

Expenditure Decentralization and Outcomes: Some Determinant Factors for Success from Cross-Country Evidence

“Decentralization measures are like some potent medicines: they must be taken at the right time, in the right dose, and for the right illness to have the desired salutary effect. Taken improperly, they can harm rather than heal”

Rémy Prud’homme (1995)

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Abstract:

This paper attempts to answer the question of whether and in what conditions assigning more expenditure responsibilities to Sub-National governments is better to achieve development goals. Using a panel data of developing and transition countries, empirical evidence show that spending by local governments has helped to foster reduction of mortality infant rates, especially in countries with high level ethnic diversity and where revenue mobilization has also been decentralized. These results confirm some theoretical predictions of the fiscal federalism literature.

Keywords: Decentralization, heterogeneity, vertical imbalances.

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1- Introduction

Since the 1980s, there seems to be a consensus that too much centralization is not effective and that it is necessary to transfer part of the powers of the central government to regional or local authorities. While several States have already turned to the decentralized approach of government, whether decentralization has kept its promise remain unclear, especially as far as poverty reduction at the national level is concerned. This paper attempts to shed light on the issue, by investigating the linkages between expenditure decentralization and mortality infant rates using cross-country data.

Expenditure decentralization is a core component of decentralization. According to the theoretical literature (Oates, 1972; 1999), local governments are in better position provide basic goods and services because they are closer to people. However, decentralization may not be efficient. In fact, Prud'Homme (1994) raises the experience of Tunisia where the centralization of sewage services proved to be more effective than delegating the provision of such services to local governments. There seems to be some critical elements for the success of expenditure decentralization.

The theoretical literature suggests that there is a golden rule to follow should positive gains be expected from decentralization. The rule has three pillars: proper assignment of public expenditure responsibilities to local governments, provision of appropriate means (technical and financial capacity) to carry out the assigned functions, and creation of political and economic incentives to align politician private's interests with public goals. But, how to implement the rule is a key issue for development planners, especially in the prospect of achieving the Millennium Development Goals (MDGs).

Assessing some tips for a successful implementation of decentralization reforms is therefore important. Using cross-country data covering the past three decades, Robalino and al. (2001) find that a greater share of public expenditures managed by local governments is consistently associated with lower mortality infant rates and identify some enhancing factors of the benefits of fiscal decentralization. However, their empirical analysis is plagued with some methodological problems that end up casting doubts on the robustness of their conclusions.

This paper contributes to the literature on the benefits of fiscal decentralization by clarifying some enabling conditions that allow local governments to achieve better outcomes. First, we delve into the theoretical literature on fiscal federalism to identify testable hypotheses to be assessed thereafter, using available cross-country data. Second, unlike previous empirical analysis, we control for potential endogeneity in the analysis using GMM estimator.

The remainder of the paper is organized as follow: the next section reviews the theoretical literature. Section 3 sketches the empirical methodology and section 4 presents the estimation results. Section 5 concludes.

2- Theoretical Framework

Public interventions designed to achieve various developmental goals may be carried out either by local governments or the center. The key policy issue in decentralization reforms is how to organize responsibilities among these different layers of government so as to maximize the overall level of efficiency and welfare.

One of the core principle of the theory of fiscal federalism is the Oates (1972)' Decentralization Theorem. It set out a basic rule for the decentralized provisions

of public goods and services to be Pareto-superior to a centralized determination of public outputs. Three inter-related conditions are explicit in the Theorem: heterogeneity, externalities and economies of scales.

According to Oates (1972), welfare is maximized under decentralization when regions are heterogeneous in their preferences for public goods, which does not exhibit inter-regional spillovers or costs saving from a centralized provision. The presence of externalities and economies of scales give some rationale for centralization and thus, create a basic trade-off between centralization and decentralization.

However, Besley and Coates (2003) indicate that even though a critical level of spillovers above which centralization produces a significant surplus exists, this critical level is particularly higher, thereby implying a weaker case for centralization. Turning to economies of scales, Prud'Homme (1995) argues that for most local public services, the provision in a given city is independent of the provision in other cities, thereby implying minimal welfare losses under decentralization.

