

Fiscal Decentralization and the Efficiency of Public Service Delivery

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Abstract

This study analyzed the impact of fiscal decentralization on the efficiency of public service delivery across 37 countries for the periods ranging from 2008 to 2018. The study employed a stochastic frontier approach to estimate time-varying efficiency coefficients and investigated the impact of different measures of fiscal decentralization on the estimated efficiency coefficients using the panel of fully modified ordinary least squares. The findings revealed that fiscal decentralization improved the efficiency of public service delivery. In specific terms, first, expenditure and tax revenue decentralizations considerably impacted the improvements of the efficiency of public service delivery. Second, it was observed that fiscal decentralization would guarantee sustained improvement in the efficiency gains obtained from public service delivery under favorable political and institutional environments. Third, a low level of decentralization will be detrimental to improving the efficiency of public service delivery. The study recommended that the governments of respective countries should ensure adequate linkages between revenue/tax sources and expenditure assignments and make frantic efforts to strengthen political and institutional environments to improve efficiency gains from public expenditure outcomes.

Keywords : decentralization, efficiency, institutions, stochastic frontier analysis, panel data model

JEL Classification Codes : C16, C33, D61, H77, O43

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The efficiency of public service delivery undoubtedly has a positive influence on poverty reduction in less developed economies, expansion of potential outputs in developing economies, and income redistribution in both. Citizens the world over are continuously asking questions and demanding that governments account for what they do with tax payers' money. There has also been rising attention on the nature of the financial relationship between the different tiers of government.

The study of impacts of fiscal decentralization is a complicated exercise involving series of dimensions and differing empirical evidence. There are varying arguments about the efficacy of the Central government in the allocation of financial resources among other tiers of government. Some schools of thought believe that State and local governments are restrained in their abilities to play redistributive roles as well as coordinate fiscal and monetary policies. There are little or no empirical efforts made to investigate the impact of fiscal decentralization on the efficiency of public service delivery across countries over time. This study fills this gap by focusing on the empirical assessment of the relationship between the different measures of fiscal decentralization (expenditure, revenue, and tax revenue decentralizations) and the efficiency of public service delivery in two critical sectors (education and health) across countries, and over time. The study also stands out from previous known studies

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because it emphasizes the efficiency of public expenditure outcomes (school enrollment rate and infant mortality rate) rather than merely focusing on policy inputs (like public education and health expenditures), taking into account political and institutional environment. Moreover, it uses recent econometric techniques to address the issues of efficiencies of public service delivery and the impact of expenditure, revenue, and tax revenue decentralizations on the efficiency of public service delivery to settle the unresolved controversies in the literature about the nature of relationships among the subject matters.

Review of Relevant Literature and Theoretical Background

Theorists of fiscal decentralization have made economic cases for the roles of governments in the allocation and distribution of resources across the different levels of government. However, decentralized systems of government are expected to stir some sets of fiscal problems (Brown & Jackson, 1990). Interestingly, Tiebout (1956) and Musgrave (1969), in their famous Tiebout–Musgrave layer cake model (also referred to as an “Assignment Problem”), emphasized that, in the course of decentralizing state activities, the stabilization and distributive roles should be left to the Central government and the allocative roles should be discharged by the State and local governments.

The nature of the relationship between fiscal decentralization measures and economic growth depends largely on theoretical explanations. For instance, a positive relationship can be attributed to the public choice perspective; favorable decentralization can be achieved through increased public spending and a negative relationship between the duo is explained by the public choice school (Göcen et al., 2017). Also, this influence also depends on the pro-cyclicality or counter cyclicality of fiscal policy (Mohanty & Mishra, 2017).

Fiscal decentralization can enhance efficiency in public service delivery considering political and institutional environments. When provided an access to a constituent that enjoys a reasonable control over a limited geographic domain, there is a tendency for the internalization of the costs and benefits of public goods, and this is expected to improve the overall allocative efficiency of the government (Oates, 1972). The improvement of service delivery incentives in sub-national governments can be easily realized if they mobilize own-revenue via various tax revenue outlets rather than depending on the statutory transfers from the Central government (Ahmad et al., 2005). The impact of fiscal decentralization in developing, emerging, and developed countries can improve the efficiency of the delivery of public services under political and institutional environments (Kimble et al., 2012; Sow & Razafimahefa, 2015) taking into consideration the adverse effect of growing debt on its effectiveness, especially in developing economies (Dash & Rath, 2016). The expected benefits from fiscal decentralization may be constrained in a geographic area with a high level of ethno linguistic fractionalization (Robalino et al., 2001). In most developing countries, the expected efficiency gains from fiscal decentralization may not be realized taking into account the constraints imposed by the Central government in the control of revenue collection (Davoodi & Zou, 1998).

