Does Fiscal Decentralization Reduce Poverty? An Insight from Provincial Level Analysis in Pakistan

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The present study has been designed to check the effect of fiscal decentralization (FD) on the poverty levels in Pakistan. Three measures of FD, namely intergovernmental transfers, provincial government revenues, and expenditure, are used in this study. Furthermore, the effect of FD is checked on the poverty levels separately in four provinces of Pakistan. Poverty levels are measured with the help of the Multidimensional Poverty Index (MPI) and the percentage of poor households with a value under 35 according to the International Wealth Index (IWI). This study has used panel data from 1990 to 2020 for the model in which poverty is measured through IWI value. Data from 2004 to 2020 has been used for the model in which poverty is measured through MPI. Feasible Generalized Least Square (FGLS) has been used to obtain the regression results by avoiding the problem of serial correlation and heteroscedasticity. The study's results highlighted that two measures, namely intergovernmental transfers and provincial government expenditures, have a nonlinear relationship with poverty. An increase in intergovernmental transfers and provincial government expenditures reduces poverty at a decreasing rate at first. Then, an increase in both variables results in the form of a higher level of poverty. Moreover, revenue decentralization at the provincial level increases poverty initially and reduces poverty after a critical point.

1.   Introduction

Poverty has remained one of the fundamental macroeconomic issues of developing countries. Decentralization has been a popular tool to reduce poverty in these countries and improve public sector delivery. Fiscal decentralization (FD) can lead to improved socioeconomic institutions and political engagement of the masses to get their due right systematically, reducing the country's poverty level. According to Oates (1973) and Plaček et al. (2020), the decentralized government can perform better than the centralized government as the decentralized government has better ideas of the problems of the masses at a local level. FD refers to a mechanism through which planning and decision-making power is transferred from central governments to lower tiers of the government, such as provinces and states (Karim & Khan, 2020; Lin & Zhou, 2021). Through FD, resources and duties are also transferred to the local level to increase the governing system's efficiency and authority, which increases the government services' capacity (Digdowiseiso, 2022). Many developed and developing countries have adopted FD policies to create a competitive environment, better utilization of resources, and poverty alleviation at a local level. The present has been designed to check the impact of FD on the poverty level in Pakistan.

FD ensures efficient utilization of the resources through local bodies (AKGÜN, 2023; Sarwar et al., 2022; Xie et al., 2024). Most developing and developed countries tried to reap the benefits of this policy, which is evident in these countries. In the list of developed countries, Canada is 96 % fiscal decentralized, the United States of America is 80% fiscal decentralized, and Switzerland is also 80% fiscal decentralized, while Zimbabwe, as a developing country, is 32 % fiscal decentralized (Schneider, 2006; Tselios & Rodríguez-Pose, 2022). According to the Inter-American Development Bank (1997), local government made up 50% of the total public expenditure of Argentina. Developing countries lack resources and face administrative, social, and economic issues. Many countries have used FD to solve economic and administrative issues. In 1983, 43% of the total national expenditures of Vietnam were conducted by the local government, which significantly contributed towards human development (Fotso et al., 2023). Brazil increased its total tax revenues by 22.5 % by transferring power by adopting the decentralization policy of 1988 (Khan et al., 2014; Ehsan, 2021). The quality and efficiency of public service delivery increased significantly when Tanzania introduced FD policy in 1982 (Slater, 1989; Mkenda & Rand, 2020).

Pakistan came into being in 1947 after becoming independent from British rule in the subcontinent and adopted the concept of FD with minor adjustments (Akram & Alvi, 2022). Raisman Award Program was launched in 1951 to fairly divide the public funds between federal and provincial governments to solve the economic problems of Pakistan (Ahmed & Fatima, 2022). In 1962, the National Finance Commission (NFC) was established for funds allocation, and share was decided between federal and provincial funds of 80:20 in 1973 (Ahmad & Khan, 2023). The share was modified to 62.5:37.5 percent, where more funds were 17.5%, and more funds were given to provinces (Raza et al., 2023). The federal government was responsible for

making loan payments and military expenditures. The proportion again changed in 2009 in the 7th NFC award when the federal government share reduced to 42.5 % from 62.5 %, whereas the share of provincial governments increased to 57.5 5% from 37.5 % (Ahmed et al., 2022).

