ASSESSING THE EFFICIENCY OF TAX ADMINISTRATION IN AFRICA

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Introduction

- Even decades after political independence, African countries still seem to struggle to finance legitimate public spending needs
- Despite taxation being a viable tool to meet such needs, tax revenue as a percentage of GDP remains relatively low on the continent
- African tax authorities face pressure to become more efficient in generating revenue. However, empirical work on existing levels of efficiency is scant due to limited conceptualization of efficiency and a lack of cross-country comparable tax administrative data

Objectives

The paper uses data compiled by the African Tax Administration Forum (ATAF) for 27 African countries for the period 2012 to 2017 and three techniques - Data Envelopment Analysis (DEA), Stochastic Frontier Analysis (SFA) and Tobit Regression - to address the following objectives:

- Estimate the technical efficiency of tax administration in Africa
- Examine the factors that drive the technical efficiency of tax administration in Africa

Empirical techniques

Stochastic frontier analysis

$$Y_{it} = \alpha_i + \beta' X_{it} + v_{it} + \mu_{it}$$

Where: $Y_{it}$is tax to GDP ratio for administration $i$in year t, $\alpha_i$fixed effect, β'a vector of unknown parameters, X_{it}matrix of inputs, v_{it}stochastic error, μ_{it}inefficiency component

$$TE_{it} = \frac{exp(Y_{it})}{exp(\alpha + \beta' X_{it} + v_{it})} = \frac{exp(\alpha + \beta' X_{it} + v_{it} + \mu_{it})}{exp(\alpha + \beta' X_{it} + v_{it})} = exp(-\mu_{it})$$

Where: $TE_{it}$is technical efficiency

Note: This is a parametric estimation. The paper estimates all three distributions: Half normal, truncated and exponential.

Tobit regression analysis

Fy

$$Y_j^* = \beta' X_{jk} + \mu_i$$

Sts

$$y_i = \begin{cases} L & if\ Y_j^* \le L \\ Y_j^* & if\ L < Y^* < U \\ U & if\ Y_j^* \ge U \end{cases}$$

$y_i$represents observed dependent variable, X_{jk}vector of factors, $j$factors, $k$is the administration.

Note: The Tobit model is used since the dependent variable (efficiency score) is censored between 0 and 1.

Data envelopment analysis

$$Max h_k(u,v) = \frac{\sum_{r=1}^{s} u_r y_{rk}}{\sum_{i=1}^{m} v_i x_{ik}}$$

Subject to:

$$\frac{\sum_{r=1}^{s} u_r y_{rk}}{\sum_{i=1}^{m} v_i x_{ik}} \le 1\ \forall_j (j = 1, \dots, n)$$

$$v_i, u_r \ge 0\ \forall_{i,j,r}$$

$$\sum \frac{v_i}{u_r} = 1\ \forall_j$$

Technical efficiency is:

$$TE_k = \frac{1}{h_k}$$

Where: $x_{it}$is the i^{th}input of DMU $j$and $y_{rj}$is the r^{th}output of DMU j.Where $v_i$and $u_r$are weights and $k$is the DMU being examined and $h_k$is the objective function

Note: Estimation includes both constant and variable returns to scale

Table 1: Data – input, output and structural variables

Variable	Category	Method	Source
Tax revenue (% GDP)	Output variable	SFA/DEA	WB
Total operational cost	Input variable	SFA/DEA	ATAF
Number of taxpayers	Input variable	SFA/DEA	ATAF
Number of staff (ratio of working pop)	Input variable	SFA/DEA	ATAF
GDP per capita	Structural/Economic	SFA/Tobit	WB
Trade Openness	Structural/Economic	SFA/Tobit	WB
Agricultural Value Added	Structural/Economic	SFA/Tobit	WB
Income Inequality	Structural/Economic	SFA/Tobit	WB
Inflation Rate	Structural/Economic	SFA/Tobit	WB
Non-tax revenue (% GDP)	Structural/Economic	SFA/Tobit	WB
Population Density	Structural/Demographic	SFA/Tobit	WB
Population Growth	Structural/Demographic	SFA/Tobit	WB
Ratio of Urban Population	Structural/Demographic	SFA/Tobit	WB
Corruption Index	Structural/Institutional	SFA/Tobit	TI
Strategies for informal sector (dummy)	Structural/Administrative	SFA/Tobit	ATAF
Use of semi-autonomous structure (dummy)	Structural/Administrative	SFA/Tobit	ATAF
Strategies for HNWI (dummy)	Structural/Administrative	SFA/Tobit	ATAF

Table 2: Results of Tobit regression – determinants of efficiency

Variables	Efficiency Scores (DEA CRS)	Efficiency Scores (DEA VRS)
GDP per capita	0.014***(0.004)	0.032***(0.007)
Non-tax revenue	-0.034***(0.009)	-0.054***(0.015)
Trade openness	0.274***(0.021)	0.332***(0.036)
Population density	0.067***(0.008)	0.039***(0.013)
Agricultural Value Added	-0.069***(0.019)	-0.101***(0.032)
Corruption Index	-0.091*(0.054)	-0.159*(0.092)
Inflation rate	-0.054***(0.008)	-0.046***(0.014)
Inequality	0.002(0.017)	-0.002(0.029)
Population growth	0.166***(0.023)	0.135***(0.039)
Urban population ratio	-0.122***(0.021)	-0.090**(0.035)
Use of strategies for informal sector	0.038*(0.022)	0.067*(0.037)
Use of semi-autonomous structure	-0.168***(0.021)	-0.166***(0.036)
Use of strategies for HNWI	0.150***(0.038)	0.232***(0.065)
Observations	154	154

Table 3: Correlation between efficiency scores

	SFA (Half normal)	SFA (Truncated)	SFA (Exponential)	DEA (CRS)	DEA (VRS)
SFA (Half normal)	1				
SFA (Truncated)	0,9706***	1			
SFA (Exponential)	0,6244***	0,5500***	1		
DEA (CRS)	0,2532***	0,2431***	0,1237	1	
DEA (VRS)	0,2500***	0,2429***	0,1041	0,8938***	1

Table 4: Summary statistics of average efficiency scores

Variable	Obs	Mean	Std. Dev.	Min	Max
SFA (Half normal)	27	0,43	0,13	0,23	0,73
SFA (Truncated)	27	0,42	0,13	0,21	0,74
SFA (Exponential)	27	0,60	0,02	0,53	0,63
DEA (CRS)	27	0,53	0,17	0,20	0,95
DEA (VRS)	27	0,61	0,20	0,22	0,97

Conclusion

- On average, the efficiency scores show that many African tax administrations operate relatively inefficiently.
- African tax administrations could improve their performance by between 3% and 79% to reach their maximum capacity.
- Several factors affect the efficiency of African tax administrations including strategies that deal with the informal sector, segmenting taxpayers, and institutional reforms such as strengthening the partial autonomy of the tax administrations could improve their efficiency.