


TAXABLE CAPACITIES: HOW HAS ECONOMIC TRANSFORMATION AND RESOURCE DEPENDENCY WORK?

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ARTICLE INFO	ABSTRACT
<p>Article history:</p> <p>Received 29 May 2023</p> <p>Accepted 24 August 2023</p>	<p>Purpose: This paper examines the impact of economic transformation and natural resource dependency on the taxable capacity of SSA countries.</p> <p>Theoretical framework: This paper is based on positive tax theories which is concerned with who bears the burden of various taxes, and the incidence of a particular tax.</p>
<p>Keywords:</p> <p>Tax; Growth; Resources; STFA.</p> <div data-bbox="172 949 480 1189" style="text-align: center;">  </div>	<p>Design/Methodology/Approach: This paper employed Stochastic Tax Frontier Analysis (STFA) using annual data for thirty-three SSA countries for eighteen years that range from 2002-2019.</p> <p>Findings: Empirical findings from this study indicate that most Middle-Income Countries (for example, Botswana, Cameroun, Cote d' Ivoire, Lesotho etc) dominate the High Tax Performance category. This further confirm the positive and significant influence of real per capita income in the taxable capacity model of the SSA region as well as that of the MICs. However, exception to this trend is those of countries with relatively low per capita income (for example, Mali and Burundi) but operating near their tax potential, and with appreciable tax effort. The reason that may be attributed for this exception may be the rise of mining activities (though, this may not be enough to raise 30% of the countries' hydrocarbon revenue) by large companies.</p> <p>Research, Practical & Social implications: The construction and analysis of tax revenue performance matrix for the sub-Saharan Africa by this study have provided relevant information for sub-Saharan Africa countries in preparing for substantial fiscal independence and would give clear indications of the revenue productivity of existing taxes that may lessen the anxiety of the apparent fiscal deficit challenges faced by most SSA countries, and this will further provide policy directions for future tax reforms in the various countries of the region.</p> <p>Originality/Value: The originality of this study lies in its investigation of the taxable capacities; how has economic transformation and resource dependency works. Additionally, the study highlights the relevance of tackling regulatory issues to ensure the safe and effective use of taxable capacities.</p> <p>Doi: https://doi.org/10.26668/businessreview/2023.v8i9.2650</p>

CAPACIDADES TRIBUTÁVEIS: COMO FUNCIONAM A TRANSFORMAÇÃO ECONÔMICA E A DEPENDÊNCIA DE RECURSOS?

RESUMO

Objetivo: Este artigo examina o impacto da transformação econômica e da dependência de recursos naturais na capacidade tributável dos países com AAS.

Estrutura teórica: Este artigo é baseado em teorias fiscais positivas que está preocupado com quem suporta o peso de vários impostos, e a incidência de um determinado imposto.

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Design/Methodologia/Abordagem: Este artigo empregou a Análise de Fronteira Fiscal Estocástica (STFA) usando dados anuais para trinta e três países da SSA por dezoito anos que variam de 2002 a 2019.

Constatações: Os resultados empíricos deste estudo indicam que a maioria dos países de rendimento médio (por exemplo, Botsuana, Camarões, Costa do Marfim, Lesoto etc.) domina a categoria de alto desempenho fiscal. Isto confirma ainda a influência positiva e significativa do rendimento per capita real no modelo de capacidade tributável da região do REA, bem como do CIV. No entanto, a exceção a esta tendência são os países com relativamente baixo rendimento per capita (por exemplo, Mali e Burundi), mas que operam perto do seu potencial fiscal, e com esforço fiscal apreciável. A razão que pode ser atribuída a esta exceção pode ser o aumento das atividades de mineração (embora, isso pode não ser suficiente para aumentar 30% da receita de hidrocarbonetos dos países) por grandes empresas.

Investigação, Implicações práticas e Sociais: A construção e a análise da matriz de desempenho das receitas fiscais para a África Subsariana através do presente estudo forneceram informações relevantes para os países da África Subsariana, preparando-se para uma independência orçamental substancial, e forneceriam indicações claras da produtividade das receitas dos impostos existentes, que podem reduzir a ansiedade dos desafios do défice orçamental aparente enfrentados pela maioria dos países da África Subsariana, e isso proporcionará orientações políticas para futuras reformas fiscais nos vários países da região.

Originalidade/Valor: A originalidade deste estudo está na sua investigação das capacidades tributáveis; como funciona a transformação econômica e a dependência de recursos. Além disso, o estudo destaca a importância de abordar questões regulamentares para assegurar a utilização segura e eficaz das capacidades tributáveis.

Palavras-chave: Imposto, Crescimento, Recursos, STFA.

CAPACIDADES IMPONIBLES: ¿CÓMO HA FUNCIONADO LA TRANSFORMACIÓN ECONÓMICA Y LA DEPENDENCIA DE LOS RECURSOS?

RESUMEN

Objetivo: Este trabajo examina el impacto de la transformación económica y la dependencia de los recursos naturales en la capacidad imponible de los países ASS.

Marco teórico: Este artículo se basa en teorías fiscales positivas que se refieren a quién soporta la carga de varios impuestos, y la incidencia de un determinado impuesto.