The main objective of this decentralization is to improve the living standard of the masses and bring them out of poverty. Provincial governments are spending a larger share of funds for the economic betterment of the people, but the benefits of FD still need to be fully reaped. Although some success against poverty is achieved in the four provinces Baluchistan, Khyber Pakhtunkhwa, Punjab, and Sindh, the decrease in poverty rate is comparatively slower than the increase of provincial funds compared to the central government. According to the Economics Survey of Pakistan (2018-19), it was estimated in previous surveys that in the current year, 37% of the population in Pakistan will be below the poverty line. According to the Household Integrated Economic Survey (HIES) conducted in 2018-19, the incidence of poverty is highest in Baluchistan (56.8%), followed by Sindh (43.7%), KPK (36%), and Punjab (31.6%). Figure 1 shows trends of revenue decentralization (RD) and expenditure decentralization (ED) in Pakistan over the last four decades.

Figure No 1: Trend of Fiscal Decentralization in Pakistan
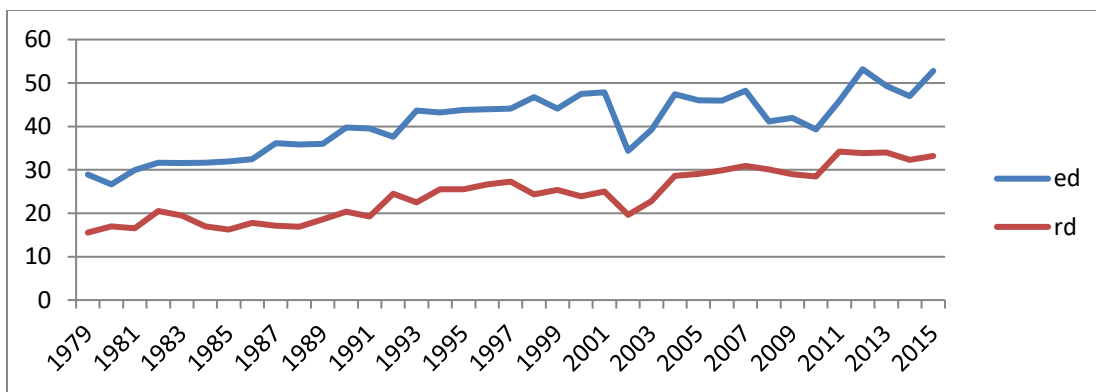
Source: Hand book of Statistic State Bank (2015)

Table No 1: Population in Percentage living below Poverty line in Pakistan

	1988	1997	1999	2002	2005	2011	2016	2019
Overall	23	28	30	33	30	38	38	37 (-1.7)
Urban	19	25	25	30	28	34	32	32 (0.0)
Rural	26	30	32	35	31	39	41	39 (-2.3)

Source: HIES estimated data for different years. Annual growth rate from the previous year for year 2019 is mentioned in parentheses.

According to Figure 1, it can be seen that expenditure decentralization has increased from 30% in 1979 to over 50% in 2015. At the same time, revenue decentralization increased from 16

% to 30%. So, FD has empowered the provinces of Pakistan in spending over the past three decades.

Critics have expressed doubts about the effectiveness of fiscal devolution in reducing poverty. The results of empirical studies on the effect of FD on reducing poverty in rising and developing nations, including Pakistan, are complicated and contentious.

However, the Table 1 shows that between 1987–1988 and 2018–2019, there was a relatively higher incidence of poverty in rural Pakistan. Since 2010–2011, the estimates of poverty have remained unchanged, which is a worrying trend. Pakistan's economy has yet to grow due to political and economic instability in Pakistan. The policy shifts by ever-changing governments to eradicate poverty have affected poor people badly. The FD process is interpreted as due to political instability and its effects on Pakistan's economic conditions (R. E. A. Khan, 2020). It needs to be clarified in the case of Pakistan whether the objective of poverty eradication through the redistribution of resources among provincial governments by decentralization is achieved or not. The present is an attempt to answer whether FD has reduced poverty or not.

1.1 Objectives of the study

The present study is designed to check the relationship between FD and poverty status in Pakistan. To do so, the present study has analyzed four provinces of Pakistan, namely Baluchistan, Khyber Pakhtunkhwa (KPK), Punjab, and Sindh. Moreover, the study also analyzes which provinces have significantly reduced poverty through FD.

1.2 Significance of the Study

FD is used as a policy tool to understand problems and manage resources at lower levels of administrative structure to address poverty issues and increase the quality of life of the masses. Many studies in literature for developing and developed countries, especially Pakistan, have analyzed the effect of decentralization on the overall poverty level of the country. The present study attempts to analyze the effect of FD on the poverty level at the provincial level. Moreover, the present research is unique in using two poverty estimates: the percentage of poor households under the IWI 35 and MPI. The present study's results can help Pakistan's policymakers oversee decentralization and its effects on poverty reduction.

