Does Fiscal Decentralization Improve Health Outcomes?

Evidence from a Cross-Country Analysis

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Abstract: While decentralization of fiscal responsibilities is one of the main objectives that has emerged in the agenda of national governments and international organizations, there is little empirical evidence of the potential benefits of this intervention. This paper is an attempt to fill, in part, the void of quantitative measurement. Using panel data on infant mortality rates, GDP per capita, and the share of public expenditures managed by local governments, we find that higher fiscal decentralization is consistently associated with lower mortality rates. Our results suggest that benefits of fiscal decentralization are particularly important for poor countries. The results also suggest that the positive effects that fiscal decentralization has on infant mortality rates increase in institutional environments that promote political rights. Fiscal decentralization also appears as a mechanism to improve health outcomes in environments with high levels of corruption. Finally, we find that environments with high levels of ethno-linguistic fractionalization tend to reduce the benefits from fiscal decentralization.

1. Introduction

Decentralization, in its various forms, has become a highly popular component in policy reform. Within the health sector, decentralization of finances and responsibilities is one of the important topics that has emerged in the agenda of national governments and international organizations. Indeed, devolving some of the centralized responsibilities to local levels is expected to improve both technical efficiency and allocative efficiency (see Peabody et al., 1999 for a review). The rationale is that decentralized programs can be designed with knowledge of the local culture and circumstances. They can also be allocatively efficient because resources can be devoted to the most-needed local services. With decentralization, fiscal responsibilities for services rest with local managers who have incentives to improve efficiency given that they can use the savings for other local purposes. Local managers also have more opportunities to reduce costs. They can tailor staff and procedures to local resources and circumstances, rather than relying on centrally determined procedures. In addition, information can be used without delay, rather than after permission is received from central agencies. Another possible benefit of devolution, at least in a large country, is that local governments can experiment with alternative ways of doing things. Some of these ways may turn out to be superior and can then be adopted by other regions.

Despite these compelling arguments in favor of decentralization, there is little evidence that countries which have decentralized management and budgets within their health systems have also improved health outcomes. Indeed, studies evaluating the impacts of decentralization in developing countries (see for example Visschedijk et al., 1995; Green and Collins, 1994; Bossert, 1995; Bossert et al., 1991; Gilson, 1993; Kutzin, 1994; and Holland and Pimphachanh, 1995) provide mixed results. Problems associated with decentralization include, for example, an increase in regional disparities in the absence of a mechanism to transfer resources from rich districts to poor districts. Another major problem is associated with the lack of skilled personnel,

the lack of information, or the loss of economies of scale which counteract efficiency gains from devolution. In addition, decentralization may impose constraints to the implementation of national policies and the creation of coordination channels across regions (Guldner, 1995). So while qualitative studies have helped to understand the pros and cons of decentralization, the magnitude of its impacts on health outcomes remains unquantified. This is unfortunate since in the absence of such quantitative measurement, there is little that can be said in terms of the economic costs and benefits from devolution. These are critical to inform the design of sound public policies.

This paper is an attempt to fill, in part, the void of quantitative measurements of the impact of decentralization. Our focus is on the impacts of *fiscal decentralization* on an indicator of health outcomes, *the infant mortality rate*. To measure these effects we develop a simple theoretical model that we then estimate on the basis of panel data for countries. This panel includes an indicator of fiscal decentralization among the social and economic indicators derived from the World Development Indicators (World Bank, 2000). The indicator has been computed as the ratio between total expenditures of local governments and total expenditures of the central government on the basis of the Government Financial Statistics (International Monetary Fund, 2000). While the indicator is only a rough proxy for the fiscal decentralization process, it allows us to derive preliminary estimates of the magnitude of the potential correlation with the infant mortality rate.

The remainder of the paper is organized in four sections. Section 2 develops a theoretical framework for estimation purposes. Section 3 describes the data and econometric methods. Section 4 summarizes the results. Finally, Section 5 presents concluding remarks.

2. A theoretical framework

As previously discussed, the major channel through which fiscal decentralization is likely to affect health outcomes is an increase in levels of allocative and technical efficiency. A decentralized system is expected to be more successful in allocating scarce resources to alternative interventions in order to maximize health outcomes. To formalize this idea, we consider the problem faced by a benevolent policymaker who attempts to maximize the national average of a health outcome indicator such as the infant mortality rate. The assumption of a

benevolent policymaker does not necessarily reflect reality, but it allows us to define a best-case scenario to be used as reference in our empirical analysis.