Finally, the core idea expressed in the Oates' theorem has not been challenged fundamentally. The recent literature is coherent with the initial presumption of Oates (1972) that decentralization increases efficiency when regions exhibit heterogeneous preferences for public goods (Lockwood, 2005). Therefore, a centralized provision would lead to welfare losses that will likely be correlated with the extent of heterogeneity.

However, a proper transfer of expenditures responsibilities to subnational governments, following the Oates (1972)' rule, is not enough to achieve welfare gains. In fact, the standard theory of fiscal federalism lay out a normative

framework for the appropriate fiscal policies needed to ensure the effectiveness of decentralization. The main focus is to provide local governments with adequate revenues, typically through local taxes, intergovernmental grants and debt instruments, to carry out their expenditures responsibilities.

Expenditure assignment needs to be matched with adequate revenues assignment. While the structure of local revenues is likely to vary somewhat across countries, it is not without consequences on the success of expenditure decentralization, however. First, controlling important tax bases give local governments more legitimacy over the use of resources, and hence leeway to manage them according to their own preferences and needs (De Mello, 2006). Second, vertical imbalances may induce irresponsible fiscal behaviors from local governments² (Rodden, 2002; Kornai and al., 2003).

This raises the crucial needs of fundamental institutional reforms to ensure that local public revenues are directed properly towards the satisfaction of citizen's revealed needs. Contrary to what is assumed in the standard fiscal federalism framework, local governments are not always benevolent, and besides, they may lack the necessary competences to perform their assigned responsibilities effectively.

Accountability and adequate capacities at local level are necessary to prevent inefficient outcomes in the use of local public revenues. It may be argued that corruption and inadequate capacities are likely to be more pronounced at local level rather than at the center (Prud'Homme, 1995; Tanzi, 1996). But nothing does in fact prevent local and central governments from taking appropriate measures to upgrade the quality of local bureaucracies. Also, what emerges from

² This is known in the literature as the soft budget constraints syndrome (Kornai and al., 2005).

the literature (Bardhan, 2002) is that the issue of poor accountability of local officials is not insuperable.

There is no universal blueprint however. A review of several country experiences shows that local accountability mechanisms have been successfully enforced through regular organizations of fair elections, institutionalized systems of periodic hearings on items of major public expenditures, etc. But, what works varies widely across regions and countries (Bardhan, 2002), thereby suggesting that the proper handling of the issue surely depends upon various specificities in each country (Oates, 2005)

Therefore, whether and to what extent decentralization reforms have helped to improve outcomes turns out to be an empirical issue. The theoretical framework generates several predictions. In particular: Decentralization of expenditure responsibilities improves efficiency, especially in countries with inter-regional heterogeneity of preferences for public goods. Moreover, the benefits of expenditures decentralization is higher the more local revenues are independents, and the better the quality of governance at local level is.

The next section sketches the empirical methodology to be used to evaluate the aforementioned predictions.

3- Empirical Methodology

On the basis of the empirical model used in Robalino and al. (2001), the following equation is specified:

$$Y_{it} = \alpha \left(\frac{CGS}{GDP} \right)_{it} + \beta_0 \left(\frac{LGS}{GDP} \right)_{it} + \beta_1 \left(\frac{LGS}{GDP} \right)_{it} * X_{it} + \lambda X_{it} + \varphi C_{it} + \eta_{it} \quad [1]$$

- Y_{it} is a measure mortality infant rates;

This outcome deserves particular attention in development process, especially as far as the MDGs are concerned.

- $\left(\frac{CGS}{GDP}\right)_{it}$ is the Central Government Expenditures as percentage of GDP;

Unlike Robalino and al. (2001), this variable is introduced to control for the impact of central government spending on outcomes, and more important, to compare the relative efficiency of a dollar when it is spent by central government to when local government spends it. Such comparison is important to answers the policy question of how scarce resources should be allocated along different levels of government.