2. Literature Review

FD is still a debated topic for policymakers regarding resource utilization and its role in reducing poverty at the lower level of administration (province or state) in a country. The literature on FD and its impact on poverty reduction suggests contradictory results (Arham, Humalinggi, Tantawi, & Kusuma, 2024; Bardhan & Mookherjee, 2005; Zheng et al., 2023; Zhou et al., 2023). The differentials in results are due to the various proxies used to measure

FD, various proxies used to measure poverty, model formation, and, lastly, country and region selection for a particular study.

The poverty reduction at the national level largely depends upon the policy mechanism adopted in respective states and provinces. The results of FD to reduce poverty depend on the sub-national level tax policy. If these taxes are progressive and do not bother the marginal section of society, then poverty can be reduced through FD. The benefits of FD can only attained if the resources of the sub-national government are allocated towards the provision of better public services and basic requirements of the marginalized segment of society (Kalirajan & Otsuka, 2012).

There are four proxies used to measure FD, namely sub-national expenditures, sub-national revenue, federal and interstate transfers, and loans and grants (Mwiathi, Wawire, & Onono, 2018; Nursini, 2019). The studies examining the effects of FD measured through the four indicators above on poverty have shown diverse results. In literature, the studies that have used sub-national expenditure as a proxy of FD, among other proxies, found that poverty is greatly reduced through the expenditure method. Similarly, various studies have shown that FD significantly affects poverty reduction through rural development and water management services instead of the general provision of services and education to the masses. Many studies have empirically proved that resources transferred to sub-national levels play a significant role in the provision of social security to the marginalized segment of society (Ahmad, 2020; Mwiathi et al., 2018; Nursini, 2019) (Karim & Khan, 2020; Mwiathi et al., 2018).

Furthermore, some researchers have also stressed that municipal resources can have a bigger effect on the multidimensional poverty headcount and reduction in the poverty gap than the fiscal resources used to provide services to the community. Fiscal autonomy can be a successful policy to shift resources from the federal government to the local government, which can efficiently allocate funds to marginalized people to combat poverty. The planning and implementation of the plans can efficiently be done at the government level instead of the federal government (Arends, 2020; Bojanic, 2020).

Many studies have empirically found the negative effect of expenditure decentralization on poverty levels (Faridi & Nazar, 2013; Karim & Khan, 2020; Nursini, 2019). The maximum benefits of FD can only be reaped if the process of transferring funds from top to bottom is transparent. The tax collection at the provincial level/sub-government level is not often enough to finance the program or planned expenditures to reduce poverty. In the literature, contradictory results have been found on the relationship between FD (measured through revenue decentralization) and poverty reduction. Rogan (2016) conducted an empirical study to check the effect of intergovernmental transfer, which is used to measure FD on poverty reduction. The results showed that intergovernmental transfers have helped in reducing poverty in Africa. In another study, Mwiathi et al. (2018) also used intergovernmental transfer as a

proxy for FD to check its effect on poverty reduction in Kenya. The study's results narrated a positive and significant relationship between intergovernmental transfer and poverty levels. Similar results were also obtained by Ginting, Sudibia, Dewi, and Marhaeni (2020) for Papua. Some researchers have concluded their studies on a note that there are many advantages of decentralization for developing countries like Pakistan, Papua and Kenya, but the results are not very encouraging for the poverty reduction policy implementation due to corruption and inequitable distribution of resources to sub-governments (Ahmad, 2020; Ginting et al., 2020; Mwiathi et al., 2018).

The effect of FD on poverty has been checked by taking various proxies to measure poverty. Many researchers have used and are still using the Human Development Index (HDI) as a measure of poverty to see how FD is affecting the HDI of a country or group of countries (Khadondi, 2018; Sepulveda & Martinez-Vazquez, 2011; Sun et al., 2023). Other than HDI, Fan, Lin, and Treisman (2009) used the wealth index to measure poverty. Many researchers have also used Head Count Ratio (HCR) to measure poverty. Ahmed (2013) conducted an empirical study and measured poverty by headcount index and household income.

Similarly, Rogan (2016) also used the headcount index and poverty gap as proxies to measure the poverty concept. Various researchers have also used the concept of MPI to measure poverty (Alkire & Santos, 2014; Saleem et al., 2023; Sanogo, 2019). Sanogo (2019) conducted an empirical study to check the relationship between poverty (measured through MPI and HCR) and FD. Galasso and Ravallion (2005) have used the Food-for-Education program as a poverty measure while researching Bangladesh's economy. Researchers have established both positive and negative effects of FD on the poverty levels for single countries and groups of countries. The results of past studies on the same country or region differ due to using different proxies to measure poverty and FD. Furthermore, the difference in results is also due to distinguishing models and estimation methods.