Diseño/Methodología/Enfoque: En este trabajo se utilizó el Análisis Estocástico de Fronteras Fiscales (STFA) utilizando datos anuales para treinta y tres países del ASS durante dieciocho años que van desde 2002 a 2019.

Hallazgos: Los hallazgos empíricos de este estudio indican que la mayoría de los países de ingresos medios (por ejemplo, Botsuana, Camerún, Costa de Marfil, Lesoto, etc.) dominan la categoría de alto rendimiento fiscal. Esto confirma además la influencia positiva y significativa de la renta real per cápita en el modelo de capacidad imponible de la región del ASS, así como en el de los PRM. Sin embargo, se exceptúan de esta tendencia los países con ingresos per cápita relativamente bajos (por ejemplo, Malí y Burundi) pero que operan cerca de su potencial impositivo y con un esfuerzo fiscal apreciable. La razón que se puede atribuir a esta excepción puede ser el aumento de las actividades mineras (aunque, esto puede no ser suficiente para recaudar el 30% de los ingresos por hidrocarburos de los países) por parte de las grandes empresas.

Investigación, Implicaciones prácticas y Sociales: La elaboración y el análisis de la matriz de rendimiento de los ingresos fiscales para el África subsahariana que se hace en el presente estudio han proporcionado información pertinente para los países del África subsahariana en la preparación para una independencia fiscal sustancial y proporcionarían indicaciones claras de la productividad de los ingresos de los impuestos existentes que podrían reducir la ansiedad de los aparentes problemas de déficit fiscal que afrontan la mayoría de los países del ASS, y esto proporcionará nuevas orientaciones de política para las futuras reformas fiscales en los diversos países de la región.

Originalidad/Valor: La originalidad de este estudio radica en su investigación de las capacidades imponibles; cómo ha funcionado la transformación económica y la dependencia de los recursos. Además, el estudio destaca la importancia de abordar las cuestiones reglamentarias para garantizar el uso seguro y eficaz de las capacidades imponibles.

Palabras clave: Impuesto, Crescimento, Recursos, STFA.

INTRODUCTION

This study investigates how the taxable capacity of Sub-Saharan African (SSA) nations is impacted by macroeconomic variables and reliance on natural resources. The study used annual data for 33 SSA countries for 18 years, from 2002 to 2019, and the period and countries were chosen based on the data's availability. The countries were also fairly distributed among the SSA region's geographical zones, such as Western Africa, Southern Africa, Central Africa, and Eastern Africa countries, among others. Generally speaking in SSA, many resource-rich nations are characterised by significant reliance on natural resources and limited tax revenue capability. These nations experience unstable revenue because of the extreme volatility of commodity prices, particularly for energy commodities like oil and gas. In essence, tax revenue from these sources is similarly regarded as being quite unstable. According to Ghura and Pattillo (2012), fluctuating tax revenue resulted in procyclical government spending, which in turn caused fluctuating public spending. According to Mejia (2013), this unpredictability widens the gap between what the public expects the government to spend and what they really receive in terms of economic chances to improve their living situations. Evidence also demonstrates that many SSA countries' economies are suffering from resource dependency and a lack of tax revenue sources. (Frankel, 2012 ; Schoneveld & Zoomers, 2015).

In essence, a country's taxing capacity is seen as a long-term answer in high resource-dependent nations. Collaborations between the public and commercial sectors can be used to build this capacity. It is advised that the public sector expand in order to increase tax capacity through the creation of a national taxation system that lessens the reliance of the government on natural resource revenues. This essay looks at how resource dependence and economic growth have affected taxable capabilities in SSA. The outcomes and conclusions will throw light on the development of the private sector and the creation of a taxation system with the purpose of reducing reliance on the extraction of natural resources. This paper examines the effects of these indicators on lowering the degree of dependence on natural resources as well as economic growth because non-economic indicators of institutional quality and human development are likely to be crucial transmission channels from high resource dependence to economic diversification. Because of the volatility in the prices of resources and related commodities, there is reason to think that a nation with a lot of reliance on resource income won't be able to maintain economic stability for very long. Studies by Pagano and Hoene (2010), Shi and Tao (2018), and others demonstrate that encouraging taxable capabilities results in less fluctuation in revenue. Their findings demonstrate that as the public sector develops,

particularly through privatisation and the establishment of national taxation systems, the degree of dependence on natural resource revenue decreases. In addition, the effectiveness of institutions and the level of human development play a crucial role in minimising this dependence and determining how quickly nations reach their ideal level of tax-generating potential. These are the empiric contributions that this work makes. In order to represent the stochastic tax frontier analysis of the degree of dependence on natural resources.

In addition to the preceding work by Besley and Persson (2014), our method offers fresh empirical estimates. We differ from previous research in two ways: (i) we use a database that covers a significantly wider range of nations and years, and (ii) we employ stochastic tax frontier analysis (STFA) to nimbly estimate the reduced-form relationship between tax rates and subsequent growth. In particular, we estimate a growth tipping point using a regression discontinuity design model. We concentrate on tax income since research has shown that other revenue streams are not significantly linked to economic growth. When compared to non-resource-rich countries, countries with an abundance of natural resources frequently have a history of comparatively low economic performance, as shown by Arezki et al. (2011). There are disagreement over how taxable capacity affects growth. Some contend that government help has hurt developing nations over the years, while others think tax levels have been too low (IMF, 2015).