Adam et al. (2012) examined the relationship between fiscal decentralization and public sector efficiency for 21 OECD countries from 1970 to 2000 utilizing the linear programming techniques of the Data Envelopment Analysis for the estimation of public service efficiency. The study revealed a U-shaped relationship between government efficiency in providing education or health services and fiscal decentralization. It also showed that higher fiscal decentralization is often beneficial for efficiency of OECD public sectors in providing education and health services.

Brosio (2014) assessed the impacts of fiscal decentralization on public service delivery in Asia taking into account proper political and fiscal institutions with attention on the education sector. The study revealed that education sector is crucial in terms of costliness and impact on national growth and individual opportunities, and that the most important recipe to ensure service delivery does not only connect to subnational governments but apply also to other tiers of governments.

Dada (2015) examined the relationship between fiscal decentralization and social services in Nigeria for 36 states from 2002 to 2010 employing the ordinary least square estimation technique and the study revealed that fiscal decentralization is consistently associated with lower mortality rate and higher literacy rate.

Rauf et al. (2017) investigated the impacts of fiscal decentralization on public services deliveries in Pakistan from 1972 to 2009 using the ARDL methodology and the empirical outcomes from the study indicated that although individual impacts of fiscal transfer are insignificant, they still support the theoretical proposition regarding fiscal decentralization and public service relationship.

Dick-Sagoe (2020) examined pertinent issues with the level of government at which decentralization improves service delivery with an emphasis on the local level by reviewing works on decentralization and service provision in developing countries. The author recommended that there are urgent needs for the review of the design of decentralization to accommodate for the demand for transparency and accountability from local government officials.

Arends (2020) assessed the extant literature relating to the established nexus between fiscal decentralization and the provision of public services, taking into account issues of efficiency, equity, and accountability from the perspectives of the risks a decentralization reform could imply. The study revealed that most advanced economies are highly enthusiastic to enjoy the attendant benefits from decentralization by its involvements in processes of recentralization, and that the enormous benefits from fiscal decentralization relies heavily on the multitude of factors (inclusive of institutional factors).

Otoo and Danquah (2021) assessed the impact of fiscal decentralization on the efficiency of local public goods and services delivery in Ghana employing both parametric and nonparametric frontier methods. The results revealed that a high share of Central government grants in total expenditure does not improve the delivery of local goods and services in Ghana. The results further indicated a clear signal to policy managers to prioritize support to different governmental levels in Ghana in the mobilization of internally generated revenue.

Other studies that have provided empirical supports for the positive and significant impact of fiscal decentralization on service delivery include Galasso and Ravallion (2005), Foguet (2001), Eskeland and Filmer (2002), Bardhan and Mookherjee (2004), Enikolopov and Zhuravskaya (2007), Freinkman and Plekhanov (2010), and Saavedra (2010). On the other hand, studies like Livingston and Azfar (2010) provided support for the negative effect of fiscal decentralization on service delivery. Khaleghian (2003) provided results revealing inconclusive impacts.

The review of literature showed varied opinions about the nature of the relationship between fiscal decentralization and service delivery. Some studies provided empirical support for the positive and significant impact of fiscal decentralization on service delivery, whereas other studies showed negative effect. These negating results should necessitate further rigorous and intuitively appealing research in this field. This study's main objective is to fill this gap by employing more robust econometric analytic tools and exploring non-linear modelling techniques in explaining the relationship.

Research Methodology and Data

Methodology

In estimating the relationship between fiscal decentralization and the efficiency of public service delivery, this study employed descriptive and causal research designs. It utilized secondary data analysis. Unlike previous studies on fiscal decentralization, this study focuses on the direct, non-linear and interactive impacts of the different measures of fiscal decentralization (expenditure, revenue, and tax revenue) at the sub-national level of government on public service delivery efficiencies with emphasis on education and health. To estimate the efficiency of public service delivery and investigate the effect of fiscal decentralization on the estimated

efficiency coefficients, the empirical segment was studied in two stages. The first stage undertook the estimation of public service delivery efficiencies using the Stochastic Frontier approach and the STATA software with special emphasis on the time-varying efficiency models of Battese and Coelli (1988) and Jondrow et al. (1982). The second stage investigated the impact of fiscal decentralization measures on the estimated efficiency coefficients obtained from the first stage using the Panel Fully Modified Least Squares technique and employing the E-VIEWS 10 software.