Empirical research conducted in Pakistan to check the relationship between FD and poverty reduction has also shown mixed results. Faridi and Nazar (2013) also found fiscal decentralization's negative effect on Pakistan's poverty. In another study, Ahmad (2020) concluded that more than resource distribution through NFC in Pakistan is needed to create a significant effect on economic growth; however, the resources generated by sub-governments in Pakistan do have a significant effect on the economic growth of Pakistan. Shahzad and Yasmin (2016) also concocted an empirical study to check how FD has affected poverty and income inequality in Pakistan. The authors found a positive and significant relationship between FD, income inequality, and poverty levels in Pakistan. The authors concluded that the inefficient tax collection at the provincial level and weak institutions are the reason behind this positive relationship. Karim and Khan (2020) conducted an empirical study to check the impact of FD on poverty levels in Pakistan by taking both revenue and expenditure decentralization. The authors used data from 1980 to 2019 and found mixed results as expenditure

decentralization affected poverty positively, while revenue decentralization's impact was negative. The FD policy can only successfully mitigate poverty through autonomy, sub-government transparency, and efficient management (Agegnehu & Dibu, 2017; Wang et al., 2023).

The review of the literature suggests that there exist ample studies that have checked the impact of FD on poverty. However, in Pakistan's case, there is a dearth of studies that have checked the effect of FD at the province level. To the best of the researcher's knowledge, none of the studies have been conducted for Pakistan that has checked the effect of FD on province-level poverty. The present study intends to fill this gap in the literature by empirically testing the relationship between FD and poverty in Pakistan. The present study has used three FD indicators: provincial revenue decentralization, intergovernmental transfers, and decentralization of provincial expenditures.

3. Data and Methodology

3.1 Data Source and Variables Description

Table No 2: Variable Source and Calculation Methodology

Variable Name	Source	Calculation methodology
Expenditure Decentralization (ED)	State Bank of Pakistan (SBP)	Ratio of Provincial Revenue + Capital Disbursement) and Total Federal Expenditure multiply by100
Revenue Decentralization (RD)	SBP	Provincial Receipts / Federal Receipts – Provincial Receipts multiply by 100
Inter Provincial Governmental Transfer (ITD)	SBP	Share Province in Total Revenue + Loans Granted by Federation/ Transfer Receipts Provinces by Federation multiply by 100
IWI	Global Data Lab (GDL)[1]	% of houses lying under IWI PCA calculated rating 35 at sub-national level
HDI	GDL	HDI at sub-national level
Log of GNI	GDL	Natural log of (Per capita GNI/ CPI of Pakistan) calculated from year 1990 to 2020
Dependency Ratio (DR)	GDL	Sum of children aged below 15 and old age over 65 divided by people with age 15 to 64 multiplying by 100
Multi-Dimensional Poverty Index (MPI)	UNDP Report[2]	MPI at sub-national level

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[1] https://globaldatalab.org/

[2] https://ophi.org.uk/

The present study has taken two time periods to check the impact of FD on the two different poverty measures. Data from 1990 to 2020 has been taken for the analysis in which the percentage of poor households under IWI 35 at the sub-national level is used to measure poverty. Data from 2004 to 2020 has been taken for the analysis in which the Multi-Dimensional Index (MPI) is used to measure poverty. Two different periods were considered for two poverty proxies due to the data's unavailability. Three equations were estimated by taking three different indicators stated in the last section to measure the concept of FD. Some control variables, namely dependency ratio, human development index (HDI), and gross national income (GNI) at the sub-national level, are also included in the models. Table 2 gives details of the variables, sources of the data on these variables, and calculation methodology.

3.2 Model

The present study has used the model developed by Nursini (2019) to check the effect of FD on poverty level. The model developed in this study (equation 1) has checked the linear and nonlinear impact of decentralization on poverty. The linear impact narrates whether FD has reduced poverty or not, and the nonlinear impact discusses whether there is any redistribution policies implementation issue for provincial governments.

$$Pov_{it} = \propto_{it} + \beta FD_{it} + \beta FD_{it}^2 + \gamma Cv_{it} + u_{it} _____ \text{ (1)}$$

The model presented in equation 1 is used to test the following hypothesis:

Ho; Fiscal decentralization significantly reduces poverty.

H₁; Fiscal decentralization does not reduce poverty.

Here, two models are developed for two indicators of poverty. Pov is the percentage of poor households under IWI 35 in model 1 and MPI for model 2. The data for Model 1 is from 1990 to 2020, while the data for the second model is from 2004 to 2020. FD is FD where three proxies are used, including RD, ED, and ITFD. Three equations are estimated, including one of these proxies in each variable. CV represents a set of control variables, including dependency ratio, HDI, and the natural log of gross national income. "i" represents the number of provinces in Pakistan, and t is the time period. For both models, "i" is the same, i.e., 4, but t is 31 for model 1 and 15 for model 2. Dummy variables are also included in the model to check the effects of FD on four provinces by taking one province as a marginal province. The marginal province was selected by taking the lowest value from the mean value of the three FD indicators' average, as Nursini (2019) suggested. The marginal province was given a value of 1 and 0 otherwise.