We postulate that within each region g in a country, the outcome indicator M is a function of structural characteristics of the economy (e.g., the level of aggregate output and its regional distribution), call them θ, and the allocation of public expenditures x_{gi} among a set of interventions $\mathbf{I}$ (say female education, vaccination campaigns, and so on). We write:

$$M_g = f_g(\theta, x_{g1}, ..., x_{gI}), \qquad (1)$$

We assume that f(.) is a continuous function which verifies $\dfrac{\partial f_g}{\partial x_{gi}} > 0$ and $\dfrac{\partial^2 f_g}{\partial x_{gi}^2} < 0$, so that an increase in expenditures in any of the interventions increases the health outcome indicator, but the marginal effect decreases with the level of expenditure. Then the problem solved by the policy maker can be written as:

$$Max_{x_{gi}} : \quad M = n_g \; f_g(\theta, x_{g1}, ..., x_{gI}) - \lambda \left(\sum_g \sum_i x_{gi} - Y \right), \qquad (2)$$

where n_g is the contribution of region g to the national average and Y is the total budget to be allocated[1]. Optimality implies $\dfrac{\partial f_g}{\partial x_{gi}} n_g = \lambda,\ \ \forall i \in \mathbf{I}$. The interpretation is that expenditures need to be allocated in such a way that the marginal impact of an additional dollar to an intervention i in region g (adjusted by its weight n_g), is the same across all interventions and regions. Hence, in theory, it is possible to compute the optimal level x_{gi}^* of spending in intervention i in region g. We would have, $x_{gi}^* = x_{gi}(\theta, Y)$ or $s_{gi}^* = s(\theta)$, where s_{gi}^* is the optimal share of expenditure in intervention i in region g.

Unfortunately, in reality, various factors deviate expenditures from their optimal levels. First, policy makers at the central level may have scant information about the functions $f_g(.)$.

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[1] We take this budget as given. The problem of allocating the entire public budget or the problem of finding the optimal taxation rate is outside the scope of this paper.

Another possibility is simply that policy makers are not benevolent and have objective functions that respond to political incentives rather than social welfare. In these cases, the functions used to allocate expenditures will be different from $f_g(.)$ and therefore observed expenditures x_{gi}^{obs} will be sub-optimal. By extension, the budget allocations to each region g defined by $y_g^{obs} = \sum_i x_{gi}^{obs}$, will be sub-optimal as well.

It is straightforward to show that for a given region g, $x_{gi}^* = x_{gi}(\theta, Y)$ are also solutions to the problem:

$$Max_{x_{gi}} : \quad M_g = f_g\left(\theta, x_{g1}, \dots, x_{gI}\right) - \lambda\left(\sum_i x_{gi} - y_g^*\right), \tag{3}$$

where y_g^* is the optimal budget of region g. Equation (3) gives the problem that would be solved by a *local*, benevolent policy maker in control of budget y_g^*. We notice that the allocation of resources by local governments will generate a national optimum *only if* the budget allocated to each local government was optimal in the first place. Nonetheless, even if the budgets $y_g = \sum_i x_{gi}^{obs}$ are sub-optimal, their management by local government can improve the health outcome as long as local authorities have a better knowledge of $f_g(.)$. If the budget going to region g is sub-optimal, the resulting level of expenditures in each intervention will be different from the optimal level; however, the relative level of expenditures will be optimal. We would have: $\dfrac{x_{gi}}{y_g^{obs}} = \dfrac{x_{gi}^*}{\sum_i x_{gi}^*}$.

When the budget is managed centrally, we can measure the level of inefficiency in the allocation to each intervention by: $u_{gi} = \dfrac{x_{gi}^*}{\sum_i x_{gi}^*} - \dfrac{x_{gi}^{obs}}{y_g^{obs}}$. Notice that we have $\sum_g \sum_i u_{gi} = 0$. Hence, we can think of $U = \sum_g \sum_i u_{gi}^2$ as a general indicator of inefficiency. Clearly, U will be a function of the share S of the total budget y_g^{obs} that is managed (i.e., allocated) by local authorities. The partial derivative of U with respect to S will depend on the relative levels of efficiency of the local and central governments in the management of public expenditures. Hence, we can postulate:

$$\frac{\partial U}{\partial S} = C(c - l),$$ (4)

where c and l are indicators of the level of efficiency in managing public resources of the central and local government respectively. So, if c>l (meaning that institutional capacity at the local level is low relative to the center), an increase in the share of public expenditures managed by local governments will increase inefficiency and reduce health outcomes.[2]

Under this set of assumptions, our health outcome indicator can be written as:

$$M = f\big(\theta, x_i(\theta, Y)\big) - h\big(U(S)\big) = g(\theta, Y) - h\big(U(S)\big),$$ (5)

where h is a continuous and monotonic function which gives the loss in the outcome indicator resulting from inefficiencies in the allocation of public expenditures. Equation (5) implies that the loss caused by a marginal deviation from the optimal level of expenditure in a given intervention is the same across regions and interventions. This is a rather restrictive assumption, but it is nonetheless necessary given the lack of data at the regional level.

