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Analysis of public sector efficiency in Sub-Saharan Africa: Focus on economic performance and stability

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Abstract

In this paper we analyze the efficiency of the public sector in Sub-Saharan African (SSA) countries over the period 1991–2020. We use DEA model to estimate relative efficiency scores for two government targets (economic performance and economic stability). Then, we use a semi-parametric econometric method to isolate the impact of government inefficiency from the inefficiency arising from the socioeconomic environment and luck. Finally, we use the Tobit model to analyze the political sources of inefficiency of public sector. The results show that the quality of the political institutions in particular the democratic participation of the citizens, the control of corruption, the weak intervention of military in politics improve the effectiveness of the public sector in SSA countries.

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1. INTRODUCTION

In recent years, the efficiency of public resources has taken an increasingly important place in political debates and scientific research in all sectors of the economy. Indeed, it is recognized that the efficient functioning of the public sector is a necessary condition for a country's better economic performance (Adam et al. 2011). This importance of the effectiveness of the public sector is even more important in the case of developing countries such as those of Sub-Saharan Africa (SSA) which must satisfy the increasingly growing needs of their populations in all areas.

Furthermore, some authors (Christl et al. 2018) empirical work has succeeded in highlighting the existence of a positive correlation between the size of the public sector and the inefficiency of the public sector. Thus, countries with small public sector sizes are more efficient than those with large public sectors. Other authors take the analysis further by looking for the determinants of public sector efficiency. Political factors have been indexed by several authors (Adam et al. 2011, Fonchamnyo and Sama 2016, Antonelli and De Bonis 2018, and Apeti et al. 2023) as being the most important determinants of efficiency of the public sector. Indeed, the political qualities of institutions require those in power to be more transparent in the management of resources, leading to greater efficiency in the public sector.

Referring to this literature, the aim of this article is to use a coherent methodology to measure the relative public sector efficiency (namely the general objectives of the government: economic performance and economic stability) of SSA countries and to show that the constructed indicators can be useful for analysis of the political sources of public sector inefficiency in SSA.

2. A BRIEF LITERATURE REVIEW

The analysis of the efficiency of economic organizations finds its theoretical foundations in microeconomic theory, by linking the resources used and the level of production achieved. However, the origin of the discussion on measuring efficiency dates back to the work of Farrell (1957), who proposed two different ways in which productive agents could be inefficient. First, they could use more inputs than technically required to achieve a given level of output, or second, they could use more inputs than technically required to achieve a given level of output. Second, they might use a sub-optimal combination of inputs given input prices and their marginal productivities. Since the work of Farrell (1957), several empirical studies on effectiveness have been carried out using mainly two approaches: the parametric approach and the non-parametric approach.

Afonso et al. (2010) use the non-parametric method to show that the newly industrialized Asian economies are more efficient than the new member states of the European Union. Using a Tobit model, they show that higher incomes, skills and education levels in the public sector as well as security of property rights seem to facilitate the prevention of inefficiencies in the public sector. Similarly, Afonso and Kazemi (2016) also apply a non-parametric approach and find that countries with a higher level of spending are less efficient in the case of 20 OECD countries.

Herrera and Ouedraogo (2018) also use two-step approach. First, using the Data Envelopment Analysis (DEA) and the Free Disposable Hull (FDH) method, they measure efficiency (in the areas of education, health and infrastructure) in 175 countries. Then, the results of the Tobit model show that efficiency scores are correlated with the quality of governance, particularly the quality of regulation and the perception of corruption. Similar results were found by Afonso et al. (2023) for 36 OECD countries. Indeed, institutional variables (political cohesion and government fragmentation, the government effectiveness and voice and accountability) have

been identified as important determinants of public sector efficiency. Unlike previous studies, Adam et al. (2011) adopt a two-stage approach to measure public sector efficiency. In the first stage, they employ the DEA to estimate technical efficiency scores. In the second stage, these scores are regressed using a Stochastic Frontier Analysis (SFA) model to account for the influence of environmental variables. Subsequently, using the Tobit model, they show that institutional variables are the determinants of public sector efficiency. Daraio and Simar (2005) suggest a general formulation of a nonparametric frontier model introducing extegrnal environmental factors that might influence the production process but are neither inputs nor outputs under the control of the producer.

