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Does Fiscal Decentralization Nexus with Life Expectancy? Evidence from Pakistan

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Authors' contributions

This work was carried out in collaboration between all authors. Author ZHJ designed the study, performed the statistical analysis, wrote description and narration of the manuscript. Author SQ supported to collect data and literature review. All authors read and approved the final manuscript.

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ABSTRACT

The magnitude of this study is to explore association between fiscal decentralization and life expectancy in Pakistan. Panel data approach was used to detect the empirically friendship between life expectancy and fiscal decentralization over the period of 1990-2010 in Pakistan. Life expectancy is used as dependent variables. The results of empirical analysis suggest that there is positive association between fiscal decentralization and life expectancy in Pakistan.

Keywords: Fiscal decentralization; life expectancy; midwives; hospitals; registered doctors.

1. INTRODUCTION

Fiscal decentralization encompasses the allocation of monetary features to local and regional government. Fiscal decentralization describes mainly two problems. The first is the distribution of outlay tasks and income sources between national, regional and local authorities. The second is the amount of discretion given to regional and local governments to find their expenditures and revenues.

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Therefore, fiscal decentralization plays a key role in each sector of economy; consequently many countries give their preferences in decentralization process over the last decade. The policy makers, economist, anthropologists, sociologists and researchers can capture advantage from process of fiscal decentralization. [1,2] looked into the characteristics of fiscal decentralization and suggest that fiscal decentralization puts positive effect on health. [2] suggested that life expectancy and infant mortality play significant roles in fiscal decentralization. They emphasize that local governments, planners and policy makers can improve efficiency as well as fairness and health outcomes of people by decentralization of fiscal policy. However, this study presents a minute experiential verification and analyzes the impact of the decentralization on life expectancy. This study is based on Pakistani provinces. The consequences of this experimental research suggest that fiscal decentralization has appropriate and significant impact on the life expectancy of human beings.

[3,4 and 5] (2001) suggested that the main aim of decentralization is to provide more financial obligations and efficient services to health sector in local, regional and national levels of government. Nevertheless, [6] describes that there is a common findings in the research literature that local spending is more approachable to increases in international transfers and to bring improvement in health sector and this phenomenon is known as the *flypaper effect*.

The benefits of decentralization are based on decision of policy making authorities. For this reason many authors are doubtful regarding the successful implementation of decentralization in less developing countries. This is so because in less developing countries policy makers have weaker administrative capacity as compared to developed countries [6].

In light of the compelling theoretical arguments decentralization policy may not be successful without some limitations [7]. Regarding economies of scale, decentralization might generate inefficient location of facilities such as local electors erected hospitals at wrong locations. Finally, [8] use data from rural villages in India for 1970-94 and find positive impact of fiscal decentralization on child mortality. The statistical values of coefficients for decentralized states have the positive effect on indicators of health, while the election frequency variable has no effect on health [9]. (2004) used the previous data 1970-1994 for rural India using an index of fiscal decentralization and his results show that effectiveness of fiscal decentralization is based on level of political decentralization. [10,11] studies Argentinean provinces over the period 1970-1994 and their result shows that the percent of revenue raised locally and the percentage of revenue over the total have a negative and significant association with infant mortality rates.

[12] in his studies used a panel data of low and high income countries and have found that there is negative association between fiscal decentralization and infant mortality rates during the period 1970-1995. The study of [13,14] over the period 1980-1993 suggests that the results of the fixed effects and random effects estimations for a panel data of Chinese provinces that fiscal decentralization is beneficial to the health sector in terms of reducing mortality rates and increasing local expenditure on health care.

[14] studies shows that fiscal decentralization of Chinese counties has negative relationship with infant mortality between 1995 and 2001. Finally, also find an inverse relationship between fiscal decentralization and infant mortality rate. A few other studies such as [15] finds that positive relationship between decentralization and immunization coverage rates in six developing countries over the period 1970-1999.

The organization structure of this study is as follows. Section II represents structure of the model. III section depicts results of the empirical study. Finally, the concluding comments are given in Section IV.

2. A THEORETICAL FRAMEWORK OF MODEL

The effect of fiscal decentralization in health sector is discussed in literature at large scale. As well as increase level of allocation of resources and technical efficiency, the outcomes of health sector would be raised. Moreover, it is expected that decentralized system to be more fruitful in allocating of scarce resources to bring improvement in health sector, particularly life expectancy. Fiscal Decentralization is expected to be more fruitful in allocating rare resources to maximize health outcomes. To authenticate this idea, here we see that how, policy makers, provincial and national members of parliament maximize the health outcomes in provinces by utilizing available resources, definite techniques and allocation of specific budget, specifically life expectancy.