A first order expansion of (5) gives:

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\begin{aligned}
M &= g(0) + (\theta - \theta_0)\frac{\partial g}{\partial \theta_0} - h\big(U(S_0)\big) - (S - S_0)\frac{\partial h}{\partial U_0}\frac{\partial U}{\partial S_0} \\
&= \left[g(0) - \theta_0\frac{\partial g}{\partial \theta_0} - h\big(U(S_0)\big) + S_0\frac{\partial h}{\partial U_0}\frac{\partial U}{\partial S_0} \right] + \frac{\partial g}{\partial \theta_0}\theta - \frac{\partial h}{\partial U_0}\frac{\partial C}{\partial(c-l)}S, \quad (6) \\
&= \alpha_0 + \alpha_1\theta + \alpha_2 S
\end{aligned}
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Hence, the sign of α_2 provides information on the relative levels of efficiency of central and local planners in allocating resources. Now, it is reasonable to expect that α_2 is itself a function of the country level of development and/or other structural factors such as the level of corruption or political rights. A simple formulation of this hypothesis would be:

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[2] Notice that in our framework we have not assumed that fiscal decentralization implies that each region manages its own resources. The efficient allocation of resources across regions requires redistribution of resources across regions.

$$\alpha_2 = a_0 + \mathbf{Xb'}, \tag{7}$$

where $\mathbf{X}$ is a row vector of structural factors and $\mathbf{b}$ is a row vector of parameters to be estimated.

The next section describes the data and methods used to estimate models such as (6) to shed light on the question of how fiscal decentralization could affect infant mortality rates.

3. Data and methods

We use a panel of low- and high-income countries covering the period 1970-1995. For each country, we observe over time the infant mortality rate, the real gross domestic product per capita (adjusted for purchasing power parity or PPP), an indicator of fiscal decentralization, and structural indicators related to institutional capacity such as civil rights, political rights, and corruption. The number of available observations varies between 519 and 664 depending on the model estimated[3]. The indicator of fiscal decentralization is defined as the ratio between expenditures managed by local governments and expenditures managed by the central government. The indicator was constructed on the basis of the Government Financial Statistics published by the IMF. This indicator has also been used by Fisman and Gatti (1999) to evaluate the linkages between corruption and fiscal decentralization, and by Davoodi and Zou (1998) to look at the relationship between economic growth and fiscal decentralization. While Fisman and Gatti find that fiscal decentralization is associated with lower levels of corruption, Davood and Zou find no correlation between fiscal decentralization and economic growth in developed countries, and a negative correlation in the case of developing countries.

On the basis of models (6) and (7) we estimate equations of the form[4]:

$$\log IMR_{it} = \alpha_0 + \alpha_1 \log GDP_{it} + a_0 \log S_{it} + \log S_{it}(\mathbf{Xb'}) + v_i + e_{it} \tag{8}$$

where IMR is the infant mortality rate measured in deaths per 1,000 live births, GDP is Gross Domestic Product (our proxy for the variable θ), S is the percentage of total expenditures

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[3] The panel is unbalanced in the sense that most of the countries have missing data for some of the variables in some of the years. The estimation methods are adjusted accordingly.

[4] Models of the infant mortality rate usually introduce as predictors indicators of female education (a demand factor) and control for policy interventions such as immunization coverage (supply factors). In our framework, however, these indicators are endogenous interventions, which are related to the level of GDP per capita and the level of fiscal decentralization. Hence, we do not include them in the regression.

managed by the local government, **X** is a vector of structural indicators, v_i are country specific shocks, and e is white noise. Table 1 presents summary statistics for each of the variables included in the analysis. The high variance of GDP per capita in the sample used for estimation purposes facilitates the generalization of the results from the analysis to countries with a GDP per capita lower than USD 1,000.