3.3 Estimation Method

The present study has used panel data, and there are three commonly used econometric techniques to estimate the panel data regression models, namely Pooled Ordinary Least Square (OLS), Fixed effects Model (FE), and Random Effects Model (RE). The pooled OLS estimation method assumes that all coefficients (constant and slope) remain unchanged over some time

and cross sections. The fixed effect model assumes that the slope of the fixed effect model remains constant while the intercepts vary across the cross-section. The random effect model is used when differences exist in the units of cross-sections across time. The Hausman test is used to check the suitability between fixed and random effect models for research involving panel data analysis. The null hypothesis of the Hausman test states that the fixed effect model is suited for the estimation, and the alternative hypothesis states that the random effect is suited for the estimation of the model. The results from the fixed effect and random effect models are efficient without autocorrelation and heteroscedasticity problems. However, if these problems are present, the Feasible Generalized Least Square (FGLS) model gives consistent results. One of the major advantages of FGLS is that it not only takes into account the problems of autocorrelation and heteroscedasticity but also cross-sectional dependence (Bai, Choi, & Liao, 2021).

3.4 Feasible Generalized Least Square (FGLS)

FGLS gives consistent and efficient results if the problems of autocorrelation and heterogeneity are present in the study. The weighted-least square (WLS) is a special case of GLS and is used when error terms are not distributed identically (Reed & Ye, 2011). The regression model is given as:

$$y = X\beta + \mu \quad \mu \sim N(0, W) \text{------------ 2}$$

Where the coefficient estimate is:

$$\hat{\beta} = (X^T X)^{-1} X^T y \text{-------------3}$$

The variance-covariance matrix of estimates is:

$$Cov(\hat{\beta}) = \sigma^2 (X^T X)^{-1} \text{-------------4}$$

The GLS estimator is given by the rule:

$$\hat{\beta}^{GLS} = (X^T W^{-1} X)^{-1} X^T W^{-1} y \text{----------------5}$$

The variance-covariance matrix of estimates for the GLS estimator is

$$Cov(\hat{\beta}) = \sigma^2 (X^T W^{-1} X)^{-1} \text{------------------6}$$

To make the GLS estimator a feasible estimator, the sample of data is used to obtain an estimate of W. When true W is replaced with its estimate $\hat{W}$, FGLS estimator is obtained. The FGLS estimator is given by the rule:

$$\hat{\beta}^{FGLS} = (X^T \hat{W}^{-1} X)^{-1} X^T \hat{W}^{-1} y \text{-------------7}$$

The variance-covariance matrix of estimates for the GLS estimator is

$$Cov(\hat{\beta}) = (X^T \hat{W}^{-1} X)^{-1} \text{--------------------8}$$

The transformed model becomes

$$y^* = X^* \beta + \mu^* \text{-------------9}$$

These transformed models are consistent with the linear-regression model assumptions.

3.5 Wooldridge Test

Wooldridge test is used to test the model's serial correlation problem. Wooldridge test is better than the other tests due to its fewer assumptions and applicability on both balanced and unbalanced data (Drukker, 2003). The null hypothesis of the Wooldridge test states that there is no correlation among error terms, while the alternative hypothesis states the presence of a serial correlation problem.

$$y_{it} = a + x1_{it}\beta_1 + x2_{it}\beta_2 + U_i + E_{it} \text{------------ (10)}$$

$$\Delta y_{it} = \Delta X_{it}B_1 + \Delta E_{it} \text{------------------- (11)}$$

3.6 Wald Test for Heteroscedasticity

Wald test has been used to check the problem of heteroscedasticity. The null hypothesis of the Wald test states that the error terms are homoscedastic (equal variance over time), while the alternative hypothesis states that there is a problem of heteroscedasticity (unequal variance over time). The test statistic for Wald Test is given below:

$$W = \sum_{i=1}(\sigma_i^{\wedge 2} - \sigma^{\wedge 2})^2/V_i \text{------------------ (12)}$$

4. Empirical Results

The present study has estimated two models with two different proxies for poverty, and three equations are made in each model according to three different measures of FD.

Table No 3: Hausman Test

Selection between FE and Pooled OLS models.

H$_0$ = Pooled OLS is appropriate.

Equations	P-values	
	Model 1	Model 2
1	.0022	.0031
2	.0015	.002
3	.0321	.0018

Selection between RE and FE models.

