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Fiscal Decentralization and Health Outcome: Case of Pakistan

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Abstract: *Present study is an attempt to investigate the effect of fiscal decentralization on health outcomes in Pakistan. This paper is based on time series data which covers the period from 1982 to 2019. The idea behind the present study is that fiscal decentralization plays an important role in economic development and improving health outcomes. Fiscal decentralization improves the efficiency of the public institution, which can lead to an improved health facility. To estimate the coefficients of the equation, Auto-regressive distributive lag model is used. The finding of this study shows that fiscal decentralization improves health outcomes. So, this study concludes that the federal government should share its power with the local government to improve health indicators.*

Introduction

Different forms of shifting of government power and resources from federal to local or lower levels of government are called fiscal decentralization. In present days, fiscal decentralization is an important tool for government policymakers. Not only advanced countries continue to abandon centralized governance, but it is also followed by developing countries. Therefore, it has become increasingly important to know the impact of decentralization. Decentralization has been adopted in many countries to obtain efficiency in government departments and organizations. The main rationale behind this is that local government is very close to people and has good information about the problems, cultures and circumstances of the people that allows them to solve the problems efficiently within given resources.

Fiscal decentralization has emerged as one of the important policy reforms in the agenda of national and international governments. Fiscal decentralization is seen as a technique in which government revenue mobilization can be increased by broadening the tax net. It could also be seen as a leaner and more efficient public

sector as resources can be allocated to the most-needed local services. There is also a consideration that fiscal decentralization is a good way to deliver public goods effectively, as local management has more possibilities to reduce costs in delivering public goods. It is also argued that macroeconomic variables could have a positive effect and have actual changes in society due to fiscal decentralization and public goods availability to people.

Despite the justification in favour of fiscal decentralization, there is little affirmation that fiscal decentralization has improved health outcomes. The problem associated with decentralization includes the constraints on the implementation of national policies, regional disparities that effect the transfer of resources from rich to poor regions, absence of coordination between regions, lack of skilled management, insufficient information, and loss of efficiency gains because of absence of economies of scale.

No-one can deny the importance of health; even health proxy is an important component of the Human Development Index. Therefore, if the government wants to improve its worldwide HDI ranking, then along the improvement of its other components, it should concentrate on the solution of health problems and the provision of health services. Keeping in view its importance, health outcome is used as the most important or central variable that can be influenced by fiscal decentralization. This study has taken the crude mortality rate as a proxy of health outcomes. Apart from fiscal decentralization, other control variables which affect the health outcome and are included in this study are i.e., unemployment rate, health expenditure, population growth rate, school enrollment, and the number of physicians.

In this literature, many studies are observed on the topic of health outcomes and fiscal decentralization. However, mixed results have been found, for example, Visschedijk et al., 1995; Kutzin, 1994; and Gilson, 1993. The possibility of these mixed results could be different measures of fiscal decentralization by different researchers.

Different studies have used different variables like economic growth, FDI and wellbeing to check its relation with fiscal decentralization but no full-fledged study is available to examine the association among fiscal devolution and health outcome especially in case of Pakistan. This paper is an attempt to fill this research gap. The main aim of this study is to analyze the effect of fiscal devolution on crude mortality rate in Pakistan and to reach at a conclusion whether fiscal decentralization improves the health outcome or not. To measure this effect, a simple theoretical model (that is further divided into two models) is developed and estimated on the basis of time series data for Pakistan.

This study is designed as follow: segment one explains the introduction. Review of literature is given in second segment. Segment three demonstrates the data description, sources of data, model specification. Methodology and results are given in the segment four. Finally, conclusion and policy recommendation in is given last segment.

Review of Past Studies

In recent literature on this topic, Hanif et al. (2020) investigated whether fiscal devolution caused economic development in fifteen least developed countries (in comparison to a group of studies by Oates focusing on developed countries only) over the period of 2000-2015 by employing two-steps system Generalized Method of Moment (GMM). Their study concluded that economic development is influenced by spending devolution, corruption, performance of government departments, and tax revenue. However, per capita income, performance of government departments, delivery of public goods, and health facilities indicated direct relation with economic development.