- $\left(\frac{LGS}{GDP}\right)_{it}$ is the Sub-National expenditures as percentage of GDP;

This measure is preferred to the subnational share of expenditure as percentage of total expenditures, or of central government expenditures. The later can only inform on whether spending by local governments has a positive impact on outcomes. They cannot inform on whether transferring more expenditure responsibilities to local government would improve outcomes above that which results from a given level of centralization; and the above specification offer the advantage to shed light on that particular issue.

- X_{it} is one of the variables that, by hypothesis, condition the effectiveness of expenditure decentralization. Two variables are considered in this regard:

- a) Heterogeneity, which is measured by the extent of ethnic diversity within the country (ELF).

An assortment of political economy models suggest that ethnic diversity impedes agreement about the provision of public goods and creates incentives for growth-reducing policies in a centralized system of planning (Alesina and Spoloare, 1997; Easterly and Levine, 1997). Therefore, the more a society is polarized, the more decentralization is likely to reduce conflicts of interest between the different groups and improve economic performances.

- b) The extent of revenue decentralization, which is measured by vertical imbalance (VI).

VI here is the degree to which subnational governments rely on the central government to support their expenditures. This proxy does not distinguish what proportion of transfers is conditional versus general purpose, and the GFS data do not provide this information.

- C_{it} is a set of control variables: GDP per capita, index of corruption and index of bureaucracy quality. These variables have been identified as important determinants of mortality infant rates.
- η_{it} is the error term to account for all other factors influencing outcomes which are not integrated in the model. It is specified as follow: $\eta_{it} = \omega_i + \gamma_t + \varepsilon_{it}$ where ω_i are time-invariant unobserved country-specific effects which adjust for any mean differences in outcomes across countries; γ_t are time-specific effects

strictly identical across countries; and ε_{it} is the component of the error term which is assumed orthogonal to ω_i and γ_t , and satisfy the classical assumptions.

The rationale to interact X_{it} with $\left(\frac{LGS}{GDP}\right)_{it}$ is to provide a better description of the relationship between expenditure decentralization and outcomes. A significant interaction term (β_1) means that the effects of $\left(\frac{LGS}{GDP}\right)_{it}$ on Y_{it} vary with the value of X_{it} ; and this effect is given by $\beta_0 + \beta_1 \bar{X}$, where \bar{X} is the mean of X_{it} .

The first approach to obtain coefficients of interest is to estimate equation [1], using Ordinary Least Squares (OLS).

However, this approach is prone to two potential problems. First, measurement error on the measurement of expenditure decentralization will most likely produce downward-biased and inconsistent parameters estimates of its effects. This is likely since subnational expenditures figures do not disentangle autonomous spending (the true measure of expenditure decentralization) from spending on the behalf of the Central Government; and the database used does not provide such information.

Second, omitted variables or reverse causation may cause OLS estimates to reflect only simple correlation rather than true causal relationships from expenditure decentralization to better outcomes. It is not possible to control for every important variables that affect both decentralization and outcomes, such as cross-national differences in the items of public spending and this problem causes bias and inconsistency in OLS estimates, thereby confounding the influence of decentralization on outcomes.

The use of generalized method of moment (GMM) provides the means to deal with these problems by instrumenting the endogenous variables in equation [1]. GMM estimators take first differences to eliminate unobserved country-specific effects; and use lagged (endogenous) variables in level as instruments in first-differenced equation, to correct for potential endogeneity.

However, these instruments may be weakly correlated with the endogenous variables so that the parameters are only weakly identified (largely inconsistent and biased). In this case, Arellano and Bond (1998) suggest using an extended GMM estimator (SYS-GMM) in which lagged-first differences of the endogenous variables are used as instruments for equations in levels, in addition to the usual lagged levels as instruments for equations in first-differences.

The SYS-GMM uses more instruments to improve the efficiency of estimates, provided that the error term is not serially correlated, and that the difference in the explanatory variables and the error term is not correlated (Blundell and Bond, 2000; Hayakawa, 2007). Therefore, the validity of those assumptions is determining for the validity of GMM estimates.