3. MEASURING PUBLIC SECTOR EFFICIENCY

3.1. Methodology

In this study, we are interested in productive efficiency, which reflects the capacity of a public sector to maximize production for a given set of inputs. Successful governments are on the frontier, while those that do not optimize the use of their inputs are inefficient to some extent. Farrell (1957) shows that this type of inefficiency can be measured in terms of the distance between a given public sector and the best practice equivalent (which forms the frontier) and the resulting score is a scalar measure between zero (lowest efficiency score) and one (public sector with best practice).

As Adam et al. (2011), we use a three-stage model for calculating efficiency scores. This approach combines the DEA and the SFA. This method has the advantage of separating the efficiency of government into two: the efficiency due to the chance of having a favorable environment and the pure efficiency of government.

However, this approach is subject to the Simar and Wilson (2007) critique. According to these authors, the main shortcoming of this approach is that the efficiency estimates are serially correlated in a complicated way, and the efficiency scores from the first stage are biased. Faced with these limitations, Simar and Wilson (2007) propose a methodological improvement by incorporating bootstrap techniques to refine statistical inference in the second stage. However, another major criticism of two-stage approaches lies in their dependence on an assumption of separability between the input-output space and that of environmental variables, a condition often questionable in practice. To verify the separability condition between the technological space (inputs-outputs) and environmental variables, we applied the bootstrap separability test developed by Simar and Wilson (2007). This method consists of regressing the efficiency scores obtained from DEA on the explanatory environmental variables using a bootstrap truncated regression.

In the first stage, we use the DEA model, incorporating bootstrap techniques[1], to measure public sector efficiency. In the second stage, the SFA model is used to separate stage 1 efficiency scores into efficiency attributable to government management practices and efficiency due to the macroeconomic environment and statistical noise. The SFA model is:

$$eff_{it} = f\,(Z_{it}; a) + v_{it} + u_{it}$$
$$u_{it} = \beta(t)\mu_i \qquad (1)$$

Where eff_{it} represents the vector of efficiency scores obtained in the first stage, Z_{it} are country-specific variables, a are parameters vectors to be estimated, v_{it} represents random

[1] Efficiency scores were estimated using the rDEA package in R (version 4.5.0). The bootstrap method developed by Simar and Wilson (2007) was implemented. The analysis was conducted under the assumption of variable returns to scale (VRS). The input-oriented approach was applied. Bias correction was carried out using the smooth bootstrap method.

statistical noise, u_{it} represents inefficiency and the function $\beta(t)$ is specified as a set of time dummy variables β_t. The β_ts are treated as the coefficients of the fixed effects u_i, and once both are estimated, u_{it} is obtained as $u_{it} = max_i\{\hat{\beta}_t\hat{\mu}_i\} - (\hat{\beta}_t\hat{\mu}_i)$. For the distribution of the error term, we assume $v_{it} \sim N(0, \sigma_2)$, but no distribution assumption is made on u_{it}, which may be correlated with the control variables or the remaining disturbance.

The impact of environment and noise on stage 1 efficiency scores is captured by the deterministic frontier : $f(z_i;\ \beta) + v_{it}$. u_{it} represents government inefficiency, disentangled from the impact of the socio-economic environment and luck. This inefficiency is based on the capacity of public sectors to adapt to the vagaries of the socio-economic environment and luck, but does not take into account the capacity of certain public sectors to maintain the use of inputs. This is because the original input data are implicitly used in estimation "(1)", which would likely be different in light of a different socio-economic environment or chance scenario (Adam et al. 2011).

The results obtained are then used to penalize public sectors which have been advantaged by their relatively favorable economic environment and/or their relative luck. Thus, the adjusted government inputs are constructed from the results of the SFA regressions of stage 2 using:

$$x_{it}^A = x_{it} + \left[max_{it}\{z_{it}\hat{\beta}\} - z_{it}\hat{\beta}\right][max_{it}\{\hat{v}_{it}\} - \hat{v}_{it}] \quad (2)$$

Where x_{it}^A and x_{it} are adjusted and observed inputs, respectively.