LITERATURE

The Doing Business Reports of 2018, indicates the areas in which sub-Saharan African countries have made paying taxes less costly or costly by their respective tax reforms exercise (see Table 1)

Table 1: Tax reforms and the ease of tax payments in selected sub-Saharan Africa economies

Economy	Some tax reform(s) efforts
Burkina Faso	Abolition of separate capital gains tax on real estate's properties
Burundi	Reduction of corporate income tax rate
Congo, Democratic Republic	Simplification of corporate income tax return, and abolition of minimum tax payable depending on company's size
Congo, Republic	Abolition of the rate on the rental business premises and the tax on company-owned cars.
Cote d' Ivoire	The increment in employers' contribution rate to social security, and the abolition of myriad of tax reliefs for businesses
Gabon	Introduction of electronic tax collection system, and also, the reduction of corporate income tax rates.
Gambia	Replacing sales tax with the VAT.
Kenya	Increment of employers' Social Security Contribution rate.
Madagascar	Training taxpayers in the use of online system for VAT declarations

Mauritania	Introduction of a new health insurance contribution for employers that is levied on gross salaries.
Namibia	Introduction of a new vocational education and training levy.
Rwanda	Rolling out its electronic filing system to the majority of businesses, and the reduction of property tax rate and business trading license fee.
Senegal	Abolition of the vehicle tax, and also provided an access to an on-line declaration forms for VAT online.
Seychelles	Reduction of business tax rate applicable to income above one million, and the introduction of an electronic tax payment system.
Sierra-Leone	Introduction of capital gains tax.
South Africa	Replacement of the secondary tax on companies with a dividend tax borne by Shareholders.
South Sudan	Increment of corporate income tax rate.
Swaziland	Reduction of corporate income tax rate.
Tanzania	Introduction of an excise tax on money transfers, and the reduction of the rate for skill and development levy.
Togo	The downward review of the payroll tax rate, and the increment of corporate income tax rate and employers' social security contribution rate
Zambia	Abolition of the medical levy and the introduction of an online system for filing corporate income tax, VAT etc

Source: Authors' compilation using information from Doing Business Database, 2023.

The post filing index in Table 2 was based on four equally weighted components, which include: the time it will take to comply with VAT refund (hours), the time it will take to obtain a VAT refund (weeks), time to comply with Company Income Tax (CIT) audit (hours) and the time to complete the CIT audit (weeks). The simple average of these four indicators gives the overall average of the DTF score.

The DTF score is important to tax analysis because of its relevance in the measurement of the performance of tax administration across different functions. The European Union has the highest DTF scoring, and this indicates that European Union has the most efficient tax administration followed by North America. However, the DTF score of the Africa region is about 55.3, indicating a moderately efficient tax administration of the tax systems operational in the countries that make up the region.

The Paying Taxes Analysis by PWC in 2018 reports that Africa have the highest number of tax payments components and the second highest total tax and contribution rate for 2016. The Africa region's below average post-filing score is driven down by a handful of very poor performing economies. Also, Africa's largest number of payments – profit taxes (3.7), labour taxes (14.6) and other taxes (17.1) followed by Central America and Caribbean – profit taxes (4.6), labour taxes(11.3) and other taxes(15.3) reflect the limited use of electronic filing and payment in both regions compared to those of European Union, North America, Central Asia and Eastern Europe, Middle East, Asia Pacific and South America.

Lahrlid and O'Donovan (2016) explain that the likely ways of combating informalities in tax payments in sub-Saharan Africa countries is by concentrating on active penalties as well as enhancing detection and enforcement rates. Furthermore, they identify the various measures of combating the informal economy from the taxpayer perspectives in Table 3. The effective implementation of these issues reported and explained in Table 3 will further expand the taxable capacity of the SSA region, and the taxable base of indirect taxes in the region will be further broadened.

Table 2: Taxpayer-centric perspectives on the informal economy

Taxpayers' Perspective	Measures to combat the informal economy
Reduce costs of formalisation	In order to reduce the cost of formalizations, measures that will improve tax policy and administration should be instituted. Also, taxpayer service and wider business environment should be adopted
Enhance deterrence	Measures that will improve detection and enforcement should be instituted. Also, there should be a frequent review of penalty regime that will combat corruption in tax revenue collections.
Increase benefits of formalization	Measures that will ensure access to rights of property owners as well as contract enforcements, welfare entitlements, and access to finance/business support should be instituted.
improve tax morale	Policies that will minimize inefficiencies of the use of fiscal resources, provide high quality social goods and services, and bring about increased tax compliance in the population as a whole should be encouraged.

Source: Author's compilation, 2023

Torrance and Morrisey (2014) opine that tax effort indices less than one implies that the country is exploiting its tax capacity less than the average, while a ratio greater than unity suggests that the country is exploiting its tax capacity greater than the average. More specifically, Garg, Goyal and Pal (2014) asserted that a low tax effort simply signifies that a particular state or country has not utilized its tax potential or capacity fully relative to that of other states or countries vice versa.

