

## Chapter 9

### Fiscal decentralisation and the efficiency of public service delivery

by

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*This chapter explores the impact of fiscal decentralisation on the efficiency of public service delivery. It uses a stochastic frontier method to estimate time-varying efficiency coefficients and analyses the impact of fiscal decentralisation on those efficiency coefficients. The findings indicate that fiscal decentralisation can improve the efficiency of public service delivery but only under specific conditions. First, the decentralisation process requires adequate political and institutional environments. Second, a sufficient degree of expenditure decentralisation seems necessary to obtain favourable outcomes. Third, decentralisation of expenditure needs to be accompanied by sufficient decentralisation of revenue. Absent these conditions, fiscal decentralisation can worsen the efficiency of public service delivery.*

\* The authors are grateful to B. Akitoby, M. De Broeck, J.L. Combes, V. Gaspar, F. Grigoli, S. Gupta, M. Marinkov, A. Minea, J. Oliveira-Martins, A. Schaechter and participants in the IMF Fiscal Affairs Department seminar and OECD-KIPF Workshop for their useful comments.

## Introduction

This chapter analyses the impacts of fiscal decentralisation on the efficiency of public service delivery. It contributes to existing studies by focusing explicitly on the efficiency of public service delivery instead of the policy outcome. The policy outcome can be improved by augmenting policy inputs (for instance, spending allocation); in contrast, efficiency is measured as the difference in policy outcomes — across countries and over time — under a similar set of policy inputs. This chapter also covers a large sample of countries, including developed, emerging and developing economies.<sup>1</sup> Last, it uses recent empirical techniques to reach the findings and ascertain their robustness.

The chapter's findings suggest that fiscal decentralisation can serve as a policy tool to improve performance, but only under specific conditions. Our findings focus on the efficiency of spending on education and health and indicate that an adequate institutional environment is needed for decentralisation to improve public service delivery. Such conditions include effective autonomy of local governments, strong accountability at various levels of institutions, good governance, and strong capacity at the local level. Moreover, a sufficient degree of expenditure decentralisation seems necessary to obtain a positive outcome. And finally, decentralisation of expenditure needs to be accompanied by sufficient decentralisation of revenue to obtain favourable outcomes. Absent these conditions, fiscal decentralisation can worsen the efficiency of public service delivery.

The paper is structured as follows. The next section reviews the existing literature and summarises the merits and risks of fiscal decentralisation. The third section presents the empirical analysis. The final section concludes with the main policy recommendations.

## Literature review and theoretical background

Fiscal decentralisation can improve the efficiency of public service delivery through preference matching and allocative efficiency. Local governments possess better access to local preferences and, consequently, have an informational advantage over the central government in deciding which provision of goods and services would best satisfy citizens' needs (Hayek, 1945; Tiebout, 1956; Musgrave, 1969). When provided by the jurisdiction that has the control over the minimum geographic area, costs and benefits of public services are fully internalised, which is expected to improve allocative efficiency (Oates, 1972).

Fiscal decentralisation can also ameliorate efficiencies by fostering stronger accountability. Geographical closeness of public institutions to the local population (final beneficiaries) fosters accountability and can improve public service outcomes, particularly in sectors such as education and health (Ahmad, Brosio, and Tanzi, 2008; Cantarero and Sanchez, 2006). Local accountability is expected to put pressure on local authorities to continuously search for ways to produce and deliver better public services under limited resources, leading to “productive efficiency”. Accountability can foster larger spending in public investment and other growth-enhancing sectors, such as education and health (Keen and Marchand, 1997; Arze del Granado, Martinez-Vazquez and McNab, 2005; Bénassy-Quéré, Goyalraja and Trannoy, 2007; Kappeler and Valila, 2008; Fredriksen, 2013). Local accountability can be strengthened through a direct election of local authorities by the local population.

Furthermore, fiscal decentralisation can improve efficiency through the “voting with one’s feet” hypothesis. Decentralisation gives voters more electoral control over authorities (Seabright, 1996; Persson and Tabellini, 2000; Hindriks and Lockwood, 2005). It encourages competition across local governments to improve public services; voters can use the performance of neighbouring governments to make inferences about the competence or benevolence of their own local politicians (Bordignon, Cerniglia and Revelli, 2004). Fiscal decentralisation may lead to a decrease in lobbying by interest groups, distorting policy choices and increasing waste of public funds.

However, fiscal decentralisation can worsen public service delivery if economies of scale are important. Devolution of public service delivery to a small-scale local government can decrease efficiency and increase costs if economies of scale are important in the process of production and provision of some specific public goods. For instance, shifting the production and provision of public services to a municipality with a small number of government officials (producers and providers) and a small population (beneficiaries) can reduce efficiency.

Fiscal decentralisation can also obstruct the redistribution role of the central government. To guarantee a minimum level of public services and cater to basic needs (or standard of living) for the entire population (regardless of their geographical location), the central government often carries out equalisation transfers, which would be disrupted in cases of insufficient leverage over resources (Ter-Minassian, 1997). When a significant share of revenue and expenditure is shifted to local governments, the central government does not possess sufficient resources to reduce large income differences across the regions of a country.

Fiscal decentralisation can also hinder public service delivery if accountability is loose. If accountability is not broadly anchored in a local democratic process, but instead is based on rent-seeking political behaviour, local governments would be tempted to allocate higher decentralised expenditure to non-productive expenditure items (such as wages and goods and services instead of capital expenditure). This can hinder efficiency, economic growth, and overall macroeconomic performance (Davoodi and Zou, 1998; Phillips and Woller, 1998; Zhang and Zou, 1998; Ezcurra and Rodriguez-Pose, 2010; Gonzalez-Alegre, 2010; Grisorio and Prota, 2011).

## Empirical analysis

### *Methodology*

This chapter investigates the efficiency, rather than just the outcome, of public service delivery in health and education. Policy outcome is the directly measurable impact of public service delivery; outcome indicators can include infant mortality rates and school enrolment rates. Policy outcomes can be improved by augmenting policy inputs, such as expenditure allocation for health and education. However, the efficiency analysis focuses on the improvement in outcome while keeping inputs unchanged.<sup>2</sup> This approach allows us to analyse the impact of policies other than inputs in improving the provision of public goods and services; such policies can include fiscal decentralisation.

The methodology is based on a two-step approach, estimating efficiency coefficients and analysing the impact of fiscal decentralisation on the latter. In a first step, the efficiency of public service delivery is estimated using stochastic frontier techniques. These techniques provide time-varying coefficients that measure the

distance of the public services in a specific country at a specific year to the best public services provided using similar inputs in the sample of countries considered in this analysis. In a second step, the effects of fiscal decentralisation on the estimated efficiencies are estimated. Instrumental variable methods are used to obtain bias-corrected coefficients. These methods address concerns about endogeneity associated with the decentralisation process; they can also tackle reverse causality that could plague the estimated parameters.

In a first step, efficiency coefficients are estimated from stochastic frontier techniques. Methodologies on efficiency estimates can be grouped into two main approaches: 1) a parametric approach (Battese and Coelli, 1988; Jayasuriya and Wodon, 2003; Grigoli and Kapsoli, 2013); and 2) a non-parametric approach (Gupta and Verhoeven, 2001; Herrera and Pang, 2005; Gupta et al., 2007). This chapter uses the parametric approach-based stochastic frontier analysis (SFA). The SFA allows for estimating models with multiple inputs, as opposed to non-parametric models that do not take into account the effect of exogenous factors on the outcome variable because of the restriction on the number of variables. As the outcome variables in this chapter, that is, infant mortality and enrolment ratio, are plausibly affected by structural factors other than public expenditure, such as socio-economic characteristics of the country, a multivariable model is better suited for the analysis. Moreover, the SFA allows us to estimate country-specific and time-varying coefficients.

The SFA techniques assume that no economic agent (i.e. country) can exceed the ideal “frontier.” The frontier refers to the optimum output — infant mortality rate or enrolment rate — produced with limited inputs, such as public expenditure. The deviation of the output in a specific country at a specific time from this frontier represents the individual measure of the efficiency of that country. Efficient governments are those operating at, or very close to, the frontier as they try to reduce the infant mortality rate or improve the enrolment rate, given a limited amount of public expenditure.

The first-step model is specified as follows:

$$Y_{it} = \alpha + \gamma PE_{it-1} + \sum_{k=1}^K \varphi_k Z_{k,it-1} + \varepsilon_{it} \quad (1)$$

$$\begin{cases} \varepsilon_{it} = \omega_{it} \pm \eta_{it} \\ \eta_{it} = g(t) g \eta_i \text{ and } g(t) = \exp[-\lambda(t - T_i)] \end{cases} \quad (2)$$

The dependent variable  $Y_{it}$  in equation (1) represents public expenditure outcomes in health and education, namely the infant mortality rate and the secondary school enrolment rate, with subscripts  $i$  and  $t$  denoting respectively country and time dimensions. The interest variable  $PE_{it-1}$  corresponds to public expenditure on health and education as a percentage of gross domestic product (GDP). A set of control variables  $Z_{k,it}$  are added, which are likely to influence the infant mortality rate or the enrolment rate. The error term  $\varepsilon_{it}$  in equation (1) has two components as shown in equation (2);  $\omega_{it}$  represents an idiosyncratic disturbance, capturing measurement error or any other classical noise, and the remaining part  $\eta_{it}$  is a one-sided disturbance capturing the country-specific and time-varying efficiency of public expenditure.<sup>3</sup> Equations (1) and (2) allow us to obtain the country-specific and time-varying efficiency of public expenditure, following the formula provided by Battese and Coelli (1988) and Jondrow et al. (1988).