To implement "(2)", it is necessary to separate managerial inefficiency u_{it} from the remainder disturbance v_{it} (chance) into the residuals of "(1)" in order to obtain estimates of v_{it} for each government. As noted by Fried et al. (2002) and Adam et al. (2011), the conditional estimators of managerial inefficiency, given by $\hat{E}[u_{it}|v_{it} + u_{it}]$, make it possible to derive estimators of statistical noise in a residual way as follows:

$$\hat{E}[v_{it}|v_{it} + u_{it}] = Eff_{it} - z_{it}\hat{\beta} - \hat{E}[u_{it}|v_{it} + u_{it}] \quad (3)$$

which provide, conditional $v_{it} + u_{it}$, estimators for v_{it} in "(2)".

In stage 3, we repeat the exercise of stage 1, this time using the adjusted input data x_{it}^A resulting from the analysis in stage 2.

3.2. Data

The methodology described above will be applied to a panel of SSA countries over the period 1990-2020. However, we excluded 3 countries (Malawi, Sao Tome and Principe, South Sudan) from the first step due to lack of necessary data on some variables. According to Tanzi and Schuknecht (2000), "it is difficult, if not impossible, to consider all the socio-economic objectives that governments might wish to influence with their spending". Adam et al. (2011) identify two categories of public spending objectives: specific and general. The authors define six public performance sub-indicators (education, health, economic affairs, general public services, social security and welfare and defence) and two general public spending objectives (economic performance objective and economic stability objective). The difficulty of obtaining disaggregated data on public spending, on the one hand, and data on the outputs of this spending, on the other, leads us in this context to give priority to the construction of more general indicators of public spending. These are the target of economic performance and the target of economic stability.

Referring to the relevant literature (the work of Adam et al. 2011, and Apeti et al. 2023), the variables used as outputs for general economic performance are the unemployment rate (U) and the GDP growth rate (GDP). Lower scores on the unemployment rate and higher scores on economic growth reflect better economic performance. The corresponding outputs for economic stability are the standard deviation of the economic growth rate (Std_dev_GDP) and the inflation rate (Inf). Lower scores on both measures denote better economic stability. For both measures, the relevant spending account that serves as input is total public spending (%

of GDP). Data on all these variables are taken from the World Bank's Development Indicators (WDI, 2023). To take into account the long-term effects of public spending and to exclude the potential effects of economic cycles on some outputs (the unemployment rate and inflation) the period is subdivided into three ten-year sub-periods (1991-2000; 2001- 2010; 2011-2020). In the SFA regression (second step), we use socio-economic conditions, investment profile (obtained from ICERG) and urbanization rate (obtained from WDI). These variables were identified by Adam et al. (2011) to equalize the opportunities of different countries. We have also introduced a variable related to commodity prices (obtained from International Monetary Fund), as GDP and the unemployment rate are closely linked to their fluctuations.[2]

The Table I reports the inputs and outputs used, along with some descriptive statistics. The statistics recorded in Table I show that there are countries characterized by a relatively large public sector, whose public expenditure exceeds 40% as a share of GDP (e.g. Angola, Botswana, Cabo Verde, Republic of Congo, Equatorial Guinea, Ethiopia, Mauritania, Namibia and Zambia), and countries whose size of the public sector does not exceed 25% as a share of GDP (for example Central African Republic, Congo Democratic, Gambia and Sierra Leone). The size of the public sector for most countries is around the average (35.86%).

Table I: Summary statistics for outputs and inputs

Variables	Average	Std. Dev.	Min	Max
Output				
Unemployment rate	7.9936	6.6142	0.7213	26.6798
Inflation rate (consumer prices annual %)	10.1063	13.8932	1.1474	84.2927
GDP growth rate (annual %)	3.9761	4.1011	-5.5035	36.3116
Standard deviation of the annual GDP growth rate	4.4534	4.7589	0.5879	43.7272
Input				
Total public spending (% of GDP): sum of General government final consumption expenditure (% of GDP) and Gross fixed capital formation (% of GDP)	37.0404	15.4014	15.9028	154.9701
'Leveling the playing field' variables				
Protection of investment index : This is an assessment of factors affecting the risk to investment that are not covered by other political, economic and financial risk components.	6.6068	1.8357	1.5	10.9375
Quality of socioeconomic environment index: This is an assessment of the socioeconomic pressures at work in society that could constrain government action or fuel social dissatisfaction.	3.4920	1.4148	0.3416	6.3166
% of total population in urban areas: Urban population refers to people living in urban areas as defined by national statistical offices.	38.5557	15.5351	13.066	88.4374
Commodity prices index : Commodity Net Export Price Index, Individual Commodities Weighted by Ratio of Net Exports to GDP – Historical, annual, rolling weights	99.3570	6.3888	75.7244	105.8244