Some of the previous studies that approached the construction of tax effort indices more accurately, include: Challiah, Baas and Kelly (1975); Soumadi et al., 2023; Ramkumar et al., 2023; Stotsky and WoldeMariam, (1997); Piancastelli (2001); Le, Moreno-Dodson and Rojchaichanthorn (2008); Rabiei and Balagetabi, (2013); Castro and Camarillo, (2014). These studies explained that tax effort indices are obtained by dividing a country's actual tax revenue by her predicted tax revenue or the potential collection at efficiency frontiers.

Martinez-Vazquez, Vulovic and Liu, (2011) explained that the factors determining tax shares in both developed and developing countries are classified as 'demand' factors and 'supply' factors. Thus, the demand factors simply represent those factors that 'pull the level of certain taxes or the overall budget constraint of the public sector.

The analysis of the tax revenue collection potential of a country according to Musgrave (1987) requires some fundamental features. According to him, these features include: the level of development (which can be measured with per capita GDP); the availability of “tax handles”; the political will to apply taxes broadly; and the capacity of the judiciary to ensure that taxpayers comply with tax laws. These factors identified are critical to evaluating the taxable capacity of the economy of the country.

Positive tax theories are concerned with who bears the burden of various taxes, and what is the incidence of a particular tax. In a related development, the normative tax theory fundamentally uses the combination of positive tax theory on the effects of tax changes, as well as the ethical criteria for the evaluation of these effects, to assess the overall performance of the tax system. (Burgess & Stern, 1993).

Atkinson and Stiglitz (1976) created a broader framework for analyzing the interaction between different kinds of taxation. They extended the Ramsey formula for optimal excise taxation to include vertical equity objective. To this end, they gave an algebraic analysis of the tax model. According to them, if X_i are the individuals purchases of commodity i , then a general tax system will then have as a relationship between potentially observable characteristics, X_i, Y and W , and his or her tax payments can be described as:

$$T = T(X, Y, W) \quad (1)$$

Equation (1) simply indicates a tax system that possesses a higher degree of linear separability in practice, because nonlinear and non-separable tax systems have higher cost of calculating tax liabilities as well as significantly higher costs of record-keeping and enforcement. The framework fundamentally show that the theory of optimal taxation must be concerned with the choice of tax base as well as the structure of taxes imposed. By extension, they also considered excise taxes and distribution like other optimal taxation theorist using a well- behaved utility function aimed at maximizing a social welfare function. Equation 1 will form the basis for our model specification.

THEORETICAL FRAMEWORK AND METHODOLOGY

This study adopts the Stochastic Tax Frontier Analysis (STFA) based on the Stochastic Frontier Analysis (SFA) of Aigner, Lovell and Schmidt (1977) and Meeusen and Van de Broeck (1977) which were extended to a panel data framework, using the Maximum Likelihood

estimation technique. However, the model specification for this study relies on the tax analytical model of Atkinson and Stiglitz (1976) with significant modifications. The STFA approach is best suited for achieving this study because it enables us to define the maximum amount of tax revenue that the SSA countries could mobilize at a given point in time, given her prevailing economic and demographic characteristics.

In order to achieve this objective, the Researcher assumed a world of no inefficiency, and that tax administration in country i can raise tax revenue $q_i = f(Z_i, \alpha)$. The SFA assumes that tax administration potentially raises less tax revenue in the event of inefficiency (ξ_i), and technically. When $\xi = 1$, it means that tax administrations in the SSA countries are mobilizing the optimal amount of tax revenues, using her available inputs (Z_i) (for example, economic and demographic factors) to define tax bases and tax revenue function $f(Z_i, \alpha)$. In addition, we assumed that the function $f(Z_i, \alpha)$ is linear in logs, and that k inputs define the countries tax bases, and defines $\mu_i = -(\xi_i)$. Hence, the basic Stochastic Tax Frontier Model of the SSA countries in a panel data framework for the study is given as:

$$q_{i,t} = \alpha_0 + \sum_{i=1}^k \alpha_i Z_{i,t} + v_{i,t} - \mu_{i,t} \quad (2)$$

Where:

$q_{i,t}$ represents tax revenue to gross domestic product ratio for country i at time t , that is the actual maximum tax revenue collected given her countries' economic and demographic settings. Therefore, without inefficiencies in tax administration the SSA countries could raise $(q_{i,t}) = f(Z_{i,t}, \alpha)$, but in the event of potential inefficiencies, tax administration would only raise $(q_{i,t}) = f(Z_{i,t}, \alpha)\xi_i$.

To broaden our analysis including the likely empirical evidence of natural resource dependency, we created a dummy variable (oil) to distinguish the major oil exporting countries (Angola, Cameroun, Chad, Congo Republic, Gabon and Nigeria) in the SSA region. This differentiated treatment of the oil exporting countries from other countries is due in part to determine the potential for domestic tax revenue mobilization that is not dependent on oil-related activities.