In the first stage, this study specified a time-varying and country-specific stochastic frontier model to obtain efficiency values for public service delivery. This methodology was found suitable for this study because of its flexibility in accommodating multiple exogenous variables and creating opportunities for the estimation of time-varying and country-specific coefficients that can be employed in a panel data setting of this kind. Hence, the stochastic frontier model specified for this study is as follows:

$$Q_{it} = \phi + \partial PE_{i,t-1} + \sum_{k=1}^k \lambda_k X_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

$$\left\{ \begin{array}{l} \varepsilon_{it} = \alpha_{it} \pm \zeta_{it} \\ \zeta_{it} = g(t) \pm \zeta_i, \text{ and } g(t) = \exp[-\lambda(t - T_i)] \end{array} \right\} \quad (2)$$

In equation 1, Q_{it} is the dependent variable (public expenditure policy outcomes) representing the secondary school enrollment rate and the infant mortality rate (per 1,000 live births). The former captures public expenditure outcomes on education while the latter represents public expenditure outcomes on health. $PE_{i,t-1}$ denotes policy inputs, i.e., public education expenditure on education and health as a percent of GDP. X_{it} represents control variables that have policy relevance to public expenditure outcomes; we introduced real GDP per capita as a proxy for the level of development and population density (people per square kilometers of land area) to capture the sizes of the countries. ε_{it} is the error term, and because of the two error components of the stochastic frontier model there is a need for equation 2 to address the time-varying efficiency components. Therefore, α_{it} denotes idiosyncratic disturbances while ζ_{it} represents the one-sided disturbance and this allows for the estimation of the country-specific and time-varying public service delivery efficiencies adopting the Battese and Coelli (1988) and Jondrow et al. (1982) approaches.

The second stage of the estimation exercise was on the investigation of the direct, non-linear, and political-cum-institutional interactions with fiscal decentralization impacts on the estimated efficiency coefficients of public service delivery employing the panel fully modified ordinary least squares. The latter methodology is appropriate for this study because it has the capacity to address concerns about endogeneity, reverse causality, heterogeneity, and simultaneity biases that may plague the parameters (Phillips, 1995; Dritsakakis et al., 2017; Pedroni, 2001). These likely econometric challenges were addressed with the one-period lags of the variables in the respective models. The baseline model for achieving stage 2 is specified as:

$$\hat{\zeta}_{it} = \beta + \phi fidec_{i,t-1} \alpha rgdppc_{i,t-1} + \pi_{it} \quad (3)$$

The dependent variable $\hat{\zeta}_{it}$ is the estimated efficiency coefficients obtained from the time-varying stochastic frontier approach in equations 1 and 2, respectively. ϕ is a parameter indicating the direct impact of fiscal decentralization on the efficiency of public service delivery. $fidec_{i,t-1}$ represents the vector of the three measures of fiscal decentralization adopted for this study. α is the parameter of the control variable, $rgdppc_{i,t-1}$ denotes a one-period lag of gross domestic product per capita, i.e., a control variable capturing the level of development, while π_{it} represents error term.

In order to investigate the possibility of a non-linear or U-shaped relationship between fiscal decentralization and the efficiency of the delivery of public services, this study introduced a squared term of the fiscal decentralization measures ($fidec_{i,t-1}$)² as an expansion of equation 2. Therefore, the non-linear effect can be captured by the following model:

$$\hat{\zeta}_{it} = \beta + \phi_1 fidec_{i,t-1} + \phi_2 (fidec_{i,t-1})^2 + \alpha rgdppc_{i,t-1} + \pi_{it} \quad (4)$$

There are rising concerns in economic and political literature that expected efficiency gains through fiscal decentralization will be constrained by institutional and political environment if the latter are not considered in the fiscal decentralization–public expenditure outcome models. Hence, this study has interacted fiscal decentralization ($fidec_{i,t-1}$) with institutional and political factor ($PI_{i,t-1}$): control of corruption, political stability and absence of violence, rule of law, and voice and accountability ($fidec_{i,t-1} * PI_{i,t-1}$). This study specified the following model to address the impact of the interaction between fiscal decentralization with political and institution factors on the efficiency of public service delivery.

$$\hat{\zeta}_{it} = \beta + \phi fidec_{i,t-1} + \delta (fidec_{i,t-1} * PI_{i,t-1}) + \alpha rgdppc_{i,t-1} + \pi_{it} \quad (5)$$

The parameters ϕ and δ indicate the impact of fiscal decentralization as well as the impact or causal link of the interaction of fiscal decentralization with political and institutional variables on the efficiency of public service delivery.