The second step consists of measuring the extent to which fiscal decentralisation affects the estimated efficiencies. The impact of fiscal decentralisation is analysed through a direct channel, a non-linear relationship, and interactions with political and institutional variables. The baseline model is the following:

$$\hat{\eta}_{it} = \alpha + \delta fd_{it-1} + \varphi GDP_{it-1} + \psi_{it} \quad (3)$$

The dependent variable  $\hat{\eta}_{it}$  is the country-specific and time-varying efficiency estimated from equations (1) and (2),  $\alpha$  is a common constant term, and  $fd_{it-1}$  measures fiscal decentralisation.

To explore non-linearities in the relationship between fiscal decentralisation and public expenditure efficiency, a quadratic specification is added—i.e. squared fiscal decentralisation

$(fd_{it-1})^2$ —as shown in equation (4). Non-linearities, if any, are detected by computing the derivatives:

$$\hat{\eta}_{it} = \alpha + \delta_1 fd_{it-1} + \delta_2 (fd_{it-1})^2 + \varphi GDP_{it-1} + \psi_{it} \quad (4)$$

Furthermore, the impact of the political and institutional environment on the relationship between decentralisation and the efficiency of public service delivery is investigated. Political and institutional variables are introduced additively ( $I_{it-1}$ ) but also in interaction with fiscal decentralisation ( $fd_{it-1} \times I_{it-1}$ ), as shown in equation (5).

$$\hat{\eta}_{it} = \alpha + \delta fd_{it-1} + \tau (fd_{it-1} \times I_{it-1}) + \rho I_{it-1} + \varphi GDP_{it-1} + \psi_{it} \quad (5)$$

Parameter  $\rho$  corresponds to the direct effect of political and institutional variables on efficiency. Parameters  $\delta$  and  $\tau$  correspond respectively to the effect of fiscal decentralisation on the efficiency and the influence of the political and institutional environments on the causal link between fiscal decentralisation and public service efficiency.  $\psi_{it}$  in equations (3) – (5) is a composite error term, taking into account country-specific characteristics.

Fiscal decentralisation is measured as the share of sub-national fiscal variables over general government fiscal variables.<sup>4</sup> The main estimates in this chapter are based on the expenditure side of fiscal decentralisation, using the share of sub-national expenditure to general government expenditure.<sup>5</sup> The primary focus is on expenditure as it is directly linked to health and education outcomes and efficiency (as opposed to revenue). However, to ensure a comprehensive study, the chapter also analyses the impacts of revenue decentralisation on the efficiency of public service delivery, using the share of local government revenue to general government revenue.<sup>6</sup> The political and institutional variables focus on the level of corruption, the degree of autonomy of the regions, the strength of the democracy, and the constitutional regime (presidential or parliamentary). Control variables in the stochastic frontier analysis comprise real GDP per capita as a measure of the level of development, the density and population size, and the average years of primary and secondary schooling. All these variables are considered to influence the infant mortality rate and the secondary school enrolment

rate.<sup>7</sup> It would be insightful to use the share of sub-national expenditure on health and education to general government expenditure in each of the two sectors; however, such data are not available for many of the countries in the sample. Furthermore, the efficiency is influenced by factors beyond expenditure, and analysis using aggregate expenditure ratio allows for more precise comparison with the analysis using aggregate revenue ratio.

Endogeneity and causality concerns are addressed through lag and instrument techniques that motivate the introduction of additional variables. An initial attempt at reducing any bias consists of introducing all explanatory variables, including fiscal decentralisation, with a one-period lag. Furthermore, two-stage least squares techniques are applied for the fiscal decentralisation variable, using three instrumental variables. First, the population size is considered a significant variable affecting the decentralisation process because larger countries generally tend to be more decentralised despite some counter examples (Dziobek, Gutierrez-Mangas and Kufa, 2011; Jiménez-Rubio, 2011; Escolano et al., 2012). The rationale is that in countries with large populations, it is more difficult for central authorities to have sufficient information to target citizens' needs, which leads to decentralisation. Second, the existence of natural resources can act as an obstacle to decentralisation, because of possible rent-seeking of fiscal authorities that benefit directly from the resource windfalls. Under such circumstances, embarking on a fiscal decentralisation process would imply a subsequent private loss for incumbent authorities. On the other hand, residents of resource-rich regions can claim larger shares of resources through accelerated decentralisation. Moreover, natural resources might be seen as a blessing, triggering the decentralisation process because windfalls may constitute an additional source of revenue to share with the sub-national governments. Third, government fractionalisation in the legislative system can affect the decentralisation process. Fractionalisation is measured as the probability that two deputies randomly picked either from the government, or the legislature will be from different parties. Higher fractionalisation may either act against the decentralisation process, owing to political motives, or accelerate decentralisation. The expected signs of these two last instrumental variables on the decentralisation process cannot be determined *a priori*.

### **Data**

The sample covers an unbalanced panel of 64 countries, including advanced, emerging and developing economies, during 1990–2012. Data are taken from various sources, including the International Monetary Fund's (IMF) *Governments Financial Statistics*, the World Bank's *World Development Indicators*, Eurostat, and OECD databases, among others. Annexes 9.A1 and 9.A2 present the full sample, variable definitions, and sources.

Fiscal decentralisation is more extensive in advanced economies than in emerging economies and developing countries, but it has accelerated in the latter two groups in recent decades. Table 9.1 and Figure 9.1 provide descriptive statistics of the main variables used in this analysis. On average, about 30% of public expenditure is implemented by sub-national governments. This share is about 40% for advanced economies compared to about 25% for emerging economies and developing countries. On the revenue side, the share of sub-national governments is about 27%; 37% in advanced economies; and 23% in emerging economies and developing countries. The legislative system appears to be much more fractionalised than the government. The probability that two deputies come from two different parties is 65%, whereas it is only

29% for members of governments. A higher corruption index indicates a more corrupt system; corruption seems more pervasive in emerging economies and developing countries. The political system index is a binary variable, taking a value of one for parliamentary regimes and zero for presidential regimes; advanced economies appear more parliamentary based than emerging economies and developing economies. A higher democracy score indicates a higher degree of democracy. The “autonomy” indicator is a dummy variable taking the value of one when constitutionally autonomous regions exist in the country.

Table 9.1. **Descriptive statistics**

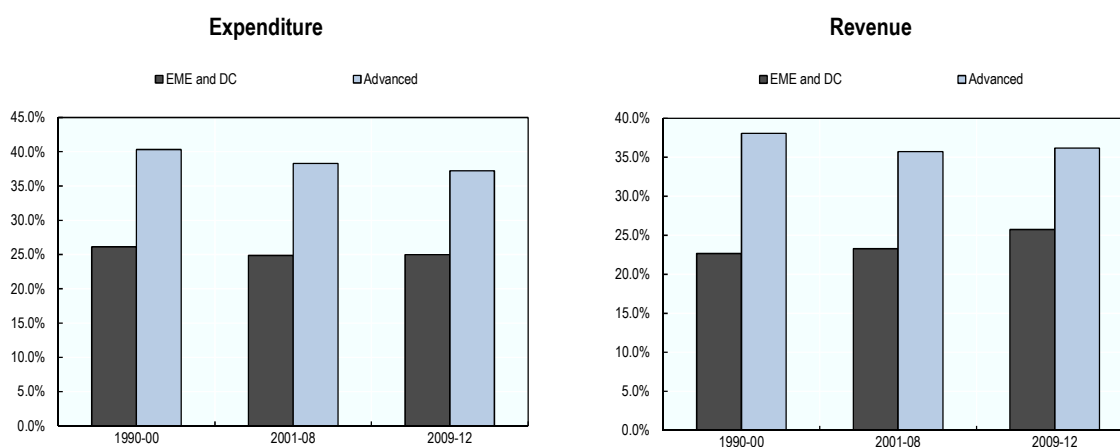
Variables	observations	Mean			Standard deviation	Min.	Max.
		All	Advanced	EME and DC			
FD expenditure (%)	1 086	29.6	39.0	25.4	21.3	0.0	98.4
FD revenue (%)	1 129	27.4	36.8	23.5	20.0	0.0	73.6
Real GDP per capita (in thousands)	1 467	22.7	34.7	17.6	15.7	1.3	97.4
Natural resources (% GDP)	1 467	4.5	1.9	5.7	8.1	0.0	64.0
Government fractionalisation	1 381	0.3	0.3	0.3	0.3	0.0	1.0
Fractionalisation	1 361	0.7	0.7	0.6	0.2	0.0	1.0
Population size (in millions)	1 472	48.6	43.3	50.9	138.7	0.1	1 236.7
Corruption	1 280	-2.7	-3.5	-2.3	1.3	-5.0	0.7
Parliamentary	1 433	0.6	0.9	0.4	0.5	0.0	1.0
Democracy	1 425	30.1	51.0	20.9	26.4	1.0	82.0
Autonomy	1 427	0.2	0.3	0.2	0.4	0.0	1.0

Note: EME = Emerging market economies; DC = Developing countries; FD = Fiscal decentralisation

Source: Authors' calculations.

Figure 9.1. **Share of sub-national government expenditure/revenue**

Percent of general government expenditure/revenue



Source: Authors' calculations.

### *Efficiency estimates*

The average efficiency of the countries in the sample is at about 85% of the production frontier. The predicted efficiencies from the stochastic frontier analysis are about 82.2% on average for health and 87.8% for education (Table 9.2). An efficiency score of  $x$  percent implies that the country delivers  $x$  percent of the possible objective

(*reducing infant mortality rate or increasing school enrolment rate*) as compared to a fully efficient country using similar input values (such as public expenditure). The benchmark efficiency estimates — columns (1) and (4) in Table 9.2 — are based on the approach proposed by Battese and Coelli (1988). To check the robustness of the findings, two other methodologies are applied. Efficiency estimates based on Jondrow et al. (1982) are presented in columns (2) and (5); and the estimates that take into account heterogeneity and heteroskedasticity are shown in columns (3) and (6). The estimates from those various approaches are highly correlated.