The assumption of policymakers does not necessarily reflect reality, but it provides us a best-case setup to be used as reference in our empirical study. It is postulate that within each province P in a country, the national income Y is a function of essential physiognomies of the economy (e.g., the real per capita income and its deliveries), nevertheless, allocations of expenditures (AX_{gi}) are based on number of interventions N (assume female education, no of hospitals, vaccination, registered midwives and registered doctors and so on).

General equation of this supposition can be written as:

$$Y_g = f_g(N; AX_{g1}, \dots, AX_{gN}), \quad (1)$$

Let $f(\cdot)$ is a continuous function which endorses the condition of optimization that $\partial f_{gi} / \partial AX_{gi} > 0$ and $\partial^2 f_{gi} / \partial AX_{gi}^2 < 0$ henceforth this shows that as well as raise in expenditures in any of interventions upsurges the health outcome indicator, but the marginal benefit will decrease. The maximization of objective function can be written as:

$$\text{Max } AX_{gi} Y_g = N_g f_g(N; AX_{g1}, \dots, AX_{gN}) - \lambda (AX_{gi} - TB) \quad (2)$$

While, gN shows contribution of provinces P and TB shows allocation of budget in different provinces.

The equation (2) suggests that expenditures are allocated in such a way that the marginal impact of an additional rupee to an interference N in provinces P is the same across all interferences and provinces. Hence, in theory, the optimal level of AX_{gi} can be computed by expenditure in interference N in province P.

Simply, optimum level of share expenditures in interference N in province P can be deduced as under:

$$*AX_{gi} = AX_{gi}(N, TB) \quad (3)$$

But inappropriately, optimum level cannot be attained owing to various reasons.

- 1) Policy makers may have limited evidence regarding the functions $f_g(.)$
- 2) Policy makers reply to political incentives rather than social welfare.

Therefore, observed expenditures $^{obs}X_{gi}$ and allocated expenditures $f_g(.)$ are not equal.

It is clearly that for a given provinces P, we can find optimal solutions of problems such as:

$$\begin{aligned}
 & *AX_{gi} = AX_{gi}(N, TB), \\
 & \text{Max } X_{gi}, Y_g = N_g f_g(N; AX_{gi}, \dots, AX_{gN}) - \lambda (AX_{gi} - TB^*) \quad (4)
 \end{aligned}$$

TB* is optimal level of budget of each province P.

Equation (4) shows that problems can be solved by friendly policy maker, provincial and national members of parliaments in allocated budget.

More clearly we find that the allocation of resources by local governments, provincial and national members of parliaments will generate a national optimum level only and only if the local government, provincial and national parliament members were used allocated budget efficiently.

$$^{obs}TB_g = ^{obs}X_{gi}$$

Nevertheless, even if the budgets are sub-optimal, local government can improve the health outcome if local governments, provincial and national members of parliaments have healthy information and take positive step regarding $f(.)$. If the budget is being provided to each province P is sub-optimal, we will get different results from the optimal level, however the relative level of expenditures will be optimal. Therefore, we have

$$A X_{gi} / ^{obs}TB_g = *AX_{gi} / *AX_{gi}$$

Now if we assume that the budget is managed at federal level, efficiency of allocation of resources can be measured such as:

Let U is a function of the share S of the total budget $^{obs}TB_g$ which is collected by local authorities. The relative levels of efficiency of the local and central governments under the administration of public outlays can be calculated by taking the partial derivative of U with respect to S. Henceforth, we can construct hypothesis such as:

$$\partial U / \partial S = LE (le-1)$$

Where le shows level of efficiency if public resources are used by central government I = shows level of efficiency if public resources are used by local government.

So, if $c > l$ shows that institutional capacity at the central level is higher relative to the local, it means that when an increase in the share of public expenditures managed by local governments will decrease efficiency and decrease health outcomes, but if share of public expenditures managed by central government the efficiency would be raised and increase health outcomes.

Thus, health outcome indicator can be written as:

$$Y = g(N, TB) - h(U(S)) \tag{5}$$

where h is a continuous and monotonic function. h tells us how much health outcome decrease due to inefficiencies in the allocation of public expenditures. Equation (5) suggests that the loss occurred due to marginal deviation from the optimal level of expenditure in a given interference is the same in the provinces.

Equations (5) differentiate and give the following results:

$$Y = g(0) + \frac{\partial g}{\partial TB_0} (TB - TB_0) - h(U(S_0)) - \frac{\partial h}{\partial U_0} \frac{\partial U}{\partial S_0} (S - S_0) \tag{6}$$

$$= g(0) - [TB_0 \frac{\partial g}{\partial TB_0} - h(U(S_0)) + S_0 \frac{\partial h}{\partial U_0} \frac{\partial U}{\partial S_0}] + TB \frac{\partial g}{\partial TB_0} - \frac{\partial h}{\partial U_0} \frac{\partial U}{\partial S_0} S \tag{7}$$

The above equation may be written in comprehensive form as under:

$$= \beta_0 + \beta_1 TB + \beta_2 S$$

β_1 shows efficiency of allocation of total budget, while β_2 shows relative level of efficiency of federal and provincial planers in allocating of available resources. Now, it is expect that β_2 is itself a function structural factor of a country.