Table 1
Mean of Model Variables

Variables	Observations	Mean	SD	Scale
Infant Mortality	766	21.6	26.61	
GDP Per Capita (PPP)	989	8,177	6,515	
Share of Local Expenditures (%)	1,145	21.4	20.4	
Ethno-linguistic Fractionalization	1,056	0.23	0.23	0-1
Corruption	1,028	4.27	1.5	0-6
Political Rights	938	2.52	1.7	1-7

Source: This study

Given that the variance of v_i is not equal to zero[5], model (8) cannot be estimated by Ordinary Least Squares (OLS) method. Fixed effects models and random effects models are usual alternatives. Nonetheless, we prefer the fixed effects model given that the assumption of independence between the exogenous variables and v_i required for the random effects model is not met.[6]

4. Results

We have estimated six models that differ in the vector **X** of structural variables. The results are summarized in Tables 2 and 3.

The first model includes only GDP per capita and the indicator of fiscal decentralization. It shows that, other things being equal, countries where local governments manage a higher share of public expenditures tend to have lower mortality rates. This does not imply that countries that

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[5] Test: Var(v_i)=0; χ^2=427.4; Prob>χ^2=0.0000

[6] Test: Cov(**x**, v_i)=0; χ^2(3)=460.26; Prob>χ^2(3)=0.0000

decentralize the management of public resources will automatically improve health outcomes. Without institutional capacity at the local level, decentralization is unlikely to be successful. In our sample of countries, it is very likely that the share of public expenditures managed by local governments is correlated with their level of institutional capacity. Hence, from the data, we cannot distinguish between local governments with low and high institutional capacity, and assess how decentralization affects health outcomes in each case. The results, however, support the view that if local governments are strengthened then fiscal decentralization is likely to improve health outcomes. For instance, in a country with a GDP per capita of USD 2,000, a 10% increase in the share of expenditures managed by local governments would reduce the mortality rate by 3.6%. The results also show that the marginal benefits of decentralization diminish as GDP per capita increases. For instance, in the case of a country with a GDP per capita of USD 5,000, the reduction in the infant mortality rate would be marginally lower, at 3.3%. One plausible explanation for this result is that problems associated with centralized systems diminish as economic development takes place.

Table 2
Estimates from Fixed Effect Models
(within estimator)

Obs	664		664		519		608		532		616	
Groups	67		67		46		54		49		55	
R-2-Within	0.80		0.80		0.84		0.82		0.83		0.82	
R-2-Between	0.76		0.72		0.54		0.77		0.57		0.79	
R2-Overall	0.77		0.73		0.53		0.79		0.51		0.78	
	Coeff.	SD	Coeff.	SD	Coeff.	SD	Coeff.	SD	Coeff.	SD	Coeff.	SD
LogGdpPPP	-0.810	0.053	-0.890	0.056	-0.921	0.060	-0.948	0.058	-0.870	0.057	-0.879	0.055
LogLocal	-0.545	0.138	-2.238	0.449	-1.802	0.542	-2.339	0.445	-2.036	0.528	-2.175	0.447
LogLocal* LogGdpPPP	0.056	0.017	0.412	0.092	0.415	0.103	0.436	0.091	0.393	0.106	0.420	0.091
LogLocal* LogGdpPPP2			-0.018	0.005	-0.017	0.005	-0.018	0.005	-0.017	0.005	-0.019	0.005
LogLocal* LogCorruption					-0.234	0.077	-0.060	0.056				
LogLocal* LogPolRights					-0.197	0.065			-0.106	0.051		
LogLocal*logAvElf											0.046	0.026
Constant	9.935	0.430	10.518	0.450	10.629	0.513	11.077	0.472	10.155	0.490	10.473	0.446

Source: This study.

Table 3
Elasticity of the Infant Mortality Rate with Respect to the Share of Local Expenditures

GDP Per Capita	Reduced	Non-Linear	Full	Corruption	Political Rights	Ethno-linguistic Fraction-alization
1000	-0.377	-1.164	-0.711	-1.197	-1.011	-1.082
1500	-0.367	-1.111	-0.656	-1.140	-0.960	-1.028
2000	-0.360	-1.074	-0.618	-1.101	-0.925	-0.991
2500	-0.355	-1.046	-0.589	-1.070	-0.898	-0.962
3000	-0.350	-1.023	-0.565	-1.046	-0.876	-0.939
3500	-0.346	-1.004	-0.545	-1.025	-0.858	-0.920
4000	-0.343	-0.988	-0.528	-1.008	-0.842	-0.903
4500	-0.340	-0.973	-0.514	-0.992	-0.828	-0.888
5000	-0.338	-0.960	-0.500	-0.978	-0.816	-0.876
5500	-0.336	-0.949	-0.488	-0.966	-0.805	-0.864
6000	-0.333	-0.938	-0.478	-0.955	-0.795	-0.853
6500	-0.331	-0.929	-0.468	-0.945	-0.786	-0.844
7000	-0.330	-0.920	-0.458	-0.935	-0.778	-0.835

Source: This study.