Table 9.2. Stochastic frontier estimates of public service efficiency

	Estimated efficiencies					
	Health			Education		
	Battese and Coelli (1988)	Jondrow et al. (1982)	Heterog	Battese and Coelli (1988)	Jondrow et al. (1982)	Heterog
Statistics	(1)	(2)	(3)	(4)	(5)	(6)
Mean of efficiencies	0.82	0.81	0.84	0.88	0.88	0.88
Standard deviation	0.09	0.10	0.11	0.10	0.10	0.13
Minimum	0.30	0.29	0.31	0.33	0.33	0.27
Maximum	0.94	0.94	0.98	0.98	0.98	0.99

*Note:* Columns 1 and 4 use the Battese and Coelli (1988) method to estimate the efficiency score, while columns 2 and 5 draw upon the alternative Jondrow et al. (1982) methodology. We allow for heterogeneity and heteroscedasticity while estimating the efficiency scores in columns 3 and 6.

*Source:* Authors' calculations.

### ***Direct channel and non-linear relationship***

Through a direct channel, expenditure decentralisation seems to improve the efficiency of public service delivery in advanced economies but has a negative impact on emerging economies and developing countries. Estimating equation (3), the first step of the two-stage least squares points to the appropriateness of the instrument variables. The latter is significantly correlated with the endogenous regressor in almost all cases (the associated p-values are  $< 0.05$ ). Besides, using the Kleibergen-Paap p values, the null hypothesis that “the equations are under-identified” can be rejected at the 5% level. The results of the second step are presented in Table 9.3. Pooling the advanced economies, emerging markets, and developing economies, it appears that fiscal decentralisation has no significant effect on the efficiency of public expenditure (Columns 1 and 6). Considering that the various countries exhibit dissimilar levels of decentralisation (as shown in the previous section), the sample is divided into two groups: 1) advanced economies; and 2) emerging markets and developing economies.<sup>8</sup> For advanced economies, fiscal decentralisation shows positive impacts on the efficiency of public expenditure on health (Column 2). To quantify this effect, one could say that a 5% increase in fiscal decentralisation would lead to 2.9 percentage point efficiency gain in public service delivery. The coefficient is statistically insignificant for education (Column 7). In contrast, for emerging markets and developing economies, the impacts are negative (Columns 3 and 8). These positive and negative effects of decentralisation, respectively for the first and second group of countries, are robust to the inclusion of time dummies, albeit with a slight reduction in the magnitude of the parameters (Columns 4, 5, 9 and 10). This seems to confirm that the results are not driven by common shocks hitting all countries at the same time, nor by a time-trend evolution of the efficiency scores.



Table 9.3. Fiscal decentralisation and public expenditure efficiency

Variables	Dependent variable: Estimated efficiencies									
	Health					Education				
	All	Advanced	EME and DC	Time dummies		All	Advanced	EME and DC	Time dummies	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
FD(t-1)	0.109 (0.925)	0.599*** (7.956)	-0.322*** (-2.919)	0.433*** (5.211)	-0.187*** (-2.737)	0.0373 (0.126)	-0.0453 (-0.339)	-0.872** (-2.545)	0.800*** (3.674)	-0.616** (-2.305)
Real GDP pc(t-1)	0.035*** (5.402)	0.008 (0.778)	0.023*** (2.730)	-0.061*** (-3.286)	-0.093*** (-6.865)	-0.020** (-2.200)	-0.077*** (-4.339)	-0.007 (-0.386)	0.044 (1.284)	-0.070** (-2.564)
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	875	269	606	269	606	690	213	477	213	477
Countries	55	14	41	14	41	53	14	39	14	39
Fisher ( <i>p-value</i> )	0.000	0.000	0.000	0.000	0.000	0.056	0.000	0.041	0.000	0.249
Hansen OID ( <i>p-value</i> )	0.000	0.008	0.000	0.000	0.007	0.000	0.000	0.004	0.042	0.000
KP-under	0.000	0.000	0.000	0.000	0.000	0.057	0.002	0.048	0.013	0.034
FD(t-1) instrumentation ( <i>p-value</i> )	0.000	0.000	0.000	0.000	0.000	0.052	0.000	0.029	0.019	0.029

Note: (\*), (\*\*) and (\*\*\*) denote statistical significance level of 10%, 5% and 1% respectively. Robust t-statistics are shown in parentheses. The Fisher statistic presents a test of joint significance of estimated coefficients. Hansen OID and Kleibergen-Paap (KP) test respectively the over-identification restriction and the hypothesis that equations are under-identified. FD instrumentation test, with a lower p-value, indicates that endogenous regressors (fiscal decentralisation) are significantly correlated with the instrumental variables (political and government fractionalisation, and natural resources).

Source: Authors' calculations.

A non-linearity analysis seems to indicate that a sufficient degree of expenditure decentralisation is required to bring about positive impacts. The non-linearity is investigated through equation (4), and the results are presented in Table 9.4. For the entire sample, the fiscal decentralisation variable and its squared term significantly affect the efficiency of public services (Columns 1 and 4). Interestingly, the coefficient of the former is negative whereas that of the latter is positive. This seems to suggest that the relationship between fiscal decentralisation and the efficiency of public service delivery is not linear, but U-shaped. A low level of fiscal decentralisation seems to be harmful; it needs to exceed about 35.7% for health and 35.4% for education to bring about improvements in the efficiency of public services.<sup>9</sup> At least, about one-third of public expenditure would need to be shifted to the local authorities to obtain favourable outcomes from fiscal decentralisation. This non-linear relationship might imply the importance of economies of scale in the production and delivery of public services. As many public services incur substantial initial fixed costs, if the scale of public services shifted to the local level is too small, the local authorities might have to reduce the provision of services to reduce the variable costs to cover the large initial fixed costs. Note, however, that the sufficient level of fiscal decentralisation likely differs across countries, depending on country-specific considerations.

Table 9.4. Fiscal decentralisation and public expenditure efficiency (non-linearity)

Variables	Dependent variable: Estimated efficiencies					
	Health			Education		
	All	FD < $fd^*$	FD $\geq fd^*$	All	FD < $fd^*$	FD $\geq fd^*$
	(1)	(2)	(3)	(4)	(5)	(6)
FD <sub>(t-1)</sub>	-2.247*** (-3.518)	-0.797*** (-3.487)	0.210** (2.415)	-1.307** (-1.963)	0.717 (0.980)	-0.061 (-0.395)
FD <sup>2</sup> <sub>(t-1)</sub>	3.149*** (3.622)			1.847** (2.259)		
Real GDP pc <sub>(t-1)</sub>	-0.003 (-0.226)	0.032*** (2.699)	-0.006 (-1.056)	-0.035** (-2.537)	0.049 (1.513)	-0.047*** (-4.222)
Number of observations	875	481	390	690	365	321
Countries	55	37	29	53	35	27
Fisher ( <i>p-value</i> )	0.000	0.000	0.049	0.036	0.311	0.000
Hansen OID ( <i>p-value</i> )	0.010	0.000	0.188	0.011	0.051	0.176
KP-under	0.001	0.004	0.000	0.077	0.019	0.000
FD <sub>(t-1)</sub> instrumentation ( <i>p-value</i> )	0.000	0.011	0.000	0.052	0.053	0.000
(FD <sub>(t-1)</sub> ) <sup>2</sup> instrumentation ( <i>p-value</i> )	0.000			0.006		

Note: (\*), (\*\*) and (\*\*\*) denote statistical significance level of 10%, 5% and 1% respectively. Robust t-statistics are shown in parentheses.

Source: Authors' calculations.

The U-shaped relationship is confirmed when the sample observations are split below and above the indicative threshold. For health, when the fiscal decentralisation ratio is below the estimated indicative threshold of 35.7%, a 1% increase in fiscal decentralisation ratio reduces the efficiency by about 0.8 percentage point (Column 2 of Table 9.4). In contrast, when the decentralisation ratio reaches or exceeds the indicative threshold, decentralisation improves the efficiency of public service delivery. A 1% increase in the decentralisation ratio increases the efficiency by 0.2 percentage point (Column 3 of Table 9.4). For education, the coefficients of the fiscal decentralisation are not statistically significant when the sample observations are divided.

The findings on the U-shape relationship are supported by the dissimilar impacts of fiscal decentralisation in advanced economies and in emerging markets and developing countries. As shown in Table 9.3, fiscal decentralisation positively affects the efficiency of public services in advanced economies and negatively affects efficiency in emerging markets and developing countries. Interestingly, the level of expenditure decentralisation is on average about 40% in advanced economies, which is above the indicative threshold of about 35%. In contrast, the average level of expenditure decentralisation is only about 25% in emerging markets and developing countries, far below the indicative threshold of 35%.

### ***Political and institutional conditions***

To support public expenditure efficiency, fiscal decentralisation requires an adequate political and institutional environment. Table 9.5 presents the results of the estimation of model (5). It appears that the interactions of the decentralisation and political and institutional variables are significantly associated with the efficiency of public service delivery. Corruption negatively affects the impacts of fiscal decentralisation on the efficiency of public services.