From our model specification, $Z_{i,t}$ represents a set of variables affecting SSA countries' tax effort and tax potential. In this study, we categorize these variables into economic factors

($ECONS_{i,t}$) and demographic factors ($DEMOG_{i,t}$). The economic factors are: Real *per capita* gross domestic product ($rgdppc$), share of agriculture in gross domestic product (agr_gdp), trade openness ($open$), inflation rate ($infl$), public debt ($pdebt$), government expenditure to gross domestic product ratio ($gexpr$), private sector credit percentage of GDP (psc), aid (net official development assistance received as percentage of gross national income) (aid), natural resource rent as percentage of GDP ($nresd$). The demographic factors are: agedependency ratio ($adpr$), the share of urban population in total population i.e the degree of urbanization ($durb$) and population density ($popde$).

Furthermore, α_i denotes the vector of unknown parameters. Also, we assumed that the idiosyncratic error component, v_i , is independently $N(0, \sigma_v)$ distributed over the observations, while, the inefficiency term μ_i is assumed to be independently half - normally $N^+(0, \sigma_u^2)$ distributed. The μ_i may also be assumed to be exponentially distributed with variance, σ_u^2 .

RESULTS AND DISCUSSION

Stationarity and Cointegration Tests

The stationarity test for this study follows the heterogeneous unit root processes (IPS and ADF-F), though, the homogeneous unit root process (LLC) results is reported alongside for completeness. The results show that the variables have first - order integration, and hence, the panel estimations exhibit both common and individual unit root processes. The panel co - integration tests show evidence of a co-integrating relationship among the variables employed the taxable capacity models. Hence, the result from co-integration testing supports panel pooling procedures for estimation in this study.

Table 3: Heterogeneous

	Null hypothesis: Assumes individual unit root process							
	IPS				ADF- F			
	I(0)		I(1)		I(0)		I(1)	
	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.
Tax Revenue(% GDP)	-1.09**	0.03	-5.20***	0.01	71.20**	0.01	128.41***	0.00
Real GDPpc	-1.21	0.73	-3.21***	0.03	42.11	0.61	112.30***	0.00
Agric. Value Added	-0.92*	0.07	-4.12***	0.01	93.01***	0.01	126.21***	0.00
Trade Openness	-2.36***	0.02	-6.31***	0.00	84.12***	0.00	154.12***	0.00
Govt. Exp.(%GDP)	-0.40	0.36	-5.11***	0.00	62.46	0.20	142.12***	0.00
Private Sect. Credit	-2.25	0.51	-2.01***	0.00	31.11	0.21	985.69***	0.00
Aid	-3.42***	0.00	-7.81***	0.00	29.16***	0.00	104.12***	0.00
Natural Resource Rent	-1.13	0.10	-3.10***	0.04	10.02	0.14	117.24***	0.00
Inflation	3.11	0.68	-1.24***	0.01	37.28	0.82	96.05***	0.00

Public Debt	1.67	0.77	-1.05***	0.01	23.06	0.99	125.72***	0.00
Population Density	-3.19***	0.00	-16.2***	0.02	128.21***	0.01	142.02***	0.00
Age Dependency Ratio	2.64	0.89	-0.82*	0.06	27.46	1.00	113.33***	0.00
Degree of Urbanization	9.12	0.99	-3.21***	0.00	25.68	0.73	126.13***	0.00

LLC : Levin, Lin and Chu t* ; IPS = Im, Pesaran and Shaw W-stat, ADF - F: Augmented Dickey Fuller-Fisher Chi-Square, PP - F = Phillips Peron -Fisher Chi - Square; stat. = statistics; prob. = probability. *** 1%; **5%; *10% Significant levels

Source: Author's compilation, 2023

Table 4: Heterogeneous - Pedroni: Series

Statistics	Macroeconomic Variables		Public Sector Variables		Demographic Variables	
	stat.	prob.	stat.	prob.	stat.	prob.
Within Dimension (Common AR Coef.)						
panel v-statistics	17.23	0.00***	12.02	0.00***	11.73	0.00***
panel rho – statistics	-4.5	0.00***	-3.15	0.00***	-2.1	0.00***
panel PP – statistics	-16.82	0.00***	-1.26	0.00***	-3.4	0.00***
panel ADF statistics	-2.5	0.00***	-0.32	0.03	-3.1	0.00***
Between Dimension (Individual AR Coefs.)						
Group rho statistics	-5.12	0.00***	-6.64	0.00***	-5.71	0.00***
Group PP statistics	-18.23	0.00***	-11.68	0.00***	-13.99	0.00***
Group ADF statistics	-1.82	0.00***	-2.02	0.02**	-5.58	0.00***

Stat. = statistics; prob. = probability. *** 1%; **5%; *10% Significant levels.

Source: Authors Computation, 2023

Taxable Capacity Models

This analysis provided better understanding of which countries are near their taxable capacity and which are far from it, and therefore, could increase their tax revenue. The differentiated treatment of the oil exporting countries from other countries is done in part to determine the potential for domestic tax revenue mobilization that is not dependent on oil-related activities, as these are highly dependent on the development in the international oil markets. Moreover, the differentiation becomes also necessary because the high level of oil revenue as percent of GDP of the Oil-exporting countries makes it very difficult to compare their tax potential and tax effort with those of other countries.