Source: author

3.3. Efficiency estimates

[2] We conducted a panel estimation of the initial efficiency scores based on these environmental variables.

For space constraints, only the results of the third stage are presented in Tables II and III.[3] Regarding the target of economic performance, the overall results indicate a certainly homogeneity of SSA countries. Overall, Mali had the highest average efficiency score (1) and South Africa had the lowest (0.79). In the decade of 1991-2000, the countries forming the frontier are Mali, Mozambique, Niger, Sierra Leone, Sudan and Uganda. In the decade 2001-2010, the frontier is formed by Angola, Congo Dem, Mali, Mozambique, Nigeria and Sierra Leone. Finally, in the last decade, the countries which form the frontier are Congo Dem, Ivory Coast, Ghana, Guinea-Bissau, Mali, Niger and Tanzania. Yet, these results should be interpreted with caution since the countries examined present small differences in GDP growth and unemployment rates.

Table II: results of efficiency scores on economic performance.[4]

Countries	**1991-2000**		**2001-2010**		**2011-2020**		
	Score	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Average Score**
Angola	0.968924	11	1.000000	1	0.920783	17	0.963236
Botswana	0.865889	18	0.819981	22	0.813164	19	0.833011
Burkina Faso	0.995865	2	0.985896	7	0.980448	11	0.987403
Cameroon	0.937633	17	0.970181	13	0.985626	10	0.964480
Congo, Dem.	0.982538	5	1.000000	1	1.000000	1	0.994179
Congo, Rep.	0.808092	21	0.821808	21	0.799801	22	0.809900
Ivory Coast	0.972067	10	0.960083	14	1.000000	1	0.977383
Gabon	0.834217	19	0.829934	20	0.803028	21	0.822393
Gambia	0.937690	16	0.937314	16	0.970591	13	0.948532
Ghana	0.947332	15	0.956422	15	1.000000	1	0.967918
Guinea	0.984797	3	0.973436	11	0.987172	7	0.981802
Guinea-Bissau	0.982320	6	0.995389	2	1.000000	1	0.992570
Kenya	0.980722	7	0.983612	8	0.986629	8	0.983654
Liberia	-	-	0.993251	4	0.987756	5	0.990503
Madagascar	0.958034	13	0.972297	12	0.998071	2	0.976134
Mali	1.000000	1	1.000000	1	1.000000	1	1.000000
Mozambique	1.000000	1	1.000000	1	0.973244	12	0.991081
Namibia	0.809288	20	0.795343	24	0.805470	20	0.803367
Niger	1.000000	1	0.992707	5	1.000000	1	0.997569
Nigeria	0.973071	9	1.000000	1	0.986554	9	0.986542
Senegal	0.961747	12	0.929229	17	0.953641	15	0.948205
Sierra Leone	1.000000	1	1.000000	1	0.988570	4	0.996190
South Africa	0.802783	22	0.808748	23	0.778646	23	0.796725
Sudan	1.000000	1	0.863067	19	0.829724	18	0.897597
Tanzania	0.978986	8	0.988934	6	1.000000	1	0.989307
Togo	0.983519	4	0.980582	9	0.987546	6	0.983882
Uganda	1.000000	1	0.994862	3	0.989510	3	0.994790
Zambia	-	-	0.924458	18	0.930879	16	0.927669
Zimbabwe	0.955096	14	0.978765	10	0.968401	14	0.967421
Spearman correlation	0.9466		0.9495		0.9888		

Source: author's calculation

[3] For the first step, we used 44 countries to calculate economic performance and economic stability efficiency scores (See Appendix 1).