H$_0$: Random effect model is appropriate

Equations	P-values	
	Model 1	Model 2
1	0.601	0.121
2	0.201	0.410
3	0.300	0.233

Table 4: Random Effect Estimates

	Model 1: Dependent Variable IWI under 35			Model 2: Dependent Variable MPI		
Variables	Equation 1	Equation 2	Equation 3	Equation 1	Equation 2	Equation 3
ED	-1.901** (0.001)	_	_	-2.190** (0.033)	_	_
ED^2	1.583** (0.001)	_	_	1.003*** (0.005)	_	_
RD	-	2.581** (.041)	_	_	0.264*** (.001)	_
RD^2	_	-.101** (.040)	_	_	-0.112** (.060)	_
ITD	_	_	-.659** (.027)	_	_	-2.965*** (.001)
ITD^2		_	.0185* (.076)		_	.0068 (.853)
HDI	-1.382 *** (.007)	-0.642581*** (.001)	-2.002*** (.002)	-.232** (.011)	-2.852*** (.010)	-1.357** (.057)
GNI	-0.328* (0.076)	-2.852** (.062)	-3.231* (.086)	-1.052 (0.911)	-.926 (.001)	-.838 (.467)
DR	.625** (.001)	.785*** (.002)	1.002 (.521)	2.001** (.015)	-.985*** (.007)	1.620 (.896)
Constant	102.18*** (0.000)	100.85*** (0.000)	205.01*** (0.000)	101.63*** (0.0000)	89.89*** (0.000)	178.82*** (0.000)
Dummy ED	-26.152*** (0.000)			-2.925*** (0.000)		
Dummy RD		-12.652*** (0.034)			-0.982 (0.995)	
Dummy ITD			-10.362*** (0.001)			-.0689** (0.029)
R^2	0.77	0.80	0.72	0.61	0.75	0.62
Prob F-statistic	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Number of provinces	4	4	4	4	4	4

*,**,*** shows significance at 10%, 5%, and 1% level.

The researcher has to choose between pooled OLS, fixed effect, and random effect models with the help of various tests. In the first step of estimation, the choice between fixed effect and pooled OLS is made by using F-test. The null hypothesis of the F-test states that pooled OLS is preferred over the fixed effect model, while the alternative hypothesis states that fixed effect is preferred over pooled OLS. Then in the next step, the choice between FE and RE models is made. The results of these tests are presented in Table 3.

The result of the F-test shows the rejection of the null hypothesis i.e. pooled OLS is appropriate, as the p-values of both the models in the three equations each are less than 0.05. At this stage, the fixed effect model is preferred over pooled OLS. The choice between fixed effect and random effect models is also made with the help of the Hausman test. The results show the failure of rejection of the null hypothesis in three equations of both models as values are greater than 0.05. The results suggest that the random effect model is appropriate for the study. The estimation of both models using the random effect model is presented in Table 4.

Before explaining the relationship among variables, the Wooldridge and Wald tests are applied to check the problem of autocorrelation and heteroscedasticity problem. The results of the Wooldridge test are presented in Table 5.

Table No 5: **Wooldridge Test**

Equations	P-values	
	Model 1	**Model 2**
1	0.021	0.025
2	0.026	0.032
3	0.023	0.022

Source: Estimations done on STATA by author

The results show that the null hypothesis is rejected at a 5 % level of significance, and it is concluded that the data has a problem of autocorrelation. The result of heteroscedasticity tests is presented in Table 6.

Table No 6: Panel GroupWise Heteroscedasticity Tests

Model 1			
P values			
Tests	Equation 1	Equation 2	Equation 3
LM	0.002	0.010	0.011
Likelihood Ratio	0.020	0.010	0.001
Wald	0.003	0.008	0.020
Model 2			

Tests	P values		
	Equation 1	Equation 2	Equation 3
LM	0.001	0.009	0.001
Likelihood Ratio	0.002	0.034	0.002
Wald	0.012	0.015	0.001

The results of both tests suggest that both models have problems of autocorrelation and heteroscedasticity. To solve these issues, FGLS has been used for both models.

4.1 Empirical Estimations using FGLS:

The results of the impact of FD on the two poverty measurements are presented in Table 7.