Table 5: SFT Parameters: Main Statistics and alternative specification indicators of SSA

variables	Battese and Coelli Decay Models								
	General Baseline			Specific Baseline					
	Model 1			Model 2			Model 3		
	coef.	st. error	p-value	coef.	st.err or	p-value	coef.	st. error	p-value
Constant	1.266***	0.169	0.000	1.731***	0.159	0.000	1.210***	0.294	0.000
agriculture value added	-0.011***	0.003	0.000	-0.017***	0.002	0.000	-0.021***	0.001	0.000
Real GDP per capita	0.012***	0.002	0.002	0.010***	0.005	0.000	0.013***	0.001	0.000
Trade Openness	0.002***	0.001	0.000	0.001***	0.001	0.000	0.001***	0.001	0.010
Inflation(annual CPI, %)	-0.006*	0.002	0.074	0.001	0.006	0.120	0.001	0.001	0.315
Private Sector Credit (%GDP)	0.001***	0.001	0.000	0.001***	0.003	0.000	0.001***	0.001	0.001
Public Debt	-0.009***	0.003	0.017	-0.004***	0.004	0.000	-0.005***	0.003	0.004
Government Expenditure (% GDP)	0.004***	0.001	0.000	0.005***	0.003	0.000	0.006***	0.001	0.000
Aid (Net ODA Received, %GDP)	-0.007***	0.002	0.007	-0.006***	0.001	0.007			

Natural Resource Rent (% GDP)	-0.012***	0.001	0.000	-0.004***	0.001	0.000			
Population Density	-0.002***	0.002	0.000	-0.021***	0.001	0.024	-0.010***	0.001	0.000
Age Dependency Ratio	-0.116***	0.033	0.000	-0.117***	0.021	0.000	-0.141***	0.053	0.000
Degree of Urbanization	-0.003***	0.001	0.000	-0.001**	0.001	0.058	-0.001***	0.001	0.014
Oil (Dummy)				-0.213***	0.016	0.000	-0.154***	0.014	0.000
Stochastic Models' Diagnostic Statistics									
Wald(Chi,2)	998.020***		0.001	1862.110**		0.001	1425.930**		0.000
Log Likelihood	-68.226		0.000	-53.113			-72.031		
Inefficiency component(sigma_u)	0.572***	0.101	0.000	0.515***	0.213	0.000	0.580***	0.320	0.001
Idiosyncratic component(Sigma_v)	0.211***	0.024	0.000	0.132***	0.012	0.000	0.127***	0.015	0.000
Signal - to - Noise Ratio	3.218***	0.201	0.000	2.901***	0.116	0.000	3.071***	0.125	0.000

Source: Authors' Computation, 2023. *** 1%; **5%; *10% Significant levels. Coef. = coefficient, st. error = standard error and p-value = probability value

Our baseline specification for the study is model 1, while models 2 and 3 take the distinction between natural resource and non-natural resource economies into consideration. Specifically, model 3 excludes aid (net ODA received) and natural resource rent (percent of GDP) to determine the tax potential and tax effort of respective countries without external financing (for example, aid inflows) and rents from hydrocarbons and non- hydrocarbon natural resources.

The signal-to-noise ratio parameters for the models are quite large and statistically significant at 1 percent significance levels, implying the rejection of the null hypotheses of no technical inefficiencies in the tax administration of the SSA region. However, the signal-to-noise ratio became significantly higher with the inclusion of the oil dummy in our baseline specification, and this may suggest higher inefficiency in the mobilization of tax revenue when our sample includes oil exporting countries. The findings of the statistical significance of the signal-to-noise ratios is consistent with the studies of Pessino and Fenochietto (2013); Langford and Ohlenburg (2015).

As expected, agriculture value added, inflation (CPI), public debt, aid, natural resource rent, age dependency ratio, population density and oil (dummy variable) are negative and statistically significant at 1, 5 and 10 percent significant levels respectively. However, the negative and statistically significant coefficient of natural resource rent (percent of GDP) is consistent with the finding of Arezki et al (2011) states that the revenue from hydrocarbons hinders incentives to tax revenue mobilization. This result shows that SSA countries with high dependency on oil have less inclination for tax revenue mobilization, and this implies that little of the countries' taxable capacity are exploited, and this often have dire consequences for the countries' economic growth when faced with shocks in international oil markets.

Tax Potential and Tax Effort Construction and Analysis

In this section, we determined the tax potential and tax effort of the sub-Saharan Africa region and those of the different groups in the region. In addition, the individual country's tax potential and tax effort were also determined. The choice of models for the construction of tax effort and tax potential are based in part to the statistical and econometric performance of the model.

This study conducted the inter-country comparisons of the tax effort indices, and an index in excess of unity is considered to be making appreciable effort in the collection of taxes, and their fiscal problems, if any could be adduced to other factors. Those well below unity are expected to re-engineer their tax collection efforts.