[4] Blanks in the tables mean that we were unable to calculate the score for this country due to insufficient data.

When the government target is economic stability, the results show heterogeneity between countries. The best-performing countries are Burkina Faso, Cameroon, Congo Dem, Gabon, Mali, Niger and Senegal. The least performers are Angola, Botswana, Liberia, Madagascar and Sierra Leone. In the first decade, the most economically stable countries were Gabon, Gambia, Ghana and Sudan. Guinea-Bissau, on the other hand, had the lowest efficiency score (0.12). In the second decade, the best frontier in terms of economic stability was formed by Congo Dem, Gabon, Guinea-Bissau, Senegal, Tanzania and Zimbabwe. The countries with the lowest efficiency scores are Angola, Botswana, Liberia, Madagascar, Sierra Leone and Sudan. In the last decade, the frontier is formed by Burkina Faso, Cameroon, Guinea-Bissau, Mali, Nigeria and Togo. By contrast, the countries with the lowest efficiency scores are Botswana, Sierra Leone, Sudan and Zimbabwe. The good performance of member countries of a monetary union (Ivory Coast, Burkina Faso, Cameroon, Gabon, Guinea-Bissau, Mali, Niger, Senegal and Togo) can be explained by the rules decreed by the union to stabilize inflation. The Spearman correlation between first and third stage efficiency scores in the years 1991s, 2001s and 2011s (see last rows of Tables II and III) is quite high and always significant at the 5% level. This result suggests that luck and a superior socio-economic environment appear to be less important than sound governance. In turn, this reflects the idea that governments have much to gain by observing and implementing the strategies followed by efficient governments, with the aim of improving their own efficiency scores.

Table III: results of efficiency scores on economic stability.

Countries	**1991-2000**		**2001-2010**		**2011-2020**		**Average Score**
	Score	**Rank**	**Score**	**Rank**	**Score**	**Rank**	
Angola	-	-	0.141024	24	0.339632	18	0.240328
Botswana	0.420496	14	0.252159	21	0.231225	22	0.301293
Burkina Faso	0.732102	5	0.762832	6	1.000000	1	0.831645
Cameroon	0.637082	7	0.955053	2	1.000000	1	0.864045
Congo, Dem	-	-	1.000000	1	0.708307	8	0.854154
Congo, Rep	0.466190	13	0.733913	8	0.365847	17	0.521983
Ivory Coast	0.595836	8	0.787102	4	0.819365	5	0.734101
Gabon	1.000000	1	1.000000	1	0.522730	10	0.840910
Gambia	1.000000	1	0.547533	12	0.388807	16	0.645447
Ghana	1.000000	1	0.612865	9	0.441781	14	0.684882
Guinea	-	-	0.519939	14	0.534470	9	0.527204
Guinea-Bissau	0.127269	17	1.000000	1	1.000000	1	0.709090
Kenya	0.466654	12	0.360484	18	0.774861	6	0.534000
Liberia	-	-	0.208166	23	0.317622	19	0.262894
Madagascar	0.319931	15	0.219818	22	0.422065	15	0.320605
Mali	0.804137	3	0.767466	5	1.000000	1	0.857201
Mozambique	-	-	0.560740	10	0.470506	13	0.515623
Namibia	-	-	0.392507	16	0.316356	20	0.354432
Niger	0.774958	4	0.816468	3	0.902220	3	0.831216
Nigeria	0.291086	16	0.385366	17	1.000000	1	0.558817
Senegal	0.876534	2	1.000000	1	0.918825	2	0.931787
Sierra Leone	-	-	0.289267	20	0.193019	24	0.241143
South Africa	0.548744	9	0.539274	13	0.492250	12	0.526756
Sudan	1.000000	1	0.332859	19	0.227757	23	0.520205
Tanzania	0.477169	11	1.000000	1	0.822665	4	0.766611
Togo	0.510780	10	0.744976	7	1.000000	1	0.751919

Uganda	0.688849	6	0.554776	11	0.751534	7	0.665053
Zambia	-	-	0.483554	15	0.501710	11	0.492632
Zimbabwe	-	-	1.000000	1	0.285432	21	0.642716
Spearman correlation	0.9980		0.9921		0.9831		