Table 9.5. Fiscal decentralisation and political/institutional environments

Variables	Dependent variable: Estimated efficiencies							
	Health				Education			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FD(t-1)	-0.523 (-1.540)	-0.809 (-1.137)	-1.307*** (-2.703)	-0.727*** (-3.159)	-1.079* (-1.780)	-0.171 (-0.217)	-0.764* (-1.889)	-0.696 (-1.275)
FD × Corruption(t-1)	-0.488*** (-3.291)				-0.608*** (-2.738)			
FD × Parliamentary(t-1)		4.373** (2.206)				1.160 (0.836)		
FD × Regime(t-1)			0.033*** (2.967)				0.0125 (1.477)	
FD × Autonomy(t-1)				2.057*** (5.457)				1.952*** (2.931)
Real GDP pc(t-1)	-0.040 (-1.535)	-0.122 (-1.598)	-0.117*** (-2.803)	0.013 (1.154)	-0.130** (-2.371)	-0.044 (-0.920)	-0.0717** (-2.257)	-0.020 (-1.120)
Number of observations	810	875	874	875	639	690	689	690
Countries	51	55	55	55	49	53	53	53
Fisher ( <i>p-value</i> )	0.006	0.097	0.001	0.000	0.029	0.700	0.241	0.061
Hansen OID ( <i>p-value</i> )	0.408	0.868	0.422	0.139	0.900	0.012	0.004	0.141
KP-under	0.040	0.175	0.013	0.001	0.076	0.134	0.067	0.092
FD(t-1) instrumentation ( <i>p-value</i> )	0.000	0.000	0.000	0.000	0.038	0.229	0.014	0.047
FD × I (t-1) instrument ( <i>p-value</i> )	0.058	0.226	0.000	0.000	0.161	0.115	0.000	0.000

Note: (\*), (\*\*) and (\*\*\*) denote statistical significance level of 10%, 5% and 1% respectively. Robust t-statistics are shown in parentheses.

Source: Authors' calculations.

When taking into account the corruption variable, a 5% increase in the fiscal decentralisation ratio is associated on average with a 2.5% decrease in the efficiency of public expenditure relative to the mean efficiency.<sup>10</sup> This might be due to the stronger power of interests groups at the local level. Local authorities may also have more discretion and fewer controls, giving room for leakage of public resources, as argued by Gauthier and Wane (2007).<sup>11</sup> In contrast, the positive and statistically significant sign of the interaction between fiscal decentralisation and the political system variables ( $FD \times Parliamentary_{(t-1)}$ ) indicates that the combination of a parliamentary system and fiscal decentralisation may boost public expenditure efficiency. Parliamentary regimes, as opposed to presidential regimes, have stronger institutional frameworks to limit the executive's discretionary powers. Also, implementing decentralisation in a more democratic environment can improve the efficiency of public service delivery. Furthermore, the existence of constitutionally autonomous regions also has positive and statistically significant impacts. Autonomous regions may be free of any vertical constraint that could come from the top level and influence the way public expenditure is implemented locally. The non-significance of real GDP per capita used as a control variable in most cases might be because the methodology already controlled for this variable in the first step when estimating efficiency.

The role of the political and institutional environment is also confirmed when separately analysing advanced economies, emerging markets and developing countries. Table 9.6 displays the results of the estimations of equation (5) using two subsamples: 1) advanced economies; and 2) emerging markets and developing economies. First, looking at the coefficients of the fiscal decentralisation variable itself, the results support the above findings that decentralisation broadly improves the efficiency of public service delivery in advanced economies but worsens the efficiency in emerging markets and developing countries. Second, advanced economies and emerging

economies and developing countries seem to broadly confirm that an adequate political and institutional environment improves the impact of fiscal decentralisation on the efficiency of public service delivery. For both sub-groups and for both health and education, corruption has negative impacts, and the autonomy of regions has positive effects on the relationship between decentralisation and public service efficiency. This is the expected result because weak governance at the local level might lead to misuse of decentralised resources and expenditure and worsen the efficiency of public service delivery. Sufficient autonomy of local authorities vis-à-vis the central government is needed to allow the preference matching and allocation efficiency to operate fully.

Table 9.6. Fiscal decentralisation and political/institutional environments (sub-groups)

Variables	Dependent variable: Estimated efficiencies							
	Health				Education			
	Advanced	EME and DC			Advanced	EME and DC		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FD(t-1)	0.106	0.874*	-0.734***	-0.489***	0.17	-1.255***	-1.455***	-0.975***
FD × Corruption(t-1)	-0.264	-1.692	(-4.688)	(-3.894)	-0.392	(-2.614)	(-4.384)	(-2.864)
		(-1.254)	(-4.618)			(-0.448)	(-3.294)	
FD × Autonomy(t-1)		-0.264		1.344***		1.754**		1.835***
		(-0.509)		-3.908		-2.54		-2.942
Real GDP pc(t-1)	-0.108	0.013	0.002	0.017*	-0.154	-0.064**	-0.056*	-0.010
	(-1.146)	-0.802	-0.147	-1.698	(-1.115)	(-2.077)	(-1.694)	(-0.560)
Number of observations	266	269	544	606	211	213	428	477
Countries	14	14	37	41	14	14	35	39
Fisher ( <i>p-value</i> )	0.003	0.000	0.000	0.000	0.002	0.006	0.000	0.005
Hansen OID ( <i>p-value</i> )	0.472	0.036	0.400	0.002	0.228	0.404	0.922	0.101
KP-under	0.521	0.036	0.004	0.000	0.642	0.049	0.064	0.007
FD(t-1) instrumentation ( <i>p-value</i> )	0.000	0.000	0.000	0.000	0.000	0.000	0.027	0.018
FD × I (t-1) instrument ( <i>p-value</i> )	0.171	0.000	0.002	0.000	0.538	0.002	0.050	0.000

Note: (\*), (\*\*) and (\*\*\*) denote statistical significance level of 10%, 5% and 1% respectively. Robust t-statistics are shown in parentheses.

Source: Authors' calculations.

### Robustness

A range of sensitivity analyses is performed to assess the robustness of the findings. Outliers are excluded from the baseline estimates. Then, the baseline model is re-estimated using a dependent variable — efficiency of public service delivery — that is derived from alternative methodologies. Finally, the political and institutional variables are replaced with alternative indicators.

The results are robust to the exclusion of countries with extreme ratios of fiscal decentralisation. The analysis is conducted using a narrowed sample. Countries entirely or almost entirely centralised, i.e. with decentralisation ratios close to zero, are excluded. Also, countries that have extremely high degrees of decentralisation, i.e. decentralisation ratios exceeding 90%, are dropped. A comparison of the results displayed in Table 9.7 with those in Table 9.3 shows that the results are not driven by outliers. Regarding health, the impact of decentralisation remains positive for advanced economies, and negative for emerging markets and developing economies, corroborating the baseline findings. The thrust of the results also remains unchanged for education despite a slight difference in the magnitude of the coefficients.

Table 9.7. Fiscal decentralisation and public expenditure efficiency: Excluding outliers

Variables	Dependent variable: Estimated efficiencies							
	Health				Education			
	Excluding outliers		0%<fd<90%		Excluding outliers		0%<fd<90%	
	Advanced	EME and DC	Advanced	EME and DC	Advanced	EME and DC	Advanced	EME and DC
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
FD <sub>(t-1)</sub>	0.599*** (-7.956)	0.338*** (-3.023)	0.599*** (-7.956)	-0.388*** (-3.315)	-0.0453 (-0.339)	-0.884** (-2.560)	-0.0453 (-0.339)	-0.931** (-2.410)
Real GDP P <sub>c</sub> (t-1)	0.00763 (0.778)	0.0224*** (2.627)	0.00763 (0.778)	0.0134 (1.426)	-0.0767*** (-4.339)	-0.00773 (-0.437)	-0.0767*** (-4.339)	0.00673 (-0.341)
Number of observations	269	593	269	531	213	467	213	426
Countries	14	40	14	37	14	38	14	35
Fisher ( <i>p-value</i> )	0.000	0.000	0.000	0.000	0.000	0.039	0.000	0.056
Hansen OID ( <i>p-value</i> )	0.008	0.000	0.008	0.000	0.000	0.005	0.000	0.037
KP-under	0.000	0.000	0.000	0.000	0.002	0.056	0.002	0.061
FD <sub>(t-1)</sub> instrumentation ( <i>p-value</i> )	0.000	0.000	0.000	0.000	0.000	0.033	0.000	0.035

Note: (\*), (\*\*) and (\*\*\*) denote statistical significance level of 10%, 5% and 1% respectively. Robust t-statistics are shown in parentheses.

Source: Authors' calculations.

The findings are robust to alternative methodologies of efficiency estimates. Two methodologies are employed to compute alternative estimates of the efficiency of public service delivery: a variant of stochastic frontier analysis based on Jondrow et al. (1982) and a methodology that takes into account the sample heterogeneity and heteroskedasticity. The results shown in Table 9.8 focus on the role of political and institutional variables, and confirm the findings from the baseline analysis.<sup>12</sup> Under both alternative efficiency estimates, and for both health and education, corruption hinders — with high statistical significance — the impacts of fiscal decentralisation on public service efficiency. The favourable role of parliamentary regimes and more democratic institutions in combination with fiscal decentralisation is also confirmed, despite weak statistical significance in some cases. The positive impact of the autonomy of regions on the relationship between fiscal decentralisation and the efficiency of public service delivery is ascertained with high statistical significance in all cases (alternative efficiency estimates and health and education).