Faridi et al. (2019) inspected the relationship between economic development and economic devolution for South Asian countries over the period of 1990 to 2016. Impact of financial devolution, spending devolution and revenue

devolution had seen on economic development. Other control variables were foreign direct investment and capital formation. Their results showed the significant negative connection of economic development with spending and revenue devolution while positive relationship with FDI and capital formation.

Alizadha et al. (2019) handled research to explore the short-run and long-run influence of economic devolution on foreign direct investment in case of Iran. They used the data of 1992 to 2014 to analyze their hypothesis by employing Johansen-Juselius cointegration test and vvector error ccorrection model (VECM). Among explanatory variables, spending and revenue devolution were the core variables and other were inflation rate, exchange rate and trade openness. All kinds of fiscal devolution improved the foreign direct investment both in short and long run. Rate of inflation and exchange rate volatility had shown negative association with FDI whereas trade openness showed the positive relation.

Abrigo et al. (2017) inspected the association between fiscal devolution and health wellbeing in Philippines. Their findings concluded that fiscal decentralization has positive relation with growing health facilities and health expenditures. They took the death rate of newborn under one month and one year as the proxy of health outcome.

Jimenez-Bubio et al. (2017) discovered the impact of economic devolution on health services in different states of Spain. They used Difference in Difference model (DID) for exploring results of 50 Spanish regions over the period of 1980 to 2010. Their outcome variable was neonatal death rate while among independent variables, per capita GDP, education, female labor force participation rate, female age at child birth, provincial decentralization, economic recession and technological innovation were used. They observed the insignificant impact of economic devolution on health outcome in short run but significant impact in long-run. They concluded that national well-being plan is more effective than the community well-being program.

Sow & Razafimahefa (2015) explored that how financial devolution effects the productivity of government in providing well-being facilities by using panel data of 64 countries from 1990 to 2012 and by applying the stochastic frontier technique. They took efficiency of public health delivery and education as dependent variable. On the other hand, fiscal decentralization, public expenditure on health and education as a percentage of GDP, political and institutional stability and public sector efficiency were used as control variables. Their results highlighted that fiscal decentralization and GDP growth improves the efficiency of public expenditures under specific situations of political and institutional stability.

Ariemo (2014) examined the impact of fiscal decentralization through constituency development fund (CDF) on primary enrollment in Kenya by using the data from 1993-2013. His study took school enrollment to standard one as dependent variable and pupil teacher ratio, class size, free primary education (FPE), and fiscal decentralization as independent variables. Their results declared that CDF decentralization policy has negative effect on standard one school enrollment.

Data, Sources and Modeling

Variable Description

Crude Mortality Rate (CMR)

Various variables are used in literature as proxy of health outcome such as infant mortality rate, crude mortality rate, life expectancy, maternal health, and number of beds per 1000 patients etc. In this research, crude mortality rate is used as a dependent variable. The crude mortality rate or crude death rate is calculated as:

Crude Mortality Rate = [Total number of deaths for specific time period / total population exposed to risk in that period] * 1000

Revenue Decentralization (RDC)

For estimation of revenue decentralization, provincial revenue is divided by summation of federal revenue and provincial revenue [Iqbal et al. 2013]. It shows that when only provincial revenue changes then estimated revenue decentralization is not greatly influenced. However, merely change in federal revenue cause the change in ratio value even when provincial revenue does not change, so this strategy is efficient.

RDC=PR/ (FR + PR)

Expenditure Decentralization (EDC)

For estimation of EDC, quotient of provincial expenditure toward aggregation of federal expenditure and provincial expenditure and then by subtracting aggregation of expenditures on interest and defense is taken [Iqbal et al. 2013]. It is considered a good technique because when only provincial revenue will change then estimated spending will not be greatly influenced but when there will be increase in federal spending then expenditure decentralization value will decrease.