When GMM-SYS is used, a Sargan Difference test should be examined to see if there is evidence that the additional moment conditions are valid. If not, first difference GMM estimates may be preferred³. Under the null hypothesis that moment conditions are valid, the test statistic is asymptotically distributed as chi-squared. In addition, the LM test of serial correlation should be examined. There should be significant first order correlation of the first order residuals and no second order correlation.

³ Blundell and Bond (2000) reported that in many contexts, additional moment restriction exploited by the GMM-SYS estimator appear to be valid though, and they appear to be useful in reducing biases associated with first-difference.

4- Data and Descriptive Statistics

The sample consists of country-level data over the period 1985–2000. It covers 76 countries of which 14 are from Africa; 8 from East Asia and Pacific (EAP); 15 from Europe and Central Asia (ECA); 15 from Latin America and Caribbean (LAC); 2 from South Asia Region and 22 from OECD. The detailed list is given in Table 1 in the appendix.

Detailed definitions and sources of variables are given in Table 2 in the appendix. It is worth pointing out the paucity of subnational data. For instance, in the Government Finance Statistics (GFS) database, which is the main source for cross-country data of fiscal flows at different level of governments, data on decentralization can be found only for 46 countries in 1996.

General descriptive statistics of the variables used are presented in table 3 in the appendix. The table below reports the simple correlations between outcomes variables and the main dependent variables.

Table 1: Fiscal Decentralization and Outcomes: Simple correlations

	Log (mir)
Log (sgs_gdp)	-0.5938***
Log (cgs_gdp)	-0.4697***
Log (gdp_cap)	-0.8993***
Corruption	-0.6686***
Bureaucracy	-0.5627***
Ethnic fractionalization	0.5646***

***: Significance at 1%

These bi-variate correlations provide *prima facie* evidence of a statistical association between outcomes and fiscal decentralization and as suggested by the theoretical literature. Also, the correlations with the other variables behave as expected. A striking fact is that correlations with expenditures by local governments are stronger than with expenditures by central governments, as suggested by the theoretical literature.

However, these correlations might be misleading because decentralization is correlated with other country-characteristics, such as ethnic fractionalization or GDP per capita (Panizza, 1999; Cerniglia, 2003; Arzaghi and Henderson, 2005). They could simply reflecting own positive direct impact of these variables on outcomes, rather than a sign of decentralization having a positive impact on outcomes. Therefore, the statistically significant correlations obtained might reverse into (statistically significant) negative ones as soon as other relevant variables are controlled for in multivariate regressions.

5- Estimation Results

This section reports and discusses the multivariate regression results on the relationship between outcomes and fiscal decentralization.

The baseline regressions take the logarithm of outcomes, GDP per capita and spending variables. The choice of the functional form was guided by the graphical analysis of the original data as presented in figures 1-3 in the appendix, which portray inverse functions between mortality infant rates and GDP per capita and spending variables. Linearization of inverse functions gives the log-log functional form retain in our analysis.

Table 2 reports the results on the mortality infant rates and public spending at different levels of government; using fixed effects estimator and successively adding controls variables.

Table 2: OLS results with mortality infant rate as dependent variable⁴

	I	II	III
Log (sgs_gdp)	-0.247*** (-4.59)	-0.061(-1.45)	-0.030 (-0.90)
Log (cgs_gdp)	-0.427*** (-5.37)	-0.077 (-1.41)	-0.106*** (-2.99)
Bureaucracy		-0.056* (-1.68)	-0.038* (-1.67)
Corruption		0.035** (2.32)	0.016 (1.23)
Log (gdp_cap)		-0.830*** (-9.14)	-0.360*** (-4.85)
10-year dummy		***	
1-year dummy			***
Constant	4.400*** (17.49)	10.325*** (12.60)	5.680*** (5.13)
R-sq Within	0.0878	0.7206	0.8457
Observations	718	368	368

***, **, *: Significance at 1%, 5% and 10%.

The first column includes only spending at central and local government as percentage of GDP. The elasticity of central government spending appears significant and almost two times higher than the elasticity of local government spending. It shows that even if subnationals spending have a significant positive impact in reducing mortality infant rates, other things being equal, spending at central level would be more efficient.