Table 9.8. Fiscal decentralisation and public expenditure efficiency: Alternative efficiency estimates

Variables	Dependent variables: Estimated efficiencies															
	Health								Health							
	The Jondrow et al. (1982) approach				Heterogeneous efficiencies				The Jondrow et al. (1982) approach				Heterogeneous efficiencies			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
FD(t-1)	-0.560 (-1.556)	-0.866 (-1.142)	-1.392*** (-2.711)	-0.781*** (-3.181)	-0.488*** (-2.962)	-0.389 (-1.424)	-0.552*** (-2.770)	-0.546*** (-2.665)	-1.087* (-1.780)	-0.174 (-0.220)	-0.774* (-1.897)	-0.702 (-1.277)	-1.726** (-2.319)	-0.694 (-0.632)	-1.254** (-2.074)	-1.327* (-1.798)
FD × Corruption(t-1)	-0.518*** (-3.284)				-0.110** (-2.543)				-0.612*** (-2.738)				-0.778*** (-2.873)			
FD × Parliamentary(t-1)		4.663** (2.208)				0.979 (1.508)				1.161 (0.833)				1.777 (0.872)		
FD × Regime(t-1)			0.0355*** (2.970)				0.009** (2.970)				0.0126 (1.477)				0.0184 (1.451)	
FD × Autonomy(t-1)				2.199*** (5.504)				1.069*** (2.732)				1.965*** (2.939)				3.121*** (3.243)
Real GDP pc(t-1)	-0.0415 (-1.516)	-0.13 (-1.596)	-0.125*** (-2.825)	0.0144 (1.182)	-0.099*** (-11.046)	-0.112*** (-4.312)	-0.132*** (-5.617)	-0.084*** (-7.668)	-0.131** (-2.377)	-0.044 (-0.922)	-0.072** (-2.256)	-0.020 (-1.136)	-0.089 (-1.306)	0.023 (0.322)	-0.036 (-0.732)	0.053** (2.185)
Number of observations	810	875	874	875	719	778	777	778	639	690	689	690	639	690	689	690
Countries	51	55	55	55	51	55	55	55	49	53	53	53	49	53	53	53
Fisher ( <i>p-value</i> )	0.006	0.095	0.001	0.000	0.000	0.000	0.000	0.000	0.029	0.695	0.239	0.060	0.001	0.011	0.001	0.000
Hansen OID ( <i>p-value</i> )	0.398	0.871	0.437	0.136	0.009	0.154	0.085	0.246	0.901	0.012	0.004	0.141	0.722	0.028	0.033	0.425
KP-under	0.040	0.175	0.013	0.001	0.000	0.013	0.000	0.000	0.076	0.134	0.067	0.092	0.076	0.134	0.067	0.092
FD(t-1) instrumentation ( <i>p-value</i> )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.038	0.229	0.014	0.047	0.038	0.229	0.014	0.047
FD × I (t-1) instrument ( <i>p-value</i> )	0.058	0.226	0.000	0.000	0.000	0.039	0.000	0.000	0.161	0.116	0.000	0.000	0.161	0.116	0.000	0.000

Note: (\*), (\*\*) and (\*\*\*) denote statistical significance level of 10%, 5% and 1% respectively. Robust t-statistics are shown in parentheses.

Source: Authors' calculations.

The thrusts of the results remain unchanged under an approach that absorbs short-term fluctuations. Fiscal decentralisation changes slowly over time and plausibly affects the efficiency of public services with time lags. Thus, it is useful to check the robustness of the results using averages of the variables over a few-year period. Accordingly, all variables are averaged over a four-year period. In the efficiency of public service delivery and the fiscal decentralisation variables, the latter is introduced with a one-period lag. The results, displayed in Table 9.9, support the baseline findings. Decentralisation improves the efficiency of public expenditure in advanced economies (Columns 2 and 8). The impact seems negative for emerging markets and developing countries, but it is not statistically significant. In terms of interactive variables, the negative impact of corruption is confirmed (Columns 4 and 10). The favourable contribution of parliamentary regimes is also ascertained (Columns 5 and 11). As for the autonomy of regions, the impact is positive but not statistically significant.

Furthermore, the results are broadly robust to alternative political and institutional variables. The following alternative variables are employed: bureaucracy, political stability and checks and balances.<sup>13</sup> All those alternative variables lead to broadly similar inferences as under the baseline analysis; the signs of the coefficients are mostly as expected, although statistical significance is low in many cases (Table 9.10).

Table 9.9. Fiscal decentralisation and public expenditure efficiency: Absorbing short-term fluctuations

Variables	Dependent variables: Four-year average of estimated efficiencies											
	Health						Education					
	All	Advanced EME and DC	Political interactions			All	Advanced EME and DC	Political interactions				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
FD(t-1)	-0.092 (-0.362)	0.294*** (3.091)	-0.759 (-1.514)	-0.350 (-1.198)	-0.313 (-0.512)	-1.637 (-1.506)	-0.001 (-0.001)	0.482*** (3.636)	-0.460 (-0.642)	-0.550 (-1.179)	-3.718 (-1.139)	0.180 (0.136)
FD × Corruption(t-1)				-0.136 (-1.539)						-0.343*** (-2.654)		
FD × Parliamentary(t-1)					1.977* (1.689)						4.912 (1.148)	
FD × Autonomy(t-1)						1.455 (1.607)						0.0738 (0.068)
Real GDP pc(t-1)	0.033*** (3.484)	0.013 (0.698)	0.028 (1.400)	0.003 (0.109)	-0.049 (-0.868)	0.020 (0.832)	-0.012 (-0.414)	-0.124*** (-3.991)	0.007 (0.217)	-0.047 (-1.187)	-0.155 (-0.969)	-0.011 (-0.268)
Number of observations	221	63	158	203	221	221	199	61	138	184	199	199
Countries	55	14	41	51	55	55	52	14	38	48	52	52
Fisher ( <i>p-value</i> )	0.002	0.002	0.016	0.011	0.231	0.218	0.909	0.001	0.815	0.078	0.83	0.996
Hansen OID ( <i>p-value</i> )	0.012	0.219	0.318	0.422	0.674	0.691	0.065	0.059	0.045	0.267	0.899	0.087
KP-under	0.522	0.107	0.698	0.361	0.569	0.717	0.507	0.134	0.667	0.255	0.646	0.704

Note: (\*), (\*\*) and (\*\*\*) denote statistical significance level of 10%, 5% and 1% respectively. Robust t-statistics are shown in parentheses.

Source: Authors' calculations.

Table 9.10. Fiscal decentralisation and public expenditure efficiency: Alternative political and institutional variables

Variables	Dependent variable: Estimated efficiencies											
	Health						Education					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
FD(t-1)	-0.486*	0.953***	-0.597***	-1.408	-0.480***	-0.022	-0.007	0.786**	-0.409	-0.811	0.565	-0.014
	(-1.838)	(3.609)	(-3.131)	(-1.513)	(-2.741)	(-0.061)	(-0.003)	(2.143)	(-1.382)	(-1.310)	(1.519)	(-0.008)
FD × Assembly elec.(t-1)	3.672***						5.499					
	(3.093)						(0.525)					
FD × Presidential(t-1)		-1.737***						-1.410***				
		(-4.999)						(-2.583)				
FD × All house(t-1)			0.541***						0.13			
			(3.846)						(1.452)			
FD × Bureaucracy(t-1)				0.379						0.16		
				(0.953)						(0.644)		
FD × Political stab.(t-1)					0.102						0.459	
					(0.781)						(1.394)	
FD × Checks balances(t-						0.141						-1.032
						(0.924)						(-1.216)
Real GDP pc(t-1)	0.054***	0.002	0.004	-0.008	0.006	0.009	0.023	-0.034**	-0.027***	-0.032	-0.022	0.080
	(5.817)	(0.169)	(0.394)	(-0.282)	(0.412)	(0.540)	(0.786)	(-2.319)	(-2.715)	(-1.541)	(-1.065)	(0.910)
<b>Additional controls</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
Number of observations	875	875	844	807	602	868	690	690	664	639	482	684
Countries	55	55	54	51	55	55	53	53	51	49	51	53
Fisher ( <i>p-value</i> )	0.000	0.000	0.000	0.000	0.000	0.596	0.533	0.016	0.003	0.074	0.039	0.812
Hansen OID ( <i>p-value</i> )	0.009	0.631	0.001	0.003	0.000	0.012	0.598	0.011	0.000	0.002	0.094	0.483
KP-under	0.013	0.000	0.000	0.135	0.024	0.426	0.872	0.109	0.062	0.262	0.007	0.858
FD(t-1) instrumentation	0.000	0.000	0.000	0.000	0.004	0.000	0.302	0.024	0.034	0.057	0.045	0.075
FD × I (t-1) instrument	0.042	0.000	0.000	0.002	0.141	0.622	0.263	0.228	0.000	0.385	0.059	0.938

Note: (\*), (\*\*) and (\*\*\*) denote statistical significance level of 10%, 5% and 1% respectively. Robust t-statistics are shown in parentheses.

Source: Authors' calculations.

### Revenue decentralisation

Revenue decentralisation can contribute to public service efficiency. Revenue decentralisation shows positive and statistically significant impacts on public service delivery for advanced economies and emerging economies and developing countries (Table 9.11). The findings are robust to alternative estimates of the efficiency variable, based on Jondrow et al. (1982) (Table 9.12) or adjusting for heterogeneity (Table 9.12). The robustness is further ascertained by excluding outliers or by restricting the sample to only the countries that have revenue decentralisation between 0% and 90% (Table 9.13). For health and education, and for advanced economies and emerging economies and developing countries, revenue decentralisation positively affects the efficiency of public service delivery. These findings might imply the need to accompany expenditure decentralisation with sufficient revenue decentralisation to ensure improved performance.<sup>14</sup>



Table 9.11. Revenue decentralisation: Baseline and country-specific estimates

Variables	Dependent variable: estimated efficiencies					
	Health			Education		
	All	Advanced	EME and DC	All	Advanced	EME and DC
	(1)	(2)	(3)	(4)	(5)	(6)
FD revenue(t-1)	0.57*** (4.334)	0.561*** (6.168)	0.0487 (0.416)	1.275** (2.524)	0.666*** (4.297)	0.673* (1.771)
Real GDP pc(t-1)	0.0485*** (5.778)	-0.0424** (-1.963)	-0.0551*** (-3.061)	0.0381 (1.640)	0.0271 (0.874)	-0.0104 (-0.242)
<b>Time dummies</b>	<b>No</b>	<b>Yes</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>	<b>Yes</b>
Number of observations	904	269	635	714	213	501
Countries	55	14	41	53	14	39
Fisher-p ( <i>p-value</i> )	0.000	0.000	0.000	0.042	0.000	0.174
Hansen OID ( <i>p-value</i> )	0.000	0.000	0.008	0.033	0.003	0.001
KP-under	0.000	0.001	0.000	0.011	0.020	0.001

Note: (\*), (\*\*) and (\*\*\*) denote statistical significance level of 10%, 5% and 1% respectively. Robust t-statistics are shown in parentheses.