Table 7: FGLS Estimation Results

Variables	Model 1: Dependent Variable IWI under 35			Model 2: Dependent Variable MPI		
	Equations			Equations		
	1	2	3	1	2	3
ED	-1.593** (0.003)	_	_	-1.854*** (0.010)	_	_
ED^2	.286** (0.041)	_	_	.034*** (0.002)	_	_
RD	_	2.066** (.037)	_	_	1.283*** (.010)	_
RD^2	_	-.159** (.037)	_	_	-.067*** (.005)	_
ITD	_	_	-.659*** (.021)	_	_	-.547*** (.002)
ITD^2		_	.009** (.058)		_	.0068*** (.017)
HDI	-2.176*** (.001)	-2.343*** (.001)	-2.971*** (.002)	-1.791*** (.002)	-2.541*** (.001)	-2.210*** (.001)
GNI	-1.871* (0.076)	-3.523*** (.000)	-3.290*** (.006)	-.124 (0.850)	-.778 (.392)	-.696 (.431)
DR	.873** (.012)	.705*** (.002)	.251 (.166)	.238** (.10)	-.082 (.479)	.090 (.433)
Constant	102.08*** (0.000)	109.03*** (0.000)	191.10*** (0.000)	157.25*** (0.0000	172.96*** (0.000)	159.24*** (0.000)

Dummy ED	-18.836 (0.001)			-2.513 (0.130)		
Dummy RD		-4.838*** (0.035)			-1.701 (0.382)	
Dummy ITD			-9.465*** (0.000)			-.183 (0.930)
Turning point	35.8	5	56.27	63	4.7942	53.7
R^2	0.92	0.92	0.92	0.89	0.88	0.89
Prob F-statistic	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Number of provinces	4	4	4	4	4	4

*,**,*** shows significance at 10%, 5%, and 1% level.

4.2 Interpretation and Discussion

4.2.1 Impact of Expenditure Decentralization on Poverty

The results showed a nonlinear relationship between FD and poverty when FD is measured through expenditure decentralization in both models. According to the results, if expenditure decentralization increases by 1%, it will reduce poverty by 1.59% when poverty is measured through household's IWI. Similar results are obtained when poverty is measured through MPI. The results indicate that increasing expenditure decentralization by 1% will reduce poverty by 1.8%. These results align with the study conducted by Faridi and Nazar (2013) and Zheng et al. (2023).

Results show that Baluchistan and KPK are marginal provinces. Sindh for initial years also remained marginal province but later the status changed. To calculate inflection point, partial derivative of poverty equation was taken with respect to FD for each equation (Mwiathi et al., 2018).

Taking derivative of the equation with respect to FD and equating it to 0 we get $\partial Pov /\partial FD$ =-1.59+2(.028) EFD -18.8DMED=0. Putting the value of dummy province equal to 1. ED = -1.59-0.114DED/ 2(.28)= 35 stating that if the provincial expenditures for marginal provinces exceed by 35% on poverty alleviating programs then it will have no impact. Instead it will increase poverty indicated by the positive coefficient of provincial expenditure decentralization square. For Model 2, the inflection point was calculated in the same way: $Povit$ =157.257+ -1.854FD + .03426FD^2 – 2.513DMED=0).

Calculation of turning point $\partial Pov /\partial FD$ =-1.85+2(.0342) ED -2.513DMED=0, putting DMED =1 → 63.

The above calculation states that expenditure decentralization can only be effective in reducing poverty if value of FD for marginal province is less than 63%; otherwise, it will not yield positive results for poverty reduction; instead, it will increase the budget deficit of provinces. The marginal provinces, especially Baluchistan and KPK, have small budgets to complete the existing projects. The positive sign of the coefficient of the square of expenditure decentralization shows that provincial governments are incapable of managing further projects. According to Karim and Khan (2020) and Digdowiseiso (2022), many economic, social, and administrative issues, including administrative capacity, corruption, and lack of resources unable the governments to complete the projects.

4.2.2 Impact of Provincial Revenue Decentralization on Poverty

The results showed an inverted U-shaped relationship between FD and poverty when FD is measured through revenue decentralization in both models. According to the results, if revenue decentralization increases by 1%, poverty will increase by 2.06%. Model 2 also showed the same results: revenue decentralization increases by 1 %, increasing the poverty level by 1.28% if poverty is measured through MPI. The main reason for such a result is the narrow tax base and generation of tax revenue through indirect taxes, which ultimately reduce the fiscal capacity of the provinces. Another reason for such a result is the ambiguity of boundaries between federal and provincial governments regarding the type of tax collection (Amaluddin, Payapo, Laitupa, & Serang, 2018; Wang et al., 2023; Zheng et al., 2023) The turning point of the inverted U-shaped relationship is calculated at 5, which narrates that the revenue decentralization should be more than 5% for the marginal provinces to reduce their poverty level if poverty is measured through IWI. The turning point for model 2 is 4.7 % when poverty is measured through MPI. The results narrate that revenue decentralization should remain above 4.7% to reduce poverty. The results indicate that poverty can be reduced at the provincial level by increasing the tax base, especially through direct taxes.