A formula of this proposition would be:

$$\beta_2 = \beta_0 + Xb' \tag{8}$$

Where as, X shows row vector of structural factors and **b'** shows estimation of parameters.

In nutshell, the central point of this realistic research is to assess the relationship between fiscal decentralization and life expectancy, where the fiscal decentralization measure the share of autonomous tax revenue of local government over the general government tax revenue. Fiscal decentralization put positive effect on life expectancy. Registered doctors, numeral of hospitals, and registered midwives are taken as explanatory variables. To examine the relationship, panel data of Pakistani provinces is used for the period 1990 - 2010. Life expectancy shows the status of health. Life expectancy is an important gauge of health in a society [14] (Robts, 2001). The structure and definition of dependent variable is given in Table 1:

Table 1. Variables and definitions

Dependent Variables	Definitions	Source
LNLFE	Logarithm of life expectancy.	Population Census of Pakistan

The structure and definition of independent variables is given in Table 2:

Table 2. Independent variables and definitions

Independent variables	Definitions	Source
LNRPCI	Logarithm of real per capita income	Economic Survey of Pakistan
LNNH	No of Hospitals	Economic Survey of Pakistan and Ministry of health, Finance Division
LNRD	Registered Doctors	Ministry of health and Pakistan Medical, Dental Council of Pakistan
LNRMW	Registered Midwives	Economic Survey and Ministry of health

Source: Authors own' selaboration.

Precisely, it is difficult to find the measure of health care decentralization. Government of Pakistan spends very little bit percentage of GDP on health. The following equation (8) the mechanism of dependent and explanatory variables is written as:

$$\ln LFE_t = \alpha + \beta_1 \ln RPCI_t + \beta_2 \ln NH_t + \beta_3 \ln RD_{rt} + \beta_4 \ln RMW_{rt} + \lambda_{rt} \quad (9)$$

Where LFE_t denotes life expectancy in logarithm form; $RPCI_t$:shows real per capita income in logarithm form; RD_t represents registered doctors in logarithms; NH_t represents no of hospital; RMW_t shows registered midwives represents acute care beds (density per 1000 population): λ_{rt} stand for the standard residual. It is not equal zero. Therefore, ordinary least square model cannot be used to detect the findings, consequently, fixed effects models and random effects model are used to detect the impact of fiscal decentralization on life expectancy. However, λ_{rt} is uncorrelated with other independent variables. Where r shows homoskedastic and t is time from 1990 to 2010.

3. RESULTS AND DISCUSSIONS

In this section, results of estimation of life expectancy and fiscal decentralization in provinces of Pakistan are presented. STATA 12.0 is used to carry out the analysis. The standard panel data techniques are used to detect the association between dependent and independent variables for the econometric estimation. Panel data has an advantage over cross sectional data by controlling individual heterogeneity (Greene, 2003). Mostly, panel data is used to find fixed effects, while Hausman's test is used to find random effects. The results of estimation are represented in Table 3. It is very interesting to point out that the results show that $RPCI$, NH , RMW and RD are positively associated to life expectancy. Finally, R^2 shows the levels of explanation, which is acceptable. The log of variables has been taken for smoothness. The sign of variables are also acceptable but some variables are significant, while resting all are of statistical insignificance. By this reasons very low percentage of GDP is being spent on explanatory variables.

Table 3. Results Dependent variable: Log of life expectancy

Variables	Fixed effects	Random effects
RPCI	0.0341	0.0342
t-Statistic	13.47	(14.62)
NH	0.0002	0.0002
t-Statistic	(1.52)	(0.98)
RD	0.0045	0.004
t-Statistic	(1.73)	(1.46)
RMW	0.0075	0.0088
t-Statistic	(2.42)	(2.34)
R ² : within	0.7347	0.765
R ² : between	0.2822	0.235
R ² : overall	0.6370	0.567
F-Statistic and Prob (F)	2228.72	
Prob	(0.0000)	
Wald chi2 statistic		736.62
Prob (Chi2)		(0.000)
Hausman statistic	64.32	
Prob (Hausman)	(0.000)	

4. CONCLUSIONS

The study explores the association between dependent and explanatory variables. The appropriate indicator of health is life expectancy which is positively related to real per capita income, registered doctors, number of hospitals and registered midwives but numbers of hospitals are statistically insignificant. Some explanatory variables are insignificant; this is so because a little bit percentage of GDP is being spend health sector. Furthermore, the results of the econometric estimations suggest that fiscal decentralization is positively associated to life expectancy in Pakistan to some extent. These consequences should be used in order to make adequate health policies in provinces of Pakistan. If government spends more percentage of GDP in health sector, then health of nation would be better and they can perform very better role to improve level of economy.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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