In Table 6, we reported tax gaps of the thirty-three SSA countries for three separate models. This is to ascertain if the tax gaps changes drastically over the years or remain stable. According to our findings, 29 out of the 33 countries (in terms of models 1 and 3) keep tax gaps with the same sign(that is, negative tax gaps), implying that about 87.88 percent of the observation do not change (except for countries with positive tax gaps, like, Botswana, Burundi, Lesotho and Mali in model1, and Botswana, Cameroun, Cote d' Ivoire and Lesotho in model 3) over the period under review, while, in model 2, 29 out 33 countries (except for that of Botswana, Burundi, Cameroun, Lesotho) have negative tax gaps. These results suggested that our estimations of tax potential and tax effort models are stable and robust, and does not provide inexplicable or drastic variations. However, oil-exporting countries have relatively low tax effort indices in our baseline equation (except for that of Gabon), and there were appreciable tax effort indices with the distinction of the natural resource dependent and non-natural dependent economies, except for Chad, Nigeria and Republic of Congo that still maintain relatively low tax effort indices.

Table 6: Tax Potential, Tax Effort and Tax Gap in sub-Saharan African Countries.

S/N	Country	Rankings						Tax - to - GDP ratio	Stochastic Frontier Models								
		Model 1		Model 2		Model 3			Model 1		Model 2		Model 3		Tax Gap in SSA Countries		
		Tax Pot.	Tax Effort	Tax Pot.	Tax Effort	Tax Pot.	Tax Effort		Tax Pot.	Tax Effort	Tax Pot.	Tax Effort	Tax Pot.	Tax Effort	Model 1	Model 2	Model 3
1	Angola**	32	19	31	12	31	13	8.146	10.092	0.839	9.561	0.885	9.568	0.889	-1.946	-1.415	-1.422
2	Benin	12	7	12	10	13	9	16.199	17.080	0.952	18.011	0.902	17.027	0.954	-0.881	-1.812	-0.828
3	Botswana	6	3	6	3	5	3	27.466	25.789	1.082	26.573	1.046	26.607	1.053	1.677	0.893	0.859
4	Burkina Faso	18	16	19	21	19	19	12.457	14.760	0.847	15.572	0.801	15.444	0.805	-2.303	-3.115	-2.987
5	Burundi	27	1	24	2	22	4	13.255	11.340	1.194	12.297	1.093	13.316	1.018	1.915	0.958	-0.061
6	Cameroun**	21	21	28	4	30	2	11.164	13.982	0.799	11.109	1.005	9.587	1.165	-2.818	0.055	1.577
7	Central Afr. Rep	31	22	30	22	29	23	8.219	10.499	0.790	10.314	0.800	11.286	0.735	-2.280	-2.095	-3.067
8	Chad**	28	31	32	26	32	25	5.286	11.245	0.534	9.377	0.646	8.637	0.674	-5.959	-4.091	-3.351
9	Comoros	23	12	23	13	26	11	11.124	12.772	0.879	12.910	0.866	12.592	0.893	-1.648	-1.786	-1.468
10	Congo Dem. Rep.	25	28	21	32	17	32	6.968	11.955	0.582	14.266	0.482	15.970	0.424	-4.987	-7.298	-9.002
11	Rep. of Congo**	30	23	29	24	23	28	7.625	10.685	0.746	10.484	0.758	13.090	0.594	-3.060	-2.859	-5.465
12	Cote d' Ivoire	15	5	15	7	18	5	15.690	15.845	0.991	16.936	0.927	15.649	1.004	-0.155	-1.246	0.041
13	Gabon**	26	6	25	11	24	18	10.890	11.412	0.959	12.258	0.891	12.951	0.841	-0.522	-1.368	-2.061
14	Ghana	16	14	18	19	14	20	13.140	15.249	0.864	16.220	0.812	16.998	0.775	-2.109	-3.080	-3.858
15	Guinea	19	9	17	16	11	21	13.512	14.535	0.940	16.344	0.831	18.009	0.751	-1.023	-2.832	-4.497
16	Guinea Bissau	29	30	27	30	27	31	6.166	11.130	0.562	11.369	0.548	12.331	0.501	-4.964	-5.203	-6.165
17	Kenya	10	18	10	15	10	17	15.325	18.252	0.841	18.403	0.833	18.097	0.848	-2.927	-3.078	-2.772
18	Lesotho	1	2	1	1	1	1	47.175	39.967	1.191	41.098	1.166	40.221	1.184	7.208	6.077	6.954
19	Madagascar	11	29	11	29	12	29	10.231	17.862	0.573	18.358	0.557	17.934	0.571	-7.631	-8.127	-7.703
20	Malawi	14	10	16	9	20	8	14.955	15.898	0.938	16.390	0.910	15.355	0.972	-0.943	-1.435	-0.400
21	Mali	20	4	20	5	21	6	14.515	14.424	1.020	15.527	0.942	14.739	0.989	0.091	-1.012	-0.224
22	Mauritius	5	25	5	25	6	24	18.378	28.058	0.658	28.248	0.653	26.146	0.707	-9.680	-9.870	-7.768
23	Mozambique	9	26	9	27	9	26	13.195	20.229	0.657	20.891	0.633	20.454	0.646	-7.034	-7.696	-7.259
24	Namibia	3	8	3	8	4	7	27.974	29.857	0.942	30.874	0.911	28.772	0.979	-1.883	-2.900	-0.798
25	Nigeria**	33	32	33	28	33	27	4.409	8.896	0.532	7.493	0.628	7.415	0.607	-4.487	-3.084	-3.006
26	Rwanda	22	17	22	17	25	15	11.117	13.189	0.844	13.578	0.821	12.843	0.867	-2.072	-2.461	-1.726
27	Senegal	7	15	8	20	8	16	18.033	21.227	0.850	22.484	0.802	20.920	0.863	-3.194	-4.451	-2.887
28	Seychelles	2	20	2	18	2	10	31.548	38.449	0.834	39.219	0.818	35.759	0.897	-6.901	-7.671	-4.211
29	Sierra Leone	24	24	26	23	28	22	8.886	12.222	0.734	11.792	0.760	11.932	0.749	-3.336	-2.906	-3.046
30	South Africa	4	11	4	6	3	14	26.875	29.336	0.918	28.969	0.928	30.968	0.870	-2.461	-2.094	-4.093
31	Tanzania	8	33	7	33	7	33	8.995	21.162	0.424	22.719	0.395	22.122	0.405	-12.167	-13.724	-13.127