4.2.3 Impact of intergovernmental Transfers on Poverty

The equations in which intergovernmental transfers are taken as a proxy of FD showed that intergovernmental transfers negatively and significantly affect poverty in both models. The results show that a 1% increase in intergovernmental transfers reduces poverty by 0.66%, where poverty is measured through IWI. The results of the second model show that a 1% increase in intergovernmental transfers reduces poverty by 0.547%, where poverty is measured through MPI. Nursini (2019) and Ginting et al. (2020) also obtained the same results while checking the impact of intergovernmental transfers on poverty. The point of inflection of model 1 due to the non-linear relationship between intergovernmental transfers and poverty is calculated as 56.27. The inflection point at 56.27 narrates that intergovernmental transfer for marginal provinces should remain the same at 56.27% as it will increase poverty beyond that point.

4.2.4 Interpretations of control variables

The HDI is taken as an independent variable of the study, and the impact of HDI on poverty is negative and significant in both the models and all three equations. The results of model 1 show that if HDI is improved by one point, it will reduce poverty by 2.1%, 2.3%, and 2.9% in the three equations of model 1. The effect is largest in equation three, where intergovernmental transfers are taken as a proxy of FD. The results of model 2 show that if HDI is improved by one point, it will reduce poverty by 1.8%, 2.5%, and 2.3% in the three equations of model 2. The increase in the HDI value of a country means improvement in per capita income, health, and education that brings prosperity and reduces poverty (Agyemang-Duah et al., 2018).

The results also suggest that GDP growth negatively and significantly affects the poverty level. The results of model one show that if GDP increases by 1%, it will reduce poverty by 1.8%, 3.528%, and 3.29% in three equations, respectively. The results also suggested that the dependency ratio affects the poverty level when poverty is measured through IWI, and FD is measured through expenditure and revenue decentralization. The results show that if the dependency ratio increases by 1%, it will increase poverty by 0.87% and 0.79%, respectively, in equations 1 and 2 of model 1. According to Fang (2022) if the dependency ratio increases, it means fewer people to work for household income and more people to feed, which results in poverty.

.4.3 Multicollinearity Test

The values of VIF are less than 10 for the three equations of both models. The details are presented in Table 8.

Table 8: Variance Inflation Factor

Equation No.	Mean VIF(Model 1)	Mean VIF (Model 2)
1	3.47	2.35
2	3.25	2.75
3	3.40	2

Source: Estimations done on STATA by author

5. Conclusions and Policy Implications

The study measures the impact of fiscal decentralization (FD) on poverty reduction in case of Pakistan. The present study has made an important contribution by using different measures of poverty i.e. IWI under 35 and MPI in the analysis to measure the impact decentralization of public resources on poverty head count and on multidimensional aspect of poverty at provincial level. Taking two proxies for poverty, the percentage of poor households under IWI 35 and MPI, make the analysis more comprehensive and robust. Furthermore, FD is measured with the help of three proxies: expenditure decentralization, revenue decentralization, and

intergovernmental transfers in order to understand the relative significance of these measures of fiscal decentralization on poverty alleviation in Pakistan. Two separate models are constructed and each model consists of three equations where each proxy of FD is regressed on the respective poverty measure along with the control variables.

The point of inflections for model 1 and model 2 are 35.8% and 63%, respectively, showing that expenditure decentralization is not contributing to these specific percentages to reduce poverty. The results show that when intergovernmental transfers are taken as a proxy of FD, they also have a nonlinear relationship. At first, intergovernmental transfers reduce poverty, but then it increases poverty. The points of inflection for model 1 and model 2 are 56.27% and 53.7%, respectively, showing that intergovernmental transfers should not increase from these limits (point of inflection). The results also showed that there are better policies than provincial government revenue decentralization to reduce poverty in model 1 and model 2. The provincial government revenue decentralization is not reducing poverty when two different poverty proxies measure poverty. The results indicate that provincial government revenue decentralization should be at most the limit of 5 % and 4.7% for model 1 and model 2, respectively. HDI, GDP growth, and dependency ratio are taken as control variables of the study. The results suggested that as HDI and GDP growth increase, poverty is reduced while the dependency ratio positively impacts poverty.

The results of the study suggested that revenue decentralization is not contributing towards poverty reduction, and there is a need to address the tax collection mechanism of Pakistan. This may be the reason for the lowest tax-to-GDP ratio of Pakistan among the regional countries of Pakistan. Moreover, the results suggest that provincial governments must develop policies to reduce poverty at the provincial level instead of dependence on the central government, as expenditure decentralization is more effective than revenue decentralization. Finally, Baluchistan and KPK are marginal provinces of Pakistan that need more attention while resources are distributed among provinces.

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