Data

This study covers 37 countries using unbalanced panel dataset as a result of the paucity of data series for a relatively few periods across the cross sections (See Appendix). The cross sections cut across developing and developed countries to gain fair representation for the period of 2008–2018. The data for the various measures of fiscal decentralization were obtained from the International Monetary Fund's Government Financial Statistics. The data for political and institutional indicators (control of corruption, political stability and absence of violence, rule of law, and voice and accountability) were obtained from World Bank's World Governance Indicators, while other variables were obtained from the World Bank's World Development Indicators.

Empirical Analysis and Results

Descriptive Analysis

The variables used for this study includes fiscal, institutional and political, demographic, and some other macroeconomic variables. From Table 1, on an average, about 28.5% accounts for the share of subnational expenditure to total expenditure. Decentralized revenue share of total revenue and decentralized tax revenue share of total tax revenue of the sub-national government account for 17.4% and 19.8%, respectively. On an average, the education and health expenditure as a percentage of GDP are 4.9% and 7.8%, respectively. The contributions of the education expenditure indicate a relatively low secondary school enrollment rate and the health expenditure value added reflect a marginal effect in the reduction of infant mortality rate. The estimates of the institutional variables are, on an average, above 50% except for political stability, whereas voice and accountability account for an average of 20.3% and 48.1 %, respectively.

Table 1. Descriptive Statistics

Variables	Mean	Std. Dev.	Min	Max
Expenditure decentralization (%)	0.285	0.164	0.002	0.677
Revenue decentralization (%)	0.174	0.151	0.003	0.663
Tax revenue decentralization (%)	0.198	0.189	0.001	0.760
GDP per capita (Constant 2010 US \$)	24080.09	23035.57	528.737	91549.04
Secondary school enrollment rate (% gross)	30233.72	538188.300	19.636	9612451
Mortality rate, Infant (per 1,000 live birth)	9.873	10.481	1.700'	64.100
Population density (People per sq. km landscape)	137.067	153.862	1.721	622.9621
Education expenditure (% GDP)	4.892	1.286	1.906	9.509
Health expenditure (% GDP)	7.776	2.122	3.046	12.346
Control of corruption	0.517	1.078	-1.636	2.344
Political stability and absence of violence	0.203	0.914	-2.301	1.418
Rule of law	0.545	1.017	-1.897	2.036
Voice and accountability	0.481	0.925	-1.660	1.738

Stochastic Frontier Efficiency Estimates of Public Service Delivery

Stage one of our modelling centers around the estimation of public service efficiency, taking into account the education and the health sector and using a time-varying stochastic frontier analysis (see Battese & Coelli, 1988 & Jondrow et al., 1982; both the methodologies are employed for robustness checks and the estimates obtained from both approaches are highly related). Table 2 shows the various descriptive statistics of the estimated efficiency coefficients. The average predicted public service efficiency for the education sector is about 34.5%. This implies that, on an average, the countries deliver about 34.5% of public service efficiency in the education sector or that the countries improved secondary school enrollment rate at less than 50% of the full efficiency score of 100%. The average predicted efficiency for the health sector is 1.3%, which is relatively low compared to that of the education sector. Thus, it can be inferred that there is low efficiency in public service delivery in the health sector or low response to reducing infant mortality rate when compared to the full efficiency score. The efficiency coefficients of the education sector are highly dispersed, though with a maximum value to the tune of 2.15% compared to that of the health sector.