Adding control variables (column II and III), including GDP per capita, corruption, bureaucracy quality and year-dummies⁵, makes the estimates decrease,

⁴ In the results tables, figures in brackets are the t-student.

but remaining large and significant for central government spending. That is, the initial positive correlation between spending variables and the outcome was simply driven by the fact that countries with higher GDP per capita and better bureaucracy quality tend to have higher share of local government spending in GDP.

Ceteris paribus, expenditure decentralization is not better to reduce mortality infant rates. However, these results are more applicable for high-incomes countries than for low-incomes countries. In fact, dividing the sample into two sub-sets regarding the level of development⁶, results obtain with high-incomes countries show that spending at local level has a significant impact on outcomes.

Table 3 shows that the coefficient of local government spending is significant and negative in low-incomes countries, but not significant in developed countries. On the contrary, central government spending appears negative and statistically significant in developed countries, but not significant in low-income countries.

This result suggest decentralization improve welfare particularly in poor countries. Robalino and al. (2001) have already obtained a similar result. Moreover, these results suggest that the previous results (table 2) were simply driven by the predominance of Developed Countries in the total sample

⁵ Time dummies variables are introduced as control variables to account for any time-varying systematic influence on mortality infant rates omitted in the model. For example, the quality of public spending that is likely to vary across time in each country, influences outcomes and a measure of that variable is not available.

⁶ We put developing and transition countries together to form the group of low-income countries because these countries are comparable regarding their level of economic development.

Table 3: OLS results on Sub-samples with mortality infant rates as dependent variable

	High-Incomes Countries		Low-Incomes Countries	
Log (sgs_gdp)	0.057 (0.90)	0.039 (0.55)	-0.08 (-1.41)	-0.0872* (-1.66)
Log (cgs_gdp)	-0.655*** (-5.58)	-0.531*** (-7.36)	0.216*** (3.26)	-0.048 (-0.76)
Bureaucracy	-0.079 (-0.85)	-0.131** (-2.09)	-0.710(-1.39)	-0.016 (-0.51)
Corruption	0.040** (2.130)	0.016 (0.84)	0.013 (0.50)	-0.046* (-1.87)
Log (gdp_cap)	-1.959*** (-4.37)	-1.144*** (-11.07)	-0.855*** (-7.60)	-0.418*** (-3.69)
Time- dummy		***		***
Constant	23.285*** (16.35)	18.226 (13.68)	9.446 (10.13)	7.064*** (8.58)
R-sq Within	0.7770	0.8212	0.5400	0.7914
Observations	228	228	140	140

***, **, *: Significance at 1%, 5% and 10%.

OLS estimates could be interpreted as a sign of endogeneity. Table 4 reports the system GMM results that better control for potential endogeneity problems as discussed above (section 3.2). Only low-incomes countries are considered. Results are obtained using the *xtgmm* command on Stata 10.

The first column suggests a positive and significant impact of local government spending on the outcome considered. It suggests also that the central government spending has a positive and significant impact on the outcome, and this impact is slightly higher than that of local government spending.

However, this does not imply that in any cases, spending at central level will be better to achieve the development goal. As discussed in the theoretical framework, the level of heterogeneity of preferences could be determinant.

Table 4: GMM results with Mortality Infant Rates as dependent variable

	I	II	III
Log (sgs_gdp)	-0.089 ^{***} (-2.24)	0.0404 ^{***} (2.64)	-0.857 ^{***} (-12.34)
Log (sgs_gdp)*ethnic		-0.486 ^{**} (-1.95)	
Log (sgs_gdp)*vi			0.014 ^{***} (11.40)
Log (cgs_gdp)	-0.132 ^{***} (-2.25)	-0.074 (-0.92)	-0.261 ^{***} (-4.91)
Corruption	-0.043 ^{**} (-6.66)	-0.021 (-1.09)	-0.069 ^{**} (-2.42)
Bureaucracy	-0.017 (-0.58)	0.005 (0.11)	-0.003 (-0.06)
Log (gdp_cap)	-0.043 (-6.66)	-1.091 ^{***} (-9.63)	-0.478 ^{***} (-13.49)
VI			-0.0127 ^{***} (-7.94)
Time- dummy		***	***
Constant			***
Observations		140	118
Sargan test		0.3236	0.5093

***, **, *: Significance at 1%, 5% and 10%.

Results in column II suggest that the impact of decentralization does depend upon the extent of ethnic heterogeneity. The elasticity of local spending is $(-0.178)^7$. There seems to be a threshold level of heterogeneity above which decentralization is better to achieve development goal.