Source: Authors' calculations.

Table 9.12. Revenue decentralisation: Alternative efficiency estimates

Variables	Dependent variable: estimated efficiencies					
	Health			Education		
	All	Jondrow et al. (1982)	Heterog.	All	Jondrow et al. (1982)	Heterog.
	(1)	(2)	(3)	(4)	(5)	(6)
FD revenue(t-1)	0.57*** (4.334)	0.616*** (4.429)	-0.098 (-0.997)	1.275** (2.524)	1.286** (2.532)	1.653*** (2.799)
Real GDP pc(t-1)	0.048*** (5.778)	0.053*** (5.842)	-0.078*** (-12.645)	0.038 (1.640)	0.038 (1.627)	0.125*** (4.503)
<b>Time dummies</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>
Number of observations	904	904	805	714	714	714
Countries	55	55	55	53	53	53
Fisher-p ( <i>p-value</i> )	0.000	0.000	0.000	0.042	0.041	0.000
Hansen OID ( <i>p-value</i> )	0.000	0.000	0.001	0.033	0.034	0.029
KP-under	0.000	0.000	0.000	0.011	0.011	0.011

Note: (\*), (\*\*) and (\*\*\*) denote statistical significance level of 10%, 5% and 1% respectively. Robust t-statistics are shown in parentheses.

Source: Authors' calculations.

Table 9.13. Revenue decentralisation: Excluding outliers

Variables	Dependent variable: Estimated efficiencies							
	Health				Education			
	Excluding outliers		0%<fd <90%		Excluding outliers		0%<fd <90%	
	Advanced	EME and DC	Advanced	EME and DC	Advanced	EME and DC	Advanced	EME and DC
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
FD(t-1)	0.670*** (8.023)	0.463*** (3.308)	0.670*** (8.023)	0.366** (2.455)	0.094 (0.680)	1.051* (1.892)	0.094 (0.680)	1.036** (2.324)
Real GDP pc(t-1)	0.041*** (3.057)	0.046*** (4.983)	0.041*** (3.057)	0.036*** (3.35)	-0.082*** (-5.654)	0.054** (-2.028)	-0.082*** (-5.654)	0.039 (-1.595)
Number of observations	269	622	269	528	213	491	213	423
Countries	14	41	14	37	14	39	14	35
Fisher ( <i>p-value</i> )	0.000	0.000	0.000	0.004	0.000	0.081	0.000	0.063
Hansen OID ( <i>p-value</i> )	0.040	0.000	0.040	0.000	0.000	0.003	0.000	0.007
KP-under	0.000	0.000	0.000	0.000	0.004	0.012	0.004	0.003
FD(t-1) instrumentation ( <i>p-value</i> )	10.445	11.122	10.445	8.222	6.387	3.573	6.387	4.399

Note: (\*), (\*\*) and (\*\*\*) denote statistical significance level of 10%, 5% and 1% respectively. Robust t-statistics are shown in parentheses.

Source: Authors' calculations.

The importance of a favourable institutional environment is also confirmed by the analysis of revenue decentralisation (Table 9.14). Corruption decreases the positive impact of revenue decentralisation on the efficiency of public service delivery. Despite the negative influence of the regime variable, which accounts for the strength of the democracy, the overall effect of revenue decentralisation remains positive. The checks and balances variable, which is incrementally coded with the existence of effective control over the executive and legislature in a presidential system, enhances the contribution of revenue decentralisation.

Table 9.14. Revenue decentralisation: Political/institutional interactions

Variables	Dependent variable: estimated efficiencies							
	Health				Education			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FD Revenue(t-1)	0.116 (0.598)	0.944*** (3.050)	1.443** (2.379)	-0.26 (-0.513)	-0.613 (-0.896)	3.436** (2.266)	2.052** (2.019)	0.593 (0.707)
FDR × Corruption(t-1)	-0.170*** (-3.787)				-0.458*** (-3.853)			
FDR × Regime(t-1)		-0.018** (-2.456)				-0.040* (-1.951)		
FDR × Parliamentary(t-1)			-2.297 (-1.406)				-0.997 (-0.836)	
FDR × Checks(t-1)				0.264** (2.110)				0.12 (0.739)
Real GDP pc(t-1)	0.039*** (3.690)	0.053* (1.729)	0.108** (2.488)	0.026 (1.287)	0.005 (0.212)	0.244** (2.002)	0.073 (1.547)	0.016 (0.481)
<b>Additional controls</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
Number of observations	836	903	904	895	660	713	714	706
Countries	51	55	55	55	49	53	53	53
Fisher ( <i>p-value</i> )	0.000	0.000	0.000	0.022	0.000	0.221	0.279	0.209
Hansen OID ( <i>p-value</i> )	0.007	0.022	0.066	0.677	0.975	0.674	0.150	0.042
KP-under	0.000	0.000	0.532	0.059	0.085	0.086	0.114	0.216

Note: (\*), (\*\*) and (\*\*\*) denote statistical significance level of 10%, 5% and 1% respectively. Robust t-statistics are shown in parentheses.

Source: Authors' calculations.

## Conclusion

Fiscal decentralisation can serve as a policy tool to improve the efficiency of public service delivery, but only under some conditions. Expenditure decentralisation seems to have improved service delivery in advanced economies, but its impact in emerging economies and developing countries seems somewhat mixed. The empirical findings in this chapter indicate that expenditure decentralisation needs to exceed a threshold of about 35% to improve service delivery. However, revenue decentralisation seems to have positive impacts across all country groups. This seems to indicate the need to accompany the decentralisation of responsibilities with sufficient decentralisation of resources.

Findings under expenditure decentralisation and under revenue decentralisation point to the need for a favourable institutional and political environment. Effective autonomy of local governments is required to allow preference matching and the allocative efficiency hypothesis to operate. Strong accountability of local authorities vis-à-vis the local population is necessary to allow the productive efficiency hypothesis to operate. Corruption needs to be tackled to prevent misuse of public resources. And capacity needs to be strengthened at the local level. Absent these conditions, fiscal decentralisation can worsen public service delivery.

An extension of this chapter could include an analysis of an alternative indicator of policy outcome and an investigation of the impact of decentralisation on macroeconomic performance. Alternative outcome indicators, such as life expectancy at birth and adjusted primary education net enrolment rate, are presented in the chapter to confirm the robustness of the results (Annex Table 9.A3). However, it would be insightful to conduct the analysis using life expectancy, school drop-out rates, or (Programme for International Student Assessment) PISA scores as these variables might exhibit a wider variance across countries and over time. Moreover, it would be essential to analyse the impact of decentralisation on key macroeconomic performance metrics, such as fiscal outcomes and GDP growth as improvements in public expenditure efficiency can be a channel through which decentralisation ultimately influences those variables.

## Notes

1. Previous studies focused solely on a specific country or a specific group of countries.
2. Alternatively, the efficiency analysis can also aim at reducing inputs while keeping the outcome unchanged.
3. A stream of the existing literature assumes time-invariant efficiency. However, the assumption of invariant efficiency might be questionable, especially in the presence of long panel data. We relax the assumption of time-invariant efficiency and allow for time-varying individual-specific efficiencies (Cornwell, Schmidt and Sickles, 1990).

4. Local governments can include states, regions, districts, municipalities, and other level(s) of government, depending on the institutional arrangement in the country.
5. Owing to difficulties in obtaining data from local and regional governments, our fiscal decentralisation index is obtained as the residual after deducting the ratio of central government share of expenditure over total general government expenditure. This approach can have some caveats, but it allows for large country and period coverages.
6. The vertical fiscal imbalance, i.e. the share of local government expenditure financed with its own revenue, can also provide important insights; however, this indicator is not available for the full sample in this study.
7. To avoid perfect collinearity, we exclude the variable average year of schooling while estimating the effect of public education expenditure on the secondary school enrolment rate. GDP per capita is used as a control variable when estimating the effect of fiscal decentralisation on public expenditure efficiency.
8. The country grouping follows the classification in the World Economic Outlook (2014). It would be insightful to divide the second group in emerging market economies (EMEs) and low-income countries (LICs); however, the variables in this analysis are available only for a limited number of LICs, impeding a thorough empirical analysis for this group separately.
9. Based on the estimated parameters in Table 9.4, the decentralisation indicative threshold for the health sector is computed as:

$$\frac{\partial \hat{\eta}_i}{\partial fd_{i-1}} = \delta_1 + 2 \times \delta_2 fd \Rightarrow fd^* = -\frac{\delta_1}{2\delta_2} \text{ or } fd^* = \left(-\frac{(-2.247)}{(2 \times 3.149)}\right) \times 100 = 35.7$$

The threshold for the education sector was derived similarly.