Table 2. Stochastic Frontier Estimates of the Efficiencies of Public Service Delivery

	Estimated Efficiencies			
	Education		Health	
	Battese & Coelli (1988)	Jondrow et al. (1982)	Battese & Coelli (1988)	Jondrow et al. (1982)
Mean	0.345	0.345	0.013	0.013
Standard deviation	0.400	0.400	0.016	0.016
Minimum	0.042	0.042	0.001	0.001
Maximum	2.150	2.150	0.074	0.074

Dependent Variable : Estimated Efficiencies using Battese and Coelli (1988) Approach

Note. FD = Fiscal decentralization; Coef. = coefficients; (*); (**); (***) represent statistical significance level of 10%, 5%, and 1%.

Relationship Between Fiscal Decentralization and Public Service Efficiency : A Direct Channel

This study assesses the direct channel through which the various measures of fiscal decentralization (that is, expenditure, revenue, and tax revenue decentralization) affect the efficiency of the service delivery of public sectors – education and health are the case in point.

In the case of education and health, expenditure decentralization has positively and significantly impacted the efficiency of public service delivery in both sectors, and this indicates that the decentralization of spending decisions across the tiers of government favorably drives efficiency in public expenditure outcomes, thereby improving gross percent of secondary school enrollment rate, and reduces infant mortality rate per one thousand live births across the cross sections studied. This is evident in Table 3. On the revenue side, fiscal decentralization exhibits a negative influence on the efficiency of public expenditure outcomes. However, the education sector exhibited a much significant, though, unfavorable impact on public service delivery. Hence, revenue decentralization across the tiers of government may not necessarily enhance allocative efficiency across education and health sectors. Interestingly, tax revenue decentralization has a positive impact on the efficiency of public service delivery in both the sectors. It has a more significant influence from the education sector, which indicates that tax revenue decentralization improves the efficiency of public service delivery.

On a general note, expenditure decentralization tends to have a much stronger impact than the tax revenue decentralization in improving the efficiency of public service delivery in both education and health sectors; a one percent increase in expenditure decentralization would lead to a 1.6 percentage points of the efficiency gains in public service delivery in the education sector compared to a 1.2% points of the efficiency gains resulting from tax revenue decentralization. The inclusion of the period/time fixed effects has no significant effect on the baseline results but with slight increase in the magnitude of the parameters, and this confirms that the empirical outcomes are not susceptible to likely shocks in the economic landscape of the group of countries studied. In order to achieve a more robust and reliable efficiency estimates as a dependent variable, this study used the time-varying stochastic frontier analysis (Jondrow et al., 1982) as an alternative approach to accommodate sample heterogeneity and heteroskedasticity (Table 4). However, the results show that there are no significant deviations from the baseline estimates (estimates of Battese & Coelli, 1988). This validates the robustness of our efficiency estimates.

Table 4. Fiscal Decentralization and the Efficiency of Public Service Delivery (Robustness Checks)

Dependent Variable : Estimated Efficiencies Using Jondrow et al. (1982) Approach						
Variables	Education			Health		
	Expenditure	Revenue	Tax Revenue	Expenditure	Revenue	Tax Revenue
	Decentralization	Decentralization	Decentralization	Decentralisation	Decentralization	Decentralization
	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)
$FD_{(t-1)}$	0.016*** (2.985)	-0.030*** (-6.403)	0.012*** (4.951)	0.004** (2.197)	-0.002 (-0.614)	0.001 (0.779)
Real GDP per capita _(t-1)	-0.136*** (-9.941)	-0.124*** (-13.073)	-0.112*** (-9.761)	-0.078*** (-17.091)	-0.073*** (-14.020)	-0.071*** (-14.635)
No. of observations	266	269	269	294	296	296
No. of cross sections	37	37	37	37	37	37
R-squared	0.998	0.998	0.998	0.539	0.523	0.519
Adjusted R-squared	0.997	0.997	0.997	0.470	0.453	0.448

Note. FD = Fiscal decentralization; Coef. = coefficients; (*); (**); (***) represent statistical significance level of 10%, 5%, and 1%.