Column III explore whether revenue decentralization is determinant for the success of expenditure decentralization. The coefficient of local spending interacted with a measure of fiscal imbalances appears positive and significant. That is the more local governments are relying on grants from central governments to finance their spending, the less are they can foster reduction of mortality infant rates.

⁷ $0.0404 + (0.45) * (-0.486) = -0.178$

6- Conclusion

This paper sought to answer the question of whether and in what conditions, assigning more expenditure responsibilities to Sub-National governments is better to achieve development goals.

The theoretical literature suggests that spending at local level is better to achieve development goals, especially in countries where higher ethnic diversity impedes agreement about the provision of public goods and creates incentives for rent-seeking by the different groups. Theory also suggests that local governments are more efficient in improving welfare when they control a broad share of their revenue, and highlights the importance of adequate governance to prevent opportunistic or inefficient behaviors at local level.

The empirical evidence based on a panel data of developing and transition suggests that spending at local level do in fact reduce mortality infant rate. More importantly, the highest impact of decentralization is obtained in countries with high level of ethnic fractionalization and with high level of revenue decentralization, thereby corroborating theoretical predictions of the fiscal federalism literature.

It is important to stress that cross-country data is hiding important within-country disparities in outcomes and decentralization of fiscal responsibilities. Therefore, an empirical study on data at subnational level could better shed light on the impact of decentralization on outcomes and on the determinant factors for success. That could be the next step of this research.

Appendix

Table 1: Sample coverage

AFR	EAP	ECA	LAC	OECD	SAR
Botswana	China	Belarus	Argentina	Australia	India
Burkina Faso	Fiji	Bulgaria	Bolivia	Austria	Sri Lanka
Congo, Rep.	Indonesia	Croatia	Brazil	Belgium	
Ethiopia	Malaysia	Czech Rep.	Chile	Canada	
Gambia, The	Mongolia	Estonia	Colombia	Denmark	
Kenya	Papua N. G.	Hungary	Costa Rica	Finland	
Madagascar	Philippines	Kazakhstan	Dominican Rep.	France	
Malawi	Thailand	Kyrgyz Rep.	Guatemala	Germany	
Mauritius		Latvia	Mexico	Greece	
Senegal		Moldova	Nicaragua	Ireland	
South Africa		Poland	Panama	Israel	
Swaziland		Romania	Paraguay	Italy	
Uganda		Russia	Peru	Luxembourg	
Zimbabwe		Slovak Rep.	Trinidad & T.	Netherlands	
		Slovenia	Uruguay	New Zealand	
				Norway	
				Portugal	
				Spain	
				Sweden	
				Switzerland	
				U.K	
				USA	

Table 2: Definition and sources of variables

Variables	Description and Sources
Mortality rate under -5 (per 1000)	The probability (expressed as a rate per 1000) that a newborn baby will die before reaching age 5, if subject to current age-specific mortality rates. <u>Source:</u> World Development Indicators (WDI).
Mortality infant rate	The number of infants dying before reaching one year of age, out of 1000 live births in a given year. <u>Source:</u> WDI
Primary completion rates	The percentage of students completing the last year of primary school. It is calculated by taking the total number of students in the last grade of primary school, minus the number of repeaters in that grade, divided by the total number of children of official graduation age. <u>Source:</u> WDI.
Central Government spending (%GDP)	Total expenditure accounted for by central government, excluding intergovernmental transfers, defense expenditures and interest payments, as a percentage of GDP. <u>Source:</u> compiled from the WBFDI Country database of the World Bank.
Sub-National spending (% GDP)	Sum of local and provincial total expenditures, excluding current and capital transfers to other levels of governments, as a percentage of GDP. <u>Source:</u> WBFDI Country database, World Bank.
Heterogeneity	There are three possibilities: a) the size of land area (AREA), b) the size of the population (POP) or c) the extent of ethno-linguistic differences within the country (ELF). <u>Sources:</u> WDI for AREA and POP and Roeder (2001) for ELF.
Vertical imbalances	It is calculated as the total amount of grants paid to sub-national governments, divided by the sum of local and provincial total expenditure, excluding current and capital transfers to other levels of government. <u>Source:</u> WBFDI County database, World Bank.
Governance quality	a) Index of bureaucracy quality (4- point scale) gives a high score to countries where the bureaucracy has the strength and