EDC= PE/ [(FE + PE) - (DE + IE)]

Combine Decentralization (CDC)

Combine decentralization is taken as fraction of revenue decentralization toward one subtract expenditure decentralization [Iqbal et al. 2013]. It is more appropriate estimation because it covers all variables of financial devolution.

CDC= RDC / (1- EDC)

Rate of Unemployment

Being unemployed, it is difficult to avail health facilities. Therefore, as unemployment increases then health services decreases. Unemployment rate is measured as:

Unemployment rate= [Total unemployed person / Aggregate labor force] *100

Health Expenditures

Health expenditure can contribute to economic performance by strengthen human capital and improving the productivity through better provision of health opportunities. It is therefore important to look at the healthcare spending to better assess the healthcare situation in a country. Health expenditure includes all expenditure for the provision of health services including family planning, nutrition and emergency aid facilities designated for health.

Population Growth Rate

It is defined as percentage change in the size of population during a year.

Population growth rate is the percentage change in the size of the population in a year. It is calculated as:

Population growth rate = N/t

Where N is the change in population and t is the time period

Primary School Enrollment

Primary school enrollment is taken as literacy rate proxy in this research. Gross enrollment is widely used to show the general level of participation in and capacity of primary education. The enrollment rate is the ratio of pupils, students and apprentices of a given age in the initial education, enrolled in an educational institution.

a. **Number of Physician:** The number of doctors per 1000 people is taken as health indictor according to world bank report.
b. **Data Sources:** This study has employed 39 years statistics from 1982-2019 of Pakistan. The data of all the variables is collected from World Development Indicators (WDI), State Bank of Pakistan (SBP), International Monetary Fund (IMF) and Ministry of Finance, Government of Pakistan.
c. **Model Specification:** The ultimate important explanatory variable in this analysis is fiscal decentralization whereas infant and crude mortality rate is taken as the proxy of health outcome.

Mortality Rate = f (Fiscal Decentralization)

Model 1: Crude Mortality Rate = F (Revenue Decentralization, Expenditure Decentralization, number of health physicians, population growth rate, health expenditures, primary school enrollment, unemployment rate)

$$CMR = a_0 + a_1 RDC + a_2 EDC + a_3 NPHY + a_4 PGR + a_5 HEXP + a_6 PSENR + a_7 UNER + e_i$$

Model 2: Crude Mortality Rate = F (Combine Decentralization, number of health physicians, population growth rate, health expenditures, primary school enrollment, unemployment rate)

$$CMR = b_0 + b_1 CDC + b_2 NPHY + b_3 PGR + b_4 HEXP + b_5 PSENR + b_6 UNER + e_i$$

Where, $a_1, b_1, a_2, b_2, \ldots, b_6, a_7$ *are slopes and* a_0 & b_0 *are intercepts/constant respectively and* e_i *is disturbance term.*

Analysis of Data

Descriptive Analysis

Summary statistics figures are shown in table below include mean, median, minimum and maximum value of all the variables used in this study. Standard deviation measure shows whether the data is closely clustered around the mean. The value of skewness shows that data is skewed left or right depending upon that value is negative or positive respectively. Jarque-Bera test is done to check the normality of data.

Table 1: Descriptive Statistics

Variables	IMR	CMR	RDC	EDC	CDC	PGR	PSENR	UNER	RUR
Mean	8.666	8.773	0.303	0.413	0.554	2.598	71.748	4.156	2.020
Median	8.34	8.45	0.285	0.335	0.440	2.584	70.838	4.210	2.030
Maximum	12.12	11.8	0.430	0.670	0.910	3.363	95.98	7.830	2.490
Minimum	5.57	6.7	0.230	0.270	0.330	2.029	51.140	0.400	1.520
Std Deviation	2.006	1.601	0.061	0.125	0.204	0.438	12.743	2.349	0.287
Skewness	0.191	0.448	1.168	0.691	0.466	0.297	0.1216	-0.094	-0.094
Kurtosis	1.764	2.022	2.985	2.022	1.424	1.732	1.886	1.915	1.876
Jarque Bera	2.649	2.789	8.186	4.299	5.028	3.103	2.058	1.819	1.947
Observations	39	39	39	39	39	39	39	39	39