Table 5. Fiscal Decentralization and the Efficiency of Public Service Delivery (Non Linearity)

Dependent Variable : Estimated Efficiencies Using Battese and Coelli (1988) Approach						
Variables	Education			Health		
	Expenditure	Revenue	Tax Revenue	Expenditure	Revenue	Tax Revenue
	Decentralization	Decentralization	Decentralization	Decentralisation	Decentralization	Decentralization
	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)
$FD_{(t-1)}$	0.006 (0.802)	-0.054*** (-11.515)	0.014*** (5.572)	0.004 (1.380)	-0.003 (-0.821)	0.002 (-1.501)
FD squared $_{(t-1)}$	0.129 (1.467)	0.915*** (6.565)	0.042 (0.632)	0.004 (0.259)	0.020 (0.992)	-0.008 (-0.884)
Real GDP PC	-0.128*** (-8.928)	-0.119*** (-14.103)	-0.106*** (-10.604)	-0.117*** (-20.086)	-0.109*** (-17.730)	-0.109*** (-16.825)
No. of observations	293	297	297	330	333	333
No. of cross sections	36	36	36	37	37	37
R-squared	0.998	0.998	0.998	0.526	0.522	0.518
Adjusted R-squared	0.997	0.998	0.997	0.462	0.458	0.454

Note. FD = Fiscal decentralization; Coef. = coefficients; (*); (**); (***) represent statistical significance level of 10%, 5%, and 1%.

Fiscal Decentralization and Public Service Efficiency : A Non-Linear Relationship

In this study, the authors move from just the assessment of the direct channel by which fiscal decentralization impacts the efficiency of public service delivery to investigating the possible U-shaped or non-linear/quadratic impact of fiscal decentralization (expenditure, revenue, and tax revenue measures) on the efficiency of public service delivery. The non-linear results are presented in Table 5.

In the case of expenditure decentralization in both the sectors, the expenditure decentralization variable and its squared term exert a positive, though not significant, effect on the efficiency of public service delivery. The revenue decentralization measure exerts negative influence on the efficiency of public service delivery in both the sectors, whereas the squared term of the revenue decentralization measure shows a positive and significant impact on the efficiency of public service delivery in the education sector. This result affirms a non-linear impact of revenue decentralization on public service delivery efficiency. The negative coefficient of revenue decentralization and positive coefficient of its squared term suggests that a relatively low level of revenue decentralization will be detrimental to the improvement in the efficiencies of public service deliveries in the sectors of the economy under consideration, most especially in the education sector.

Fiscal Decentralization and Public Service Efficiency : The Place of Political and Institutional Environments

There is an increasing attention among public financial managers and researchers that the efficiency gains through a fiscal decentralization exercise will be restricted if institutional and political environments are not taken into consideration. Hence, this study has interacted political and institutional factors with fiscal decentralization to obtain empirical results with the view of settling the aforementioned controversy in the extant literature.

From Table 6, expenditure decentralization exerts a positive and significant impact on the efficiency of public service delivery while the interactions of expenditure decentralization and political and institutional variables are

Table 6. Expenditure Decentralization, Political/Institutional Environment, and the Efficiency of Public Service Delivery

Dependent Variable : Estimated Efficiencies Using Battese and Coelli (1988) Approach								
Variables	Education				Health			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)
<i>ED</i>	0.014*** (7.646)	0.015*** (5.490)	0.012*** (6.391)	0.012*** (5.486)	0.004*** (2.693)	0.007*** (2.627)	0.009*** (2.096)	0.004*** (2.199)
<i>ED</i> * Control of corruption	0.010 (1.404)				0.003 (0.524)			
<i>ED</i> *Political stability and absence of violence		0.024*** (3.597)				0.012*** (3.598)		
<i>ED</i> *Rule of law			-0.067*** (-7.114)				-0.025*** (-3.224)	
<i>ED</i> *Voice and accountability				0.041*** (3.218)				0.001 (0.136)
Real GDP PC	-0.130*** (-28.412)	-0.136*** (-18.722)	-0.126*** (-25.203)	-0.135*** (-23.692)	-0.078*** (-20.005)	-0.081*** (-20.168)	-0.075*** (-17.664)	-0.078*** (-19.080)
No. of observations	261	261	261	261	294	294	294	294
No. of cross sections	35	35	35	35	37	37	37	37
<i>R</i> -squared	0.998	0.998	0.998	0.998	0.542	0.553	0.553	0.543
Adjusted <i>R</i> -squared	0.997	0.997	0.997	0.997	0.471	0.484	0.485	0.473

Note. *ED* = Expenditure Decentralization; (1) = Interaction of the estimated efficiency with *ED* and *ED** Control of Corruption; (2) = Interaction of the estimated efficiency with *ED* and *ED** Political stability and absence of violence ; (3) = Interaction of the estimated efficiency with *ED* and *ED** Rule of Law; (4) = Interaction of the estimated efficiency with *ED* and *ED** Voice and accountability; Coef. = coefficients; (*); (**); (***) represent statistical significance level of 10%, 5% and 1%.