	<p>expertise to govern without drastic changes in policy or interruption in government services, and where it has an established mechanism for recruitment and training. <u>Source</u>: International Country Risk Guide (ICRG).</p> <p>b) Index of Corruption (6- point scale) proxies actual or potential corruption in the form of excessive patronage, nepotism, job reservation, etc. <u>Source</u>: ICRG</p>
GDP per capita	Gross Domestic Product per capita based on purchasing power parity (PPP). <u>Source</u> : WDI.
Ethnic fractionalization	Ranges from 0 to 1. Measures the probability that two randomly selected individuals differing in their native language and ethnic groups. <u>Source</u> : Roeder (2001).

Table 3: Summary statistics of the main variables

Variables	Obs.	Mean	Std. Dev.	Min	Max
Mortality infant rate	1531	34.61	39.67	2.2	199
Under-5 mortality rate	1235	56.72	68.61	3.22	345
Primary completion rate	1007	76.54	27.451	10.47	127.15
Sub-National expenditures (% of GDP)	1437	8.83	7.91	0.10	48.27
Central government expenditures (% of GDP)	1258	22.13	9.22	1.60	50.42
Per capita GDP	3934	5512.68	7810.67	56.47	48655.21
Vertical Imbalance	1357	36.22	23.10	0	130.27
Index of ethnic-fractionalization	4327	0.45	0.26	0.10	0.93
Index of corruption (least corrupt =6)	2000	3.33	1.43	0	6
Index of bureaucracy quality (highest=4)	2018	2.21	1.25	0	4