32	Togo	13	13	14	14	15	12	14.655	16.756	0.875	17.162	0.854	16.455	0.890	-2.101	-2.507	-1.800
33	Uganda	17	27	13	31	16	30	9.253	15.121	0.612	17.459	0.530	16.402	0.564	-5.868	-8.206	-7.149
	SSA Region							14.631	17.558	0.818	18.008	0.801	17.745	0.809	-2.927	-3.377	-3.114

Source: Author's Computation, 2023. Model 1: Without Oil (Dummy variable), Model 2: With Oil (Dummy variable), Model 3: With Oil (Dummy variable) and without non – tax incomes (ODA received +natural resource rents)** oil exporting countries.

We provided summary of the average tax - to - GDP ratio, tax frontier and estimated tax effort for low income - and middle-income countries in the SSA region to ascertain the influence of income effect on the overall tax revenue performance of the region. Apparently, tax ratios are much smaller on average in the low-income countries (about 11.055) compared to that of the middle-income countries (about 18.923). Our findings are consistent with the studies that conclude that tax effort is often higher in countries with higher per capita income (see Teera and Hudson, 2004; Fenochietto and Pessino, 2013 and Langford and Ohlenburg (2015).

Table 7: Countries' Tax Potential, Tax Effort and Tax Gaps by Country Income Group in the SSA region

Countries' Group	Tax-to-GDP ratio	per capita GDP '2005(\$)
Low Income	11.055	510.021
Middle Income ⁺	18.923	4026.015

Source: Author's Computation, 2023. Model 1: Without Oil (Dummy variable), Model 2: With Oil (Dummy variable), Model 3: With Oil (Dummy variable) and without non – tax incomes (ODA received + natural resource rents).

CONCLUSIONS

The specific policy implications drawn from the study include:

- (i) A major issue for policy reference is the negative and significant impact of the oil (dummy variable) on taxable capacity of the SSA countries. This finding is suggestive of the little or no inclination of countries with relatively large oil production/reserve to embark on tax collection drive.
- (ii) Empirical findings from this study indicate that most Middle-Income Countries (for example, Botswana, Cameroun, Cote d' Ivoire, Lesotho etc) dominate the High Tax Performance category. This further confirm the positive and significant influence of real per capita income in the taxable capacity model of the SSA region as well as that of the MICs. However, exception to this trend is those of countries with relatively low per capita income (for example, Mali and Burundi) but operating near their tax potential, and with appreciable tax effort. The reason that may be attributed for this exception may be the rise of mining activities (though, this may not be enough to raise 30% of the countries' hydrocarbon revenue) by large companies.

In the recent past, the issue of tax revenue mobilization has been of interest to governments of developing and developed countries. However, the major points of emphasis in tax revenue mobilization discourse for most SSA countries is the curtailment of fiscal deficits and the overall improvement in the development of the countries in the SSA region. Arising

from our empirical results, economic and demographic factors contribute significantly to the determination of taxable capacity of SSA countries. Also, in relation to our tax performance progress matrix for the study, our empirical findings showed that there are relatively few numbers of the SSA countries at the High Tax Performers' (HTPs) category of the tax performance progress matrix. The governments of the SSA region should establish the necessary preconditions for the effective and efficient administration of the region's tax system

On the average, countries in the SSA region should implement the following specific policy recommendations: (i) International organizations like the IMF should provide technical assistance to the tax authorities of the SSA countries to ensure more effective regime for taxing mining rent so that taxes from the oil and gas will not solely dominate the resource tax revenues. (ii) The governments of the SSA countries should make policy decisions that will encourage regional co-ordination in terms of tax exemptions and international tax rules. This policy choice is to allow the countries (especially LICs) avoid the classic "beggar-thy-neighbour policy" problem.

(iii) The governments of the region should create macroeconomic environment that will allow for economic efficiency, and increase job creation to further expand the taxable base of the region.

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