10. The marginal effect of corruption is obtained as in Ebeke (2012) as follows:  $(-0.488 \times 0.05) \times 100 = -2.4$ .
11. Treisman (1999, 2000) argues that federal states may be perceived as more corrupt, because of their larger size compared to unitary states.
12. The pattern of non-linearity is also broadly confirmed under the alternative efficiency estimates, but with lower statistical significance.
13. The checks and balances variable measures the existence of effective control over the executive and legislative branches in a presidential system. In parliamentary systems, checks and balances measure whether there is a one, two, or three or more party coalition controlling the government.
14. This analysis could be complemented with a direct investigation of the impact of the vertical fiscal imbalance; however, the latter variable is not available for most countries in the sample.

## *References*

- Ahmad, E., G. Brosio and V. Tanzi (2008), “Local service provision in selected OECD countries: Do decentralized operations work better?”, *IMF Working Paper* 08/67.
- Arze del Granado, F.A., J. Martinez-Vazquez and R. McNab (2005), “Fiscal decentralization and the functional composition of public expenditures”, *International Center for Public Policy Working Paper Series*, <https://ideas.repec.org/s/ays/ispwps.html>.
- Battese, G.E. and T.J. Coelli (1988), “Prediction of firm-level technical efficiencies: With a generalized frontier production function and panel data”, *Journal of Econometrics*, Vol. 38, pp. 387-399.
- Bénassy-Quéré, A., N. Goyalraja and A. Trannoy (2007), “Tax and public input competition”, *Economic Policy, CEPR & CES & MSH*, 22(4), pp. 385-430, <http://ideas.repec.org/s/bla/ecpoli.html>.
- Bordignon, M., F. Cerniglia and F. Revelli (2004), “Yardstick competition in intergovernmental relationships: Theory and empirical predictions”, *Economics Letters*, Vol. 83, pp. 325–333.
- Cantarero, P.D. and M.P. Sanchez (2006), “Decentralization and health care outcomes: An empirical analysis within the European Union”, Working Paper, University of Cantabria, Spain.
- Cornwell, C., P. Schmidt and R. Sickles (1990), “Production frontiers with cross sectional and time series variation in efficiency levels”, *Journal of Econometrics*, Vol. 46, pp. 185- 200.
- Davoodi, H. and H. F. Zou (1998), “Fiscal decentralization and economic growth: A cross-country study”, *Journal of Urban Economics*, 43(2), pp. 244-257.
- Dziobek, C., C. Gutierrez-Mangas and P. Kufa (2011), “Measuring fiscal decentralization – Exploring the IMF’s databases”, *IMF Working Paper* 11/126.
- Ebeke, C. H. (2012), “The power of remittances on the international prevalence of child labor”, *Structural Change and Economic Dynamics*, 23(4), pp. 452–462.
- Escolano, J. et al. (2012), “Fiscal performance, institutional design and decentralization in European Union countries”, *IMF Working Papers* 12/45.
- Ezcurra, R. and A. Rodríguez-Pose (2010), “Does decentralization matter for regional disparities? A cross-country analysis”, *Journal of Economic Geography*, Oxford University Press, 10(5), pp. 619-644, <http://ideas.repec.org/s/oup/jecgeo.html>.
- Fredriksen, K. (2013), “Decentralisation and economic growth - Part 3: Decentralisation, infrastructure investment and educational performance”, *OECD Working Papers on Fiscal Federalism*, No. 16, OECD Publishing, Paris, <http://dx.doi.org/10.1787/5k4559gg7wlv-en>.

- Gauthier, B. and W. Wane (2007), “Leakage of public resources in the health sector: An empirical investigation of Chad”, *Policy Research Working Paper Series*, No. 4351.
- Gonzalez-Alegre, J. (2010), “Decentralization and the composition of public expenditure in Spain”, *Regional Studies*, 44(8), pp. 1067-1083, <http://ideas.repec.org/s/taf/regstd.html>.
- Grigoli, F. and J. Kapsoli (2013) “Waste not, want not: The efficiency of health expenditure in emerging and developing economies”, *IMF Working Papers* 13/187, <http://ideas.repec.org/p/imf/imfwpa/13-187.html>.
- Grisorio, M.J. and F. Prota (2011), “The impact of fiscal decentralization on the composition of public expenditure: panel data evidence from Italy”, *Societa italiana degli economisti*, Vol. 52.
- Gupta, S. and M. Verhoeven (2001), “The efficiency of government expenditure: Experiences from Africa”, *Journal of Policy Modelling*, Vol. 23, pp. 433–467.
- Gupta, S. et al. (2007), “Fiscal management of scale-up aid”, *IMF Working Paper*, No. 07/222.
- Hayek, V. F. (1945), “The use of knowledge in society”, *American Economic Review*, 35(4), pp. 519-530.
- Herrera, S. and G. Pang (2005), “Efficiency of public spending in developing countries: An efficiency frontier approach”, *World Bank Policy Research Working Paper*, No. 3645.
- Hindriks, J. and B. Lockwood (2005), “Decentralization and electoral accountability: Incentives, separation and voter welfare”, *CEPR Discussion Paper*, No. 5125.
- Jayasuriya, R. and Q. Wodon (2003), “Efficiency in reaching the Millennium Development Goals”, *World Bank Working Paper*, No. 9.
- Jiménez-Rubio, D. (2011), “The impact of fiscal decentralization on infant mortality rates: Evidence from OECD countries”, *Social Science and Medicine*, 73(9), pp. 1401-1407.
- Jondrow, J. et al. (1982), “On the estimation of technical inefficiency in the stochastic frontier production function model”, *Journal of Econometrics*, Vol. 19, pp. 233-238.
- Kappeler, A. and T. Valila (2008), “Fiscal federalism and the composition of public investment in Europe”, *European Journal of Political Economy*, 24(3), pp. 562-570.
- Keen, M. and M. Marchand (1997), “Fiscal competition and the pattern of public spending”, *Journal of Public Economics*, Elsevier, 66(1), pp. 33-53, <http://ideas.repec.org/s/eee/pubeco.html>.
- Musgrave, R. (1969), “Theories of fiscal federalism”, *Public Finance*, 24(4), pp. 521–32.
- Oates, W. E. (1972), *Fiscal Federalism*, Harcourt Brace Jovanovich, New York.
- Persson, T. and G. Tabellini (2000), “Political economics: Explaining economic policy”, *MIT Press*, Cambridge, MA.

- Phillips, K. and G.M. Woller (1998), “Fiscal decentralization and LDC economic growth: An empirical investigation”, *Journal of Development Studies*, 34(4), pp. 139-148, <http://ideas.repec.org/s/taf/jdevst.html>.
- Seabright, P. (1996), “Accountability and decentralization in government: An incomplete contracts model”, *European Economic Review*, Vol. 40, pp. 61-89.
- Ter-Minassian, T. (1997), “Decentralization and macroeconomic management”, *IMF Working Paper* 97/155.
- Tiebout, C. (1956), “A pure theory of local expenditures”, *Journal of Political Economy*, Vol. 64, No. 5, pp. 416-424.
- Treisman, D. (2000), “The causes of corruption: A cross-national study”, *Journal of Public Economics*.
- Treisman, D. (1999), “After the deluge: Regional crises and political consolidation in Russia”, *American Journal of Political Science*.
- Zhang, T. and H. Zou (1998), “Fiscal decentralization, public spending, and economic growth in China”, *Journal of Public Economics*, 67(2), pp. 221-240, <http://ideas.repec.org/a/eee/pubeco/v67y1998i2p221-240.html>

### *Further reading*

- Barankay, I. and B. Lockwood (2007), “Decentralization and the productive efficiency of government: Evidence from Swiss cantons”, *Journal of Public Economics* 91, pp. 1197-1218.
- Bardhan, P. and D. Mukherjee (2002), “Decentralization of governance and development”, *Journal of Economic Perspectives*, pp. 185-205.
- Battese, G. E. and T. J. Coelli (1995), “A model for technical inefficiency effects in a stochastic frontier production function for panel data”, *Empirical Economics*, Vol. 20, pp. 325–332.
- Besley, T. and M. Smart (2007), “Fiscal restraints and voter welfare”, *Journal of Public Economics*, Vol. 91, pp. 755–773.
- Davoodi, H., D. Xie and H. Zou (1999), “Fiscal decentralization and economic growth in the United States”, *Journal of Urban Economics* 45, pp. 228-239.
- Greene, W.H. (2005), “Efficiency of public spending in developing countries: A stochastic frontier approach”, World Bank.
- Grigoli, F. (2014), “A hybrid approach to estimating the efficiency of public spending on education in emerging and developing economies”, *IMF Working Paper* 14/19, <http://ideas.repec.org/p/imf/imfwpa/14-19.html>.

- Kavosi, Z. et al. (2013), “The effect of fiscal decentralization on under-five mortality in Iran: A panel data analysis”, *International Journal of Health Policy and Management*, 1(4), pp. 301-306.
- Oates, W. E. (1999), “An essay on fiscal federalism”, *Journal of Economic Literature* 37(3), pp. 1120-1149.
- Picazo, O. F., D.A. Robalino and A. Voetberg (2001), “Does fiscal decentralization improve health outcomes? Evidence from a cross-country analysis”, *World Bank Policy Research Working Paper*, No. 2565.
- Redoano, M. (2003), “Does centralization affect the number and size of lobbies?”, *CSGR Discussion Paper*, No. 604, University of Warwick.
- Ter-Minassian, T. (1997), *Fiscal Federalism in Theory and Practice*, International Monetary Fund, Washington, DC.
- Thornton, J. (2007), “Fiscal decentralization and economic growth reconsidered”, *Journal of Urban Economics*, 61(1), pp. 64-70.