Source: author's calculation

4. POLITICAL DETERMINANTS OF PUBLIC SECTOR EFFICIENCY

Once the "playing field is leveled" across countries, efficiency scores can be used as a valuable tool to examine various theoretical relationships in the public choice literature (Adam et al. 2011). Following the reasoning to the relevant literature (Adam et al. 2011, and Afonso et al. 2023) the effects of environmental variables on efficiency levels can be estimated by the censored Tobit regression method. The most-often encountered approach to modelling the DEA scores against exogenous variables is Tobit regression, which is suitable when the dependent variables are either censored or corner solution outcomes, of which DEA scores falls within the second category (Wooldridge 2002, and Hoff 2007).

Our analysis is based on the following Tobit model:

$$\begin{cases} eff_{i,t}^{*} = 0 & eff_{i,t}^{*} < 0 \\ eff_{i,t}^{*} = \lambda_t + \beta X_{i,t} + \varepsilon_{i,t} & if \quad 0 \leq eff_{i,t}^{*} \leq 1 \\ eff_{i,t}^{*} = 1 & eff_{i,t}^{*} > 1 \end{cases} \quad (4)$$

Where $eff_{i,t}^{*}$ is the efficiency score of country i at time t obtained from the three-stage analysis, $X_{i,t}$ is a vector of explanatory political variables and $\varepsilon_{i,t}$ is the error term. We added up the efficiency in economic performance and the efficiency in economic stability.

To increase our sample size and therefore the robustness of our results obtained from the estimation of "(4)", we re-estimate the eff scores using the methodology described in the previous section with an average of the data over 5 years. Our explanatory variables consist of political variables, some of which have been identified as important determinants of public sector efficiency in previous research (see Adam et al. 2011, Herrera and Ouedraogo 2018, and Afonso et al. 2023). This is a measure of democratic participation (Vot_turn), the corruption perception (CPI_Score), the military intervention in politics (military_political). The introduction of this last variable is important in the context of SSA countries where military interventions are frequent in the political management of States. A high rate of democratic participation increases democratic control over governments and influences the way public resources are used. The Corruption Perception Index (CPI) ranges from 0 to 100: a low score indicates a high level of corruption, while a high score reflects greater control over it. Similarly, the Military in Politics variable ranges from 0 to 6: a low score indicates a high level of military involvement in politics, while a high score indicates a lower level of military influence. We do not use socioeconomic variables here since these variables were used in the second step to calculate efficiency scores.

Table IV: Definition and statistics of variables used in the Tobit model.

	Definition	Source	Summary	Statistics
Eff	Average of the efficiency indices: stability and performance	Authors'calculations	Mean	0.84
			Min;Max	0.54; 1
			Obs	158
vot_turn	The proportion of voters who actually voted in the presidential. When two elections were held in the same five-year period, we used the average	Institute of Democracy and Electoral Assistance (2023)	Mean	61.2314
			Min;Max	21.09; 88.93
			Obs	147
Vap_turn	The proportion of voters who actually voted in the parliamentary. When two elections were held in the same five-year period, we used the average	Institute of Democracy and Electoral Assistance (2023)	Mean	51.10
			Min;Max	19.41; 92.42
			Obs	147
CPI_Score	Corruption Perceptions Index	Transparency International (2021)	Mean	27.79
			Min;Max	9.72; 56.2
			Obs	123
Corruption	Assessment of corruption within the political	International Country Risk Guide (2020)	Mean	2.168
			Min;Max	0 ; 5
			Obs	162
military_p~s	The index of military intervention in political management	International Country Risk Guide (2020)	Mean	2.44
			Min;Max	0 ; 6
			Obs	162
Democrat_Account	A measure of how responsive government is to its people	International Country Risk Guide (2020)	Mean	3.11
			Min;Max	1; 5.33
			Obs	162
Govern_stab	Assessment both of the governement's ability to carry out its declared programm, and its ability to stay in office	International Country Risk Guide (2020)	Mean	7.78
			Min;Max	2.53; 10,99
			Obs	162
union_member	This is a dummy variable which takes the value 1 if the country is a member of a monetary union and 0 if not.	Authors	Mean	0.44
			Min;Max	0; 1
			Obs	162

Source: Author

The results of the estimation of the Tobit model, recorded in Table V, are first presented by introducing the explanatory variables then using alternative measures (I to V).[5]

[5] For the estimation of the Tobit model, we retained 27 countries instead of the 29 countries retained in the previous tables (II and III) excluding Botswana and Liberia, because, data is missing on a variable of interest (Vot_Turn).