Table 7. Revenue Decentralization, Political/Institutional Environment, and the Efficiency of Public Service Delivery

Dependent Variable : Estimated Efficiencies Using Battese and Coelli (1988) Approach								
Variables	Education				Health			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)	Coef. (t-stat)
<i>RD</i>	-0.027*** (-9.657)	-0.026*** (-10.836)	-0.025*** (-9.269)	-0.304*** (-11.081)	-0.001 (-0.414)	-0.001 (-0.432)	-0.007 (-0.034)	-0.001 (-0.158)
<i>RD</i> * Control of corruption	0.084***				0.009			

	(6.053)				(1.063)			
<i>RD</i> * Political stability		0.039***				0.015**		
and absence of violence		(4.269)				(2.208)		
<i>RD</i> * Rule of law			-0.042***				-0.556***	
			(-2.364)				(-4.156)	
<i>RD</i> * Voice and accountability				0.249***				0.027*
				(10.661)				(1.864)
Real GDP PC	-0.123***	-0.123***	-0.118***	-0.126***	-0.073***	-0.075***	-0.071***	-0.074***
	(-21.783)	(-24.966)	(-21.960)	(-22.700)	(-19.062)	(-18.635)	(-16.696)	(-19.406)
No. of Observations	264	264	264	264	296	296	296	296
No. of Cross sections	35	35	35	35	37	37	37	37
<i>R</i> -squared	0.998	0.998	0.998	0.998	0.532	0.531	0.548	0.536
Adjusted <i>R</i> -squared	0.997	0.997	0.997	0.997	0.461	0.459	0.479	0.465

Note. *RD* = Revenue Decentralization; (1) = Interaction of the estimated efficiency with *RD* and *RD** Control of Corruption; (2) = Interaction of the estimated efficiency with *RD* and *RD** Political stability and absence of violence ; (3) = Interaction of the estimated efficiency with *RD* and *RD** Rule of Law; (4) = Interaction of the estimated efficiency with *RD* and *RD** Voice and accountability; Coef. = coefficients; (*); (**); (***) represent statistical significance level of 10%,5% and 1%.

positively related with the efficiency of public service delivery, except in the case of rule of law that shows a negative effect. Interestingly, in both education and health sectors, the combination of political and institutional factors with expenditure decentralization guarantees the improvement in the efficiency of public expenditure outcomes.

The interactions of revenue decentralization with political and institutional variables exert favorable and significant impact on the efficiency of public service delivery in both health and education sectors, except the interaction with the rule of law variable that shows a negative and significant effect on the efficiency of public service delivery. This may be a result of the lack of confidence of citizens in the various sets of rules and guidelines governing the revenue allocation decisions of the various tiers of government (Table 7).

Also, from Table 8, the interactions of tax revenue decentralization with political and institutional variables exert a positive and significant impact (except for the interaction with the rule of law variable) on the efficiency of public service delivery in education and health sectors. This indicates that an adequate political and institutional environment improves the impact of tax revenue decentralization on the efficiency of public service delivery.

Generally, the empirical outcomes of interactions of the various political and institutional factors with the different fiscal decentralization measures reveal that implementing fiscal decentralization in a conducive

Table 8. Tax Revenue Decentralization, Political/Institutional Environment, and the Efficiency of Public Service Delivery

Dependent Variable : Estimated Efficiencies Using Battese and Coelli (1988) Approach								
Variables	Education				Health			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	Coef. (<i>t</i> -stat)	Coef. (<i>t</i> -stat)	Coef. (<i>t</i> -stat)	Coef. (<i>t</i> -stat)	Coef. (<i>t</i> -stat)	Coef. (<i>t</i> -stat)	Coef. (<i>t</i> -stat)	Coef. (<i>t</i> -stat)
<i>TRD</i>	0.012*** (9.396)	0.012*** (8.114)	0.013*** (9.726)	0.011*** (10.603)	0.001 (1.050)	0.001 (0.664)	0.002 (1.003)	0.003 (0.849)