Source: Author's Calculation based on the data

Correlation Matrix

To discover the relationship between the variables taken in our study, correlation matrix is given below in Table 2. correlation coefficients are also used by many econometricians to check the multicollinearity by looking at the magnitude of these correlation coefficients. The association between specific variables to check the pair-wise linear relationship tell us the expected relationship. All types of final decentralizations are highly associated with crude mortality rate with inverse relationship.

Table 2: Correlation Matrix

	CMR	RDC	EDC	CDC	NPHY	PGR	HEXP	PSENR	UNER
CMR	1.000								
RDC	-0.791	1.000							
EDC	-0.632	0.484	1.000						
CDC	-0.819	0.805	0.901	1.000					
NPHY	-0.960	0.838	0.693	0.873	1.000				
PGR	0.958	-0.783	-0.730	-0.873	-0.975	1.000			
HEXP	0.163	0.254	-0.267	-0.057	-0.123	0.220	1.000		
PSENR	-0.942	0.803	0.742	0.895	0.980	-0.957	-0.084	1.000	
UNER	0.176	-0.287	-0.482	-0.496	-0.173	0.192	-0.189	-0.221	1.000

Source: Author's calculations based on the data

Methodology, Empirical Results and Discussions

Empirical association among fiscal decentralization and health outcome is explained in this segment. The stationary of all variable is checked at level, first difference with trend & intercept through augmented dickey fuller test. Since all variables are stationary at level or at 1st difference, so auto-regressive distributed lags (ARDL) technique can be applied to draw reliable results amongst variables.

Table 3. Result of Augmented Dickey Fuller Test

Variables	Stationary
CMR	Level and Intercept & Trend
EDC	1st difference & Intercept
RDC	1st difference & Intercept
CDC	1st difference & Intercept
UNER	1st difference & Intercept
PGR	Level and Intercept & Trend
HEXP	1st difference & Intercept
PSENR	1st difference & Intercept and trend

Source: Author's calculation based on data

Before going for error correction model (ECM), it is necessary to establish co-integration to check for long run relationship because if there is no long run relationship among two time series then it is not appropriate to estimate ECM. Autoregressive distributive lag model (ARDL)

bound test has been used below in Table 4 to identify the existence of co-integration of given variables in the time series analysis. ARDL bound test has the advantage to allow regressors to have unknown or mixed orders of integration that is not possible in other conventional integration test. Since the estimated value of F-statistics is 7.3309 which is larger than both lower and upper bound so null hypothesis of no co-integration among these variables can be rejected. This result shows that given explained variable is affected by chosen explanatory variables.

Table 4. Bound Test of ARDL

Null hypothesis: no long-run association		
Test Statistis	**Value**	**K**
F Statistics	7.3309	7
Critical Bound Values		
Significance Level	**I(0) bound**	**I(1) bound**
1 %	2.96	4.26
2.5%	2.6	3.84
5%	2.32	3.5
10%	2.03	3.13

Source: *Author's calculation*

With the assistance of ARDL model, the short-run and long-run model is estimated to test the impact of fiscal decentralization on crude mortality rate. This is assessed through support of Error Correction Model (ECM). Segment below in Table 5 explains how explanatory variables influence the explained variable. Revenue decentralization (RDC) has inverse relation with crude mortality rate and results remained statistically significant. The coefficient value of the RDC points out that one unit change in revenue decentralization has influenced the crude mortality rate inversely by -0.9978 units. The coefficient value of expenditure decentralization (EDC) is -0.5577 which explains that a one unit change in expenditure decentralization influence the health outcome inversely by 0.5577 units. The results are in line with different studies i.e., Ahmed & Lodhi (2013), Hood (2013), Uchimura & Jutting (2009) and Liberman (2002). Our results assert the same approach that fiscal devolution improves the health outcome (in case of Pakistan) and the reasoning is same that local government is well aware of the health problems and better able to manage it with local networks.

