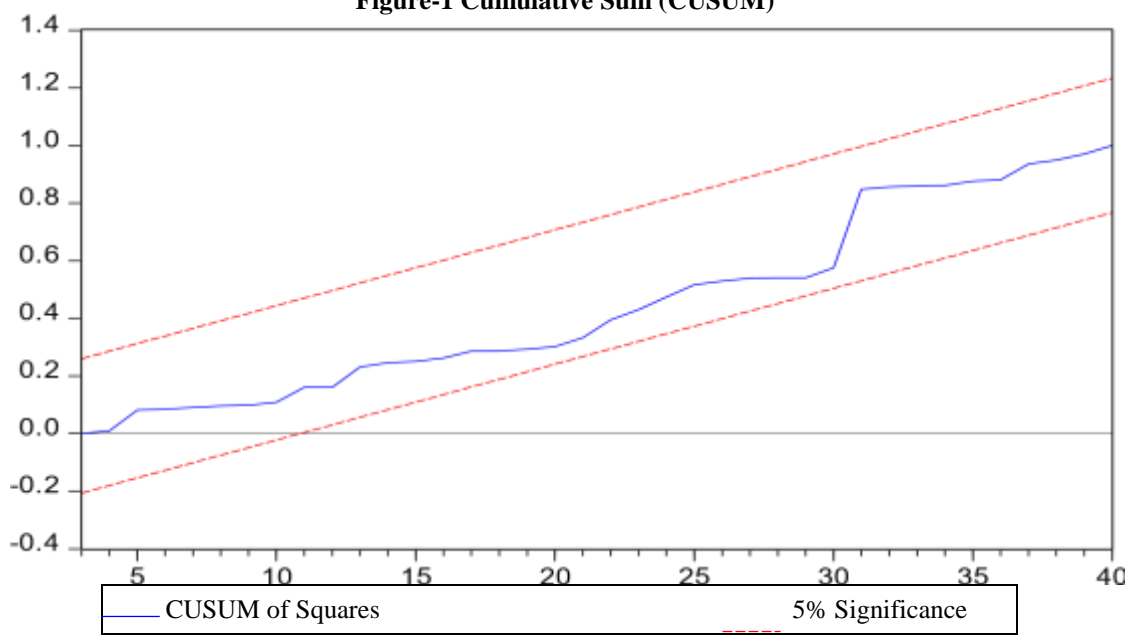


Figure-2 Cumulative Sum of Squares (CUSUM)

Table 6: Diagnostic Tests for ARDL

	<i>Jarque-Bera</i> 0.901229[0.63723]
<i>LM Test</i>	1.617274 [0.2423]
Breusch-Pagan-Godfrey Heteroskedasticity	1.129614 [0.4000]
<i>Ramsey Reset Test</i>	1.117366 [0.2794]

[*p-value]

6. Conclusions and Policy

This study empirically investigates the tax decentralization and political institutions implications for economic growth with others orderly variables. We employ time series data period 1976 to 2020 for Pakistan using ARDL co-integration technique for long run. ECM model is used for short run dynamics.

The empirical results illustrate that tax decentralization is growth promoting in Pakistan. The tax revenue generation responsibilities through decentralization process create positive externalities that raise the output of the economy. The tax decentralization empowers the provinces subject to own resources to achieve long run economic growth. The political institutions have positive association with economic growth. The negative sign of interaction term of tax decentralization and political institutions shows these are substitute to each other. The controlled variables labor force; capital formation and foreign aid have

positive association with long run economic growth. The political decentralization also contributes positively to the per capita income growth rate of Pakistan.

The impact of tax decentralization on economic growth is positive that has an important implication for the design of efficient fiscal decentralization mechanism in Pakistan. The restructuring government process is in initial phase beginning with the channel of 18th constitution amendment and 7th NFC award. The benefits of tax decentralization can be materialized when provinces have ample accountability, fiscal autonomy and adequate capability to respond to local requirements. The government has taken initiatives to provide more autonomy to provinces with bulk resource allocation ultimately to get long run economic growth for Pakistan.

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