## Annex 9.A1

## Countries, data coverage and sources

Table 9.A1.1. Countries, data coverage and sources

Countries	Coverage	Sources	Countries	Coverage	Sources
Argentina	1993–2004	GFS, WEO	Korea	2000–2012	OECD database
Australia	1990–2011	OECD database	Latvia	1995–2012	Eurostat
Austria	1990–2012	Eurostat	Lesotho	1990–2008	GFS, WEO
Bahrain	1990–2004	GFS, WEO	Lithuania	1995–2012	Eurostat
Belarus	2001–2010	GFS, WEO	Luxembourg	1990–2012	Eurostat
Belgium	1990–2012	Eurostat	Maldives	1990–2011	GFS, WEO
Bhutan	1990–2009	GFS, WEO	Malta	1995–2012	Eurostat
Bolivia	1990–2007	GFS, WEO	Mauritius	2000–2011	GFS, WEO
Brazil	1997–2012	GFS, WEO	Mexico	1990–2012	GFS, WEO
Bulgaria	1995–2012	Eurostat	Mongolia	1992–2012	GFS, WEO
Canada	1990–2010	OECD database	Netherlands	1990–2012	Eurostat
Chile	1990–2012	GFS, WEO	New Zealand	1990–2012	OECD database
Croatia	2002–2012	Eurostat	Norway	1990–2012	Eurostat
Cyprus	1995–2012	Eurostat	Pakistan	1990–2007	GFS, WEO
Czech Republic	1995–2012	Eurostat	Peru	1995–2012	GFS, WEO
Denmark	1990–2012	Eurostat	Poland	1995–2012	Eurostat
Egypt	2002–2012	GFS, WEO	Portugal	1990–2012	Eurostat
Estonia	1995–2012	Eurostat	Romania	1995–2012	Eurostat
Finland	1990–2012	Eurostat	Seychelles	1993–2012	GFS, WEO
France	1990–2012	Eurostat	Singapore	1990–2012	GFS, WEO
Georgia	1997–2012	GFS, WEO	Slovak Republic	1995–2012	Eurostat
Germany	1990–2012	Eurostat	Slovenia	1995–2012	Eurostat
Greece	1995–2012	Eurostat	South Africa	1990–2012	GFS, WEO
Hungary	1995–2012	Eurostat	Spain	1995–2012	Eurostat
Iceland	1995–2012	Eurostat	Sweden	1993–2012	Eurostat
India	1990–2012	GFS, WEO	Switzerland	1990–2012	Eurostat
Indonesia	1990–2004	GFS, WEO	Tunisia	1990–2012	GFS, WEO
Iran	1990–2009	GFS, WEO	Turkey	1990–2012	OECD database
Ireland	1990–2012	Eurostat	United Kingdom	1990–2012	Eurostat
Israel	1995–2012	OECD database	United States	1990–2012	OECD database
Italy	1990–2012	Eurostat	Uruguay	1999–2012	GFS, WEO
Japan	1990–2012	OECD database	Venezuela	1990–2005	GFS, WEO

Note: GFS = Governments Financial Statistics; WEO = World Economic Outlook

1. The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

2. **Note by Turkey:** The information in this document with reference to “Cyprus” relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the “Cyprus issue”.

3. **Note by all the European Union Member States of the OECD and the European Union:** The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

## Annex 9.A2

## Variables, definitions and data sources

Table 9.A2.1. Variables, definitions and data sources

Variables	Description	Sources
<b>Fiscal variables</b>		
Expenditure decentralisation	Fiscal decentralisation – Expenditures side	Eurostat, <i>Governments Financial Statistics</i> (GFS), OECD and <i>World Economic Outlook</i> (WEO)
Revenue decentralisation	Fiscal decentralisation – Revenue side	
<b>Demographic and macro variables</b>		
IMR	Mortality rate, infant (per 1 000 live births)	World Bank, <i>World Development Indicators</i> 2014
UMR	Mortality rate, under-5 (per 1 000 live births)	
Primary education	Primary education, duration (years)	
Secondary education	Secondary education, duration (years)	
Average years of schooling	Average years of primary and secondary schooling	
Total population	Measures the size of the population	
Density	Population density (people per sq. km of land area)	
Real GDP pc	GDP per capita, PPP (constant 2011 international)	
Natural resources (% GDP)	Natural resource rents	
<b>Health and education indicators</b>		
Health expenditure	Health expenditure, public (% of GDP)	OECD and UNESCO databases
Primary enrolment	Gross enrolment ratio, primary, both sexes (%)	
Secondary enrolment	Gross enrolment ratio, secondary, both sexes (%)	
Education expenditure	Government expenditure on education as % of GDP (%)	
<b>Political and institutional variables</b>		
Polstab	Political stability measures the likelihood that the government will be destabilised by unconstitutional or violent means	World Governance Indicators, 2013 Update
Government fractionalisation	Probability that two deputies randomly picked from the government parties will be of different parties	
Fractionalisation	The probability that two deputies picked from the legislature will be of different parties	Database of Political Institutions, 2012
Parliamentary	Dummy variable that takes value 1 if the political system is parliamentary	
Democracy	Variable recording the strength of the democracy	
Autonomy	Dummy variable taking value 1 with the existence of autonomous region	
Corruption	Assessment of corruption within the political system	International Country Risk Guide database

*Note:* Expenditure and revenue decentralisation for European and OECD countries are taken respectively from Eurostat and OECD databases. For emerging economies and developing countries, data are from GFS and WEO.

## Annex 9.A3

### Alternative policy outcome variables: Life expectancy at birth and adjusted primary education net enrolment rate

Table 9.A3.1. Fiscal decentralisation and public expenditure efficiency

Variables	Dependent variable: estimated efficiencies									
	Health					Education				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
FD <sub>(t-1)</sub>	-0.775*** (-4.072)	-0.279*** (-2.833)	-0.530** (-2.515)	-0.248 (-0.799)	0.367*** (4.924)	-1.474*** (-3.182)	0.931 (1.049)	-1.649*** (-3.104)	-0.162 (-0.787)	0.547** (2.115)
(FD <sub>(t-1)</sub> ) <sup>2</sup>	1.069*** (3.975)	0.441*** (3.134)	0.868** (2.470)			2.719*** (3.613)	-1.069 (-0.976)	3.106*** (3.230)		
Real GDP pc <sub>(t-1)</sub>	0.0027 (-0.600)	0.0150*** (3.588)	0.000 (-0.019)	0.006 (0.532)	0.002 (0.520)	0.045*** (3.542)	-0.006 (-0.626)	0.052*** (3.149)	0.067*** (6.468)	0.013 (0.972)
Number of observations	926	303	623	528	394	569	188	381	321	246
Countries	58	16	42	40	30	50	14	36	32	24
Fisher ( <i>p-value</i> )	0.000	0.000	0.003	0.119	0.000	0.000	0.748	0.000	0.000	0.066
Hansen OID ( <i>p-value</i> )	0.014	0.000	0.002	0.148	0.253	0.020	0.198	0.011	0.001	0.129
KP-under	0.000	0.000	0.000	0.419	0.000	0.000	0.061	0.004	0.048	0.001

Note: (\*), (\*\*), and (\*\*\*) denote statistical significance level of 10%, 5% and 1% respectively. Robust t-statistics are shown in parentheses.

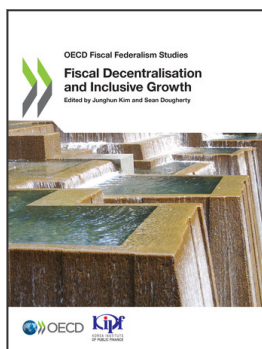
Source: Authors' calculations.

Table 9.A3.2. Fiscal decentralisation and political/institutional environment

Variables	Dependent variable: estimated efficiencies							
	Health				Education			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FD <sub>(t-1)</sub>	-0.065 (-1.261)	-0.087*** (-2.969)	-0.245*** (-3.783)	-0.146*** (-3.492)	-0.419 (-1.378)	0.003 (0.015)	-0.111 (-0.763)	-0.373* (-1.955)
FD × Corruption <sub>(t-1)</sub>	-0.026 (-0.604)				-0.426*** (-2.830)			
FD × Parliamentary <sub>(t-1)</sub>		-0.064 (-0.355)				-3.643 (-1.585)		
FD × Regime <sub>(t-1)</sub>			0.008*** (3.961)				-0.002 (-0.493)	
FD × Autonomy <sub>(t-1)</sub>				0.530*** (5.022)				1.561*** (3.259)
Real GDP pc <sub>(t-1)</sub>	0.008 (1.449)	0.0118* (1.722)	-0.027*** (-3.383)	0.006 (1.642)	-0.038 (-1.066)	0.148*** (3.376)	0.057** (2.407)	0.038** (2.220)
Number of observations	861	926	925	926	529	569	568	569
Countries	54	58	58	58	46	50	50	50
Fisher ( <i>p-value</i> )	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hansen OID ( <i>p-value</i> )	0.001	0.002	0.471	0.113	0.194	0.206	0.000	0.024
KP-under	0.264	0.122	0.000	0.000	0.026	0.445	0.000	0.001

Note: (\*), (\*\*), and (\*\*\*) denote statistical significance level of 10%, 5% and 1% respectively. Robust t-statistics are shown in parentheses.

Source: Authors' calculations.



**From:**  
**Fiscal Decentralisation and Inclusive Growth**

**Access the complete publication at:**  
<https://doi.org/10.1787/9789264302488-en>

**Please cite this chapter as:**

Sow, Moussé and Ivohasina F. Razafimahefa (2018), “Fiscal decentralisation and the efficiency of public service delivery”, in Junghun Kim and Sean Dougherty (eds.), *Fiscal Decentralisation and Inclusive Growth*, OECD Publishing, Paris/Korea Institute of Public Finance, Seoul.

DOI: <https://doi.org/10.1787/9789264302488-11-en>

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