Table 5. ARDL Short-run and Long-run Estimates of Effect of Crude Mortality Rate on Revenue and Expenditure Fiscal Decentralization in Pakistan

Dependent Variable: Crude Mortality Rate				
Selected Model: ARDL (2, 2, 1, 0, 2, 2, 1, 0)				
Sample: 1982 - 2019				
Cointegrating Form				
Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(CMR(-1))	0.0170	0.2433	0.0698	0.9451

D(RDC)	-0.0082	0.3381	0.0243	0.9808
D(RDC(-1))	0.2267	0.3152	0.7194	0.4811
D(EDC)	-0.2157	0.1570	1.3735	0.1864
D(NPHY)	-0.5165	0.4975	1.0380	0.3130
D(PGR)	0.9091	0.8805	1.0324	0.3155
D(PGR(-1))	-1.0372	0.9437	-1.0990	0.2862
D(HEXP)	-0.1323	0.1226	-1.0792	0.2947
D(HEXP(-1))	-0.1272	0.0911	-1.3968	0.1795
D(PSENR)	-0.0019	0.0049	0.3934	0.6986
D(UNER)	0.0016	0.0070	0.2362	0.8159
CointEq(-1)	-0.8901	0.2962	-3.0047	0.0076
Cointeq = CMR - (0.9978*RDC - 0.5578*EDC - 0.5803*NPHY + 0.5136				
*PGR - 0.2678*HEXP +0.0080*PSENR - 0.0019*UNER -0.6142)				
Long Run Coefficients				
Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
RDC	-0.9978	0.4955	-2.0134	0.0283
EDC	-0.5577	0.2464	-2.2631	0.0362
NPHY	-0.5802	0.5114	-1.1345	0.2714
PGR	0.5136	0.2786	1.8434	0.0818
HEXP	-0.2677	0.0957	2.7965	0.0082
PSENR	-0.0080	0.0055	-1.4454	0.1655
UNER	0.0018	0.0080	0.2329	0.8184
C	-0.614245	1.124005	-0.5464	0.5914

Source: *Author's calculations*

The error correction model (ECM) is a time-series model that is commonly used for data that has long run stochastic trend or cointegration between underlying variables. Error correction value shows the last time period deviation from its long run equilibrium. The value of cointegration is demonstrated in Table 5 which is negative and significant which shows the existence of long run relationship between explained and explanatory variables. Error correction value of -0.8901 shows that 89.01 percent errors get corrected as moving from short-run to long-run.

As health outcome is also affected by the health services provided by the government

authority and to capture this effect, number of health physicians in a country is taken as an explanatory variable. However, this association is statistically insignificant.

As the health expenditures in a country increases it leads to the better health facilities to the people so that their health improves. Improvement in the health of the people leads to decline in crude mortality rates (Jimez-Rubio, 2011). The variable health expenditures is found to be negatively related to the crude mortality rate and this association is statistically significant at the 5 percent level of significance. The coefficient of HEXP shows that one unit increases in HEXP leads to decrease in CMR by -0.2677 units.

The variable population growth rate is found to be positively related to the crude mortality rate and this association is statistically significant at the 10 percent level of significance. The coefficient of PGR shows that one unit increases in PGR leads to increase in CMR by 0.5136 units. This association indicates that as the population in a country increase, it is difficult for the government to provide health services to the people resulting the increase in crude mortality rates in country.

The variables unemployment rate (UNER) and primary school enrollment (PSNER) are found to be discouraging factors for crude mortality rate although these associations are found to be statistically insignificant.

Model: 2 Combined Fiscal Decentralization Estimation

Again, the estimated value of F-statistics is greater than both upper and lower bound so null the explained variable is affected by chosen explanatory variable.