In the second model, we add the square of the logarithm of GDP per capita to account for a non-linear effect of the level of "economic development" on the elasticity of the infant mortality rate with respect to the share of public expenditures managed by local governments. The coefficient is highly significant and suggests that benefits from fiscal decentralization will be higher for high income and low-income countries and lower for middle-income countries. One possible interpretation of this result is that, at low levels of economic development, institutional capacity in local governments increases at a lower rate than in the central government, but increases faster for high levels of economic development. Introducing the new variable has an important impact on the size of the effect of fiscal decentralization on the infant mortality rate. Indeed, in the new model, a 10% increase in the share of public resources managed by local governments in a country with a GDP per capita of USD 2,000 would reduce the infant mortality rate by 10% (as opposed to 3.6%).

To evaluate the role of governance, the third model adds Knack and Keefer (1995) indicators of corruption and political rights to the vector **X.** Again, the coefficients for the new variables are highly significant despite a changing sample size (given that the indicators are not available for all countries). The results suggest that the positive effect of fiscal decentralization on infant mortality rates is higher in institutional environments with strong political rights. This does not

come as a surprise. One possible explanation is that when political rights are high, communities can better influence policy-making at the local level, and thus encourage an allocation of resources that better meets their needs. The results also suggest that fiscal decentralization appears as a mechanism to improve health outcomes in environments with high levels of corruption. The negative effects of corruption – distorted government resource allocation decisions, reduced economic efficiency, impaired legitimacy of public institutions, and skewed income distribution in favor of the rich, have been widely reported. We speculate that fiscal decentralization, by redistributing the responsibility of the management of resources among a higher number of officials, reduces the marginal pay-off that each official derives from being corrupt and hence reduces the total level of corruption. This result does not hold, however, when the indicator of political rights is dropped (see model 4). This points to the importance of political rights to enable the anti-corruption capabilities of fiscal decentralization. On the other hand, the indicator of political rights remains significant when the indicator of corruption is dropped (see Model 5).

The last model introduces an average indicator of ethno-linguistic fractionalization (see Fedderke and Klitgaard, 1998). This indicator measures the probability that two individuals picked at random in a given country belong to different ethnic groups. The results show that when ethno-linguistic fractionalization is high, fiscal decentralization tends to be less effective in reducing infant mortality rates, probably as a result of coordination failures.

5. Conclusions

This paper explores the linkages between fiscal decentralization and infant mortality rates. The study is based on a panel of developed and developing countries using socioeconomic indicators such as infant mortality rate, GDP per capita, and the share of public expenditures managed by local governments which is used as a proxy for the level of fiscal decentralization.

Five major results follow from the analysis in the paper: i) higher fiscal decentralization is consistently associated with lower mortality rates; ii) benefits from fiscal decentralization are particularly important for poor countries; iii) the positive effects of fiscal decentralization on infant mortality rates are enhanced in institutional environments with strong political rights; iv) fiscal decentralization appears as a mechanism to improve health outcomes in environments with high levels of corruption; v) environments with high levels of ethno-linguistic fractionalization

tend to reduce the benefits from fiscal decentralization. Nonetheless, these results need to be interpreted cautiously: first, given measurement problems associated with aggregated country data; and second, given that the indicator of fiscal decentralization used in the analysis is a very crude proxy for the fiscal decentralization process.

It is also important to stress that the results presented in this paper do not imply that fiscal decentralization is a magic recipe to improve health outcomes. Appropriate institutional capacity at the local level should be an important pre-condition. An optimal allocation of public expenditures across regions and program interventions also requires appropriate coordination channels between regions and adequate transfer mechanisms (most likely from rich regions to poor regions). Public expenditure reviews at the local level can constitute an important instrument to guide this process. Other instruments include training in management and financial planning and the endowment of modern information technologies.

In short, successful decentralization requires strong leadership from the central government. The central government must be able to influence local policy and implementation without compromising the autonomy of local decision-making from which many of the benefits of a devolved system would be expected to flow. As stated by Guldner "decentralization without direction appears to undermine health system effectiveness".

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