<i>TRD</i> * Control of corruption	0.028*** (2.776)				-0.004 (-0.732)			
<i>TRD</i> * Political stability and absence of violence		0.025*** (2.432)				0.011* (1.897)		
<i>TRD</i> * Rule of law			-0.054*** (-4.264)				-0.030*** (-3.787)	
<i>TRD</i> * Voice and accountability				0.102*** (7.789)				0.024*** (2.356)
Real GDP PC	-0.110*** (-18.584)	-0.111*** (-15.718)	-0.109*** (-19.302)	-0.112*** (-22.202)	-0.072*** (-20.136)	-0.074*** (-17.480)	-0.071*** (-19.890)	-0.073*** (-18.321)
No. of Observations	264	264	264	264	296	296	296	296
No. of Cross sections	35	35	35	35	37	37	37	37
<i>R</i> -squared	0.998	0.998	0.998	0.998	0.531	0.531	0.542	0.542
Adjusted <i>R</i> -squared	0.997	0.997	0.997	0.997	0.459	0.459	0.473	0.473

Note. *TRD* = Tax Revenue Decentralization; (1) = Interaction of the estimated efficiency with *TRD* and *TRD** Control of Corruption; (2) = Interaction of the estimated efficiency with *TRD* and *TRD** Political stability and absence of violence ; (3) = Interaction of the estimated efficiency with *TRD* and *TRD** Rule of Law; (4) = Interaction of the estimated efficiency with *TRD* and *TRD** Voice and accountability; Coef. = coefficients; (*); (**); (***) represent statistical significance level of 10%, 5%, and 1%.

political and institutional environment improves the efficiency of public service delivery, and that non-compliance to the rule of law has a stronger potency to limiting the efficiency gains from public service delivery.

Policy Implications and Conclusion

In this study, the impact of fiscal decentralization on the efficiency of public service delivery was investigated. In general, the study reveals that fiscal decentralization improves the efficiency of public service delivery in terms of education and health outcomes under favorable political and institutional factors. Thus, the striking findings and policy implications of this study include:

- (1) The different measures of fiscal decentralization, especially expenditure and tax revenue decentralization, seem to have enhanced the efficiency of public service delivery, while revenue decentralization exerts negative influence on the efficiency of public service delivery. The latter indicates that decentralization has not been sufficiently accompanied by sufficient fiscal resources, but the tax revenue decentralization refuted this claim.
- (2) Empirical findings under the non-linear relationship between fiscal decentralization measures and the efficiency of public service delivery reveals that low level of fiscal decentralization, especially revenue decentralization, will be detrimental to the improvement of the efficiency of public service delivery.
- (3) Findings from the interactions of fiscal decentralization measures with political and institutional variables show that fiscal decentralization will guarantee more sustained efficiency gains for public service delivery under favorable political and institutional environments.

Arising from the policy implications, this study has recommended the following policy options:

- (1) On an average, the governments of the countries under study should ensure correspondence between

revenue/tax sources and expenditure assignments since fiscal decentralization improves education and health outcomes.

(2) There is a need to restructure and strengthen institutions across the countries to plug leakages and avoid the misuse of public funds, which should be allocated as public education and health expenditures.

(3) There is a need to ensure improvement of a decentralized expenditure management for efficient public service delivery, so as to conquer likely barriers to effective fiscal decentralization.

Limitations of the Study and Scope for Further Research

The major limitation of this study is the lack of sufficient empirical research in the field of public sector economics. The limited empirical literature is a major gap, which this study attempted to fill. There is a need for further country-specific empirical research in this area, especially with regard to the effects of fiscal decentralization at municipal levels on primary social services delivery.

Authors' Contribution

Dr. N. L. Arodoye conceived the idea, developed the quantitative design for the empirical study, and undertook the data analysis and did all numerical computations using STATA and E-VIEWS 10. Dr. S. O. Abusomwan extracted research papers with high reputations, sorted them based on keywords, generated concepts and codes relevant to the study design, verified the analytical methods, edited the study, and effected the corrections, where necessary.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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Appendix

List of Countries

Brazil	Peru	Belgium	Australia
South Africa	Israel	Netherlands	Georgia
Chile	Mongolia	Spain	Norway
El Salvador	Switzerland	Canada	Japan
Thailand	Austria	Iceland	Germany
Colombia	Armania	Russian Federation	
Mauritius	Azerbaija Rep.	Belarus	Lativa
Estonia	Czech Rep.	Hungary	Ukrain
Moldova	United Kingdom	Costa Rica	Paraguay
Kazakhstan	Afghanistan		

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