Table 6: Bound test for ARDL

Ho: No long-run association exists		
test statistic	**Value**	**K**
F-Statistic	12.308	6
Critical value for bounds		
Significance	**I (0) bound**	**I (1) bound**
1 %	3.15	4.43
2.5 %	2.75	3.99
5 %	2.45	3.61
10 %	2.12	3.23

Source: Author's calculation

Table 7. Impact of Combined fiscal decentralization

Dependent Variable: Crude Mortality Rate
Selected Model: ARDL (1, 0, 1, 0, 0, 1, 0)
Sample: 1982 2019
Cointegrating Form

Variables	Coefficient	Std. Error	t-Statistic	Prob.
D(CDC)	-0.0878	0.1026	-0.8564	0.3993
D(NPHY)	-0.2064	0.3885	-0.5312	0.5996
D(PGR)	0.0969	0.0860	1.1263	0.2699
D(HEXP)	-0.0019	0.0351	-0.0562	0.9556
D(PSENR)	-0.0069	0.0038	-1.8003	0.0830
D(UNER)	0.0003	0.0046	0.0815	0.9356
CointEq(-1)	-0.6083	0.1579	-3.8511	0.0007
Cointeq = CMR - (-0.4447*CDC -0.9006*NPHY + 0.1593*PGR -0.0424				
*HEXP -0.0126*PSENR -0.0006*UNER + 0.7821)				
Long Run Coefficients				
Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
CDC	-0.4447	0.1623	-2.7386	0.0315
NPHY	-0.9006	0.3789	-2.3765	0.0475
PGR	0.1593	0.1308	1.2179	0.2338
HEXP	-0.0424	0.0577	-2.3905	0.0256
PSENR	-0.0126	0.0053	-2.3807	0.0174
UNER	0.0006	0.0077	0.0812	0.9359
C	0.7820	0.5255	1.4879	0.1483

Source: *Author's calculation*

The combine fiscal decentralization (CDC) has negative relationship with crude mortality rate and results are statistically significant. The coefficient value of the CDC points out that that a one unit change in combined fiscal decentralization influence the crude mortality rate oppositely by 0.4447 units.

The number of physicians, health expenditure and primary school enrollment variables have significant negative impact on crude mortality rate. A one unit change in number of physicians, health expenditure and primary school enrollment will affect crude mortality rate inversely by 0.9006 units, 0.0424units and 0.0126 units respectively. Whereas population growth rate and unemployment rate variables showed the insignificant impact in influencing crude mortality rate.

Conclusion

In this research, by using the ARDL, the relationship between health and fiscal decentralization is assessed by taking observations of 38 years for Pakistan over the period of 1982 to 2019. Having the idea that fiscal decentralization could have significant impact on the economy as the subnational government has good knowledge of the local people about their

problems, capability of paying taxes and rendering of public goods.

To assess the effect of fiscal decentralization on crude mortality rate, three variables of fiscal decentralization have been used that are revenue decentralization, expenditure decentralization and combine decentralization. Firstly, in revenue decentralization, the lower-level government has the authority to gather tax receipt and to adopt the tax base with the expectation that it will bring improvement in the economy (Faridi et al. 2013) by declining the number of free riders in the society. Secondly, expenditure decentralization relates that each lower-level government and regional government delivered the public good according to the needs and interests of different types of localities. To find combine decentralization, the combine devolution variable is estimated by combining revenue and expenditure decentralization.

All types of decentralization have negative and significant relation with crude mortality rate that is taken as a proxy the health outcome. So, this study proposes that the policy which shifts the fiscal authority to local level should be adopted by policymakers to decrease the mortality rate in Pakistan. The rate of mortality is also influenced by several other factors such that number of health physicians, population growth rate, health expenditures, unemployment rate, and education level. All variables are found to have significant impact on the health services except unemployment rate in this study in case of Pakistan.

This study is limited to include the impact of certain variables on health outcome such as government accountability, institutional effectiveness, local government spending share etc. but due to unavailability of data on these variables, this research has not used those variables but the study can be extended in future by looking those aspects.

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