Figure 1: Mortality infant rates and GDP per capita

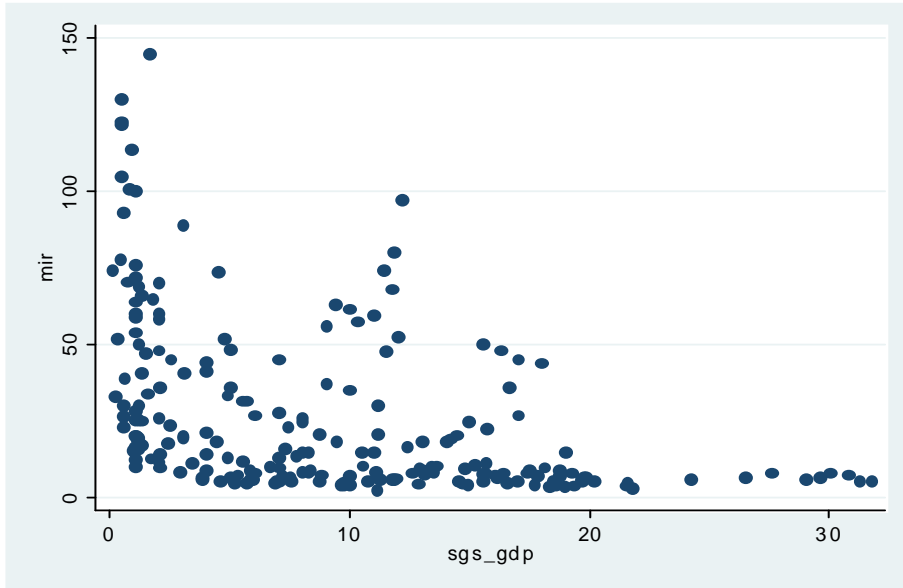


Figure 2: Mortality infant rates and Subnational share of expenditures

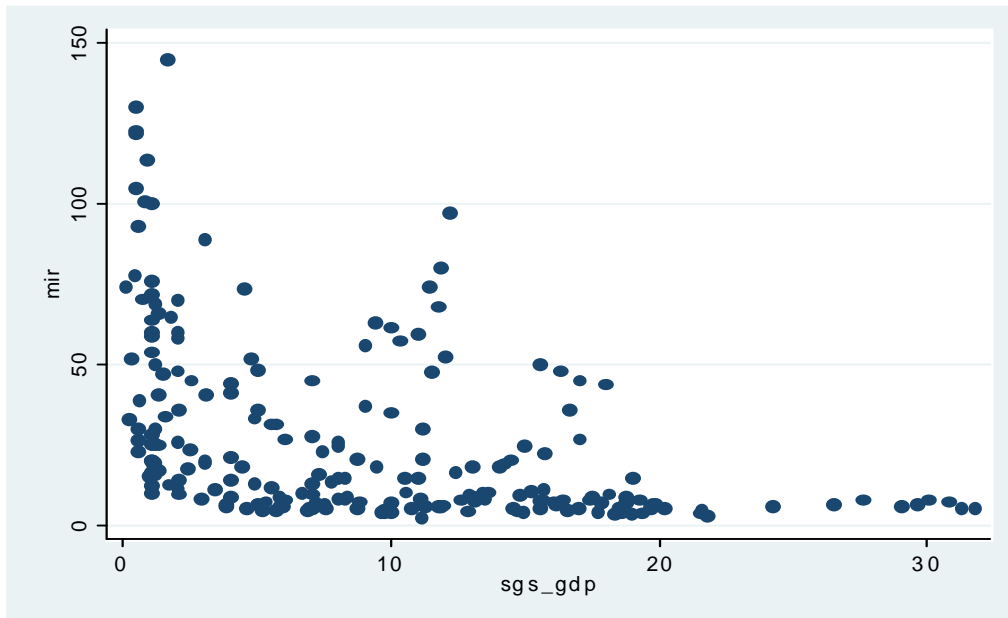
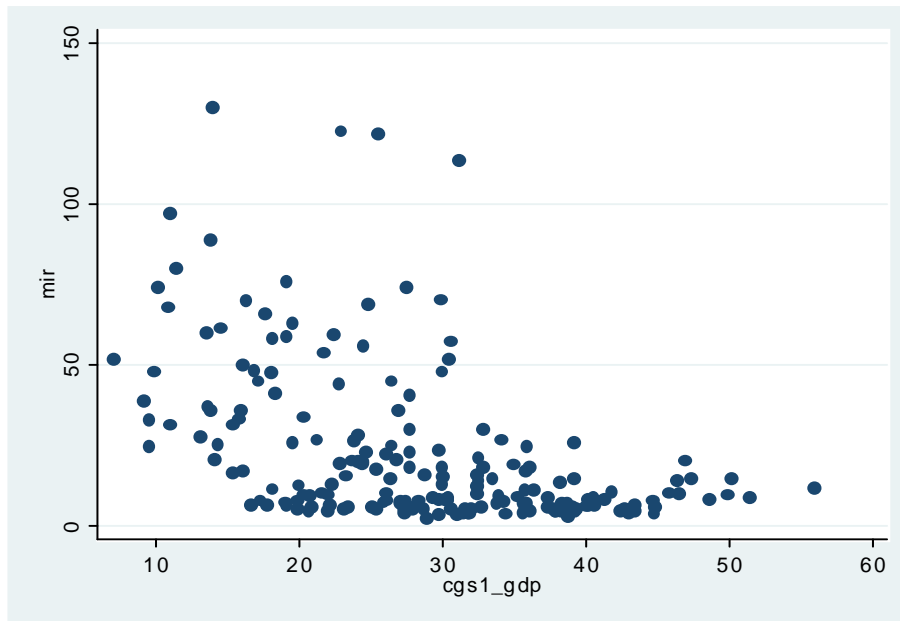


Figure 3: Mortality infant rates and central government expenditures



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