Table V: Estimation results on the determinants of inefficiency scores

Tobit regression analysis (dependent variable : eff)							
	I	II	III	IV	V	VI	VII
Vot_turn	0. 0047***		0.0028**	0.0055***	0.0054***	0.0042 **	0.0059 ***
	(6.36)		(2.34)	(6.73)	(7.98)	(2.11)	(6.63)
Vap_turn		0.0010**					
		(2.02)					
CPI_score	0.0092***						0.0114***
	(6.76)						(4.89)
Corruption		0.0518***					
		(3.36)					
military_politic			0.0142	0.0204	0.0347***	0.0211	
			(1.03)	(1.61)	(3.19)	(0.92)	
Democrat_Account				0.0428***			
				(3.17)			
Govern_stab					0.0188***		
					(2.92)		
Union_member	0.1759***	(0.6609***	0.3844***	0.2271***	0.1760***	0.5722 ***	0.2179***
	(2.92)	(4.00)	(5.33)	(3.14)	(3.18)	(3.63)	(2.84)
Log likelihood	45.92	36.99	39.42	43.23	41.79	27.80	45.92
Nbre obs.	111	143	143	143	143	143	111

(*) and (**), (***) significance of the coefficients associated with the variables at 10%; 5% and 1% respectively. The numbers in bold represent the coefficients and those in parentheses represent Student's T.
Source: Author

As can be seen, the coefficient of democratic participation is positive and significant in all alternative estimates, highlighting the positive effect of increased democratic participation on public sector efficiency. This result is consistent with the findings of previous studies (see Adam et al. 2011) and suggests that a higher degree of democratic participation encourages politicians to implement policies that improve efficiency and more the conditions of poorer categories of the population.

The coefficient associated with corruption is positive and significant at the 1% level in the alternative estimates. This result indicates that governments that have good control over corruption tend to be more effective. This result is in line with those of Herrera and Ouedraogo (2018) and Afonso et al. (2023). This result suggests that corruption reduces the public sector efficiency in SSA countries.

The coefficient associated with military involvement in political life is statistically significant only when included alongside the variable capturing government stability. This suggests that, in politically stable environments, military interference in the political arena may undermine the efficiency of public spending. Therefore, limited military involvement appears conducive to greater public sector efficiency, but only in contexts where a minimum level of political stability is ensured. Likewise, government stability and democratic accountability improve government efficiency. The coefficient associated with membership in a monetary union is positive and significant, indicating that it enhances the efficiency of public spending by enforcing strict budgetary rules, reducing borrowing costs, strengthening oversight, and stabilizing the currency.

Furthermore, a sensitivity analysis of the results (VI and VII) carried out with the Jackknife method shows that the results are substantially identical to the basic estimates (I and III). This method involves estimating the initial equation by excluding in each replication one cross sectional unit (country).

5. CONCLUSION

The objective of this article was first to measure the efficiency of the public sector and then to analyze the role of political determinants of public sector efficiency scores in SSA countries. To do this, the literature on the measurement of efficiency made it possible to retain the DEA and SFA models for measuring efficiency scores while the Tobit model was retained for the analysis of the determinants. Regarding the objective of economic performance, Mali had the highest average efficiency score (1) and South Africa had the lowest (0.79). When the government target is economic stability, the best performing countries are Burkina Faso, Cameroon, Congo Dem, Gabon, Mali, Niger and Senegal. The least performers are Angola, Botswana, Liberia, Madagascar and Sierra Leone. The results from the estimation of the Tobit model indicate that increased democratic participation and good control of corruption improve the efficiency of the public sector in SSA countries. Similarly, a decline in military intervention in political life improves the efficiency of the public sector.

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