Corruption, Governance and Tax Revenue Performance in Sub-Saharan Africa

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Abstract
Many developing countries, particularly those in Sub-Saharan Africa (SSA), are facing the problem of low tax revenue, and institutional challenges such as a high level of corruption. This paper examines the impact of corruption and five other indicators of governance on tax revenue performance in Sub-Saharan African countries. A dynamic panel data modelling approach is used as against the static approach used by most of the earlier studies. The findings show that out of the governance indicators considered, only corruption has a significant impact on tax revenue performance, while the effects of the other indicators (political stability and absence of violence, rule of law, government effectiveness, regulatory quality and voice accountability) are not statistically significant.

Keywords: Tax Revenue, Corruption, Governance, Sub-Saharan Africa
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1. Introduction

Tax is a primary and most sustainable source of revenue for governments. Through taxation, needed funds are raised for the state to meet its basic obligations to citizens (Mahdavi,2008; Kassim, 2016). The growth and development of any country largely depend on the size of tax revenue it generates for the provision of infrastructure (Worlu & Nkoro, 2012). Unfortunately, low tax revenue is one of the most critical challenges facing countries in Sub-Saharan Africa (SSA) (Bertinelli & Bourgain, 2016). Efforts made by many of these countries to increase the tax component of their revenue profiles have not yielded appreciable result. For example, as at 2015, tax revenue as a percentage of gross domestic product (GDP) stood at 6 percent for Nigeria, 5.7 percent for Angola and 4.2 percent for Chad. The average tax revenue as a percentage of GDP for countries in Sub-Saharan Africa stood at 15 percent, while it was 35 percent and 23 percent for countries in the European Union (EU) and Latin America respectively (WDI, 2015; Coulibaly & Gandhi, 2018).

Developing countries, particularly those in SSA, are also facing a myriad of institutional problems, including endemic corruption (Begum, 2007; Ajaz & Ahmad, 2010; Pontalar, Samimi & Roshan, 2010). Corruption encourages tax evasion by politically influential people. Politically influential individuals often collude with tax collectors to evade taxes completely or pay lower than the official rates to government, resulting in lower tax base and government revenue (Dia, 1996; Stasavage, 1999). Also, due to the high incidence of fraudulent practices in tax administration, many companies in SSA countries hardly pay the taxes they ought to pay. These practices include forgery of official documents (such as tax receipts), and manipulations in the issuance of tax clearance certificates as well as the collection and accounting of taxes (Muhrtala & Ogundeji, 2013). Thus, Alm, Martinez-Vazquez and McClellan (2014) opine that governments that seek to increase tax revenue must first work to ensure honest tax administration.

There exists a plethora of studies on tax revenue and its determinants (Ghura, 1998; Gupta, 2007; Mahdavi, 2008; Ajaz & Ahmad, 2010; Pontalar *et al.*, 2010; Bertinelli & Bourgain, 2016; Mawejie, 2019). Among those that focus on Sub-Saharan Africa, a few consider institutional variables of governance and corruption (Ghura, 1998), while others include economic and structural variables (Mahdavi, 2008; Bertinelli & Bourgain, 2016; Kassim, 2016). In terms of method of analysis, majority of the panel studies use static panel data analyses involving the use of pooled OLS, fixed effects and random effects models (Mahdavi, 2008; Bertineli & Bourgain, 2016). Findings from the previous studies show that both corruption and governance matter for tax revenue performance (Drif & Rawat, 2018; Epaphra & Massawe, 2017; Abebe & Fikre, 2020). Governance however has diverse indicators, such as political stability and absence of violence, rule of law, government effectiveness, regulatory quality and voice accountability. If it is agreed that governance matters, then which of the indicators matters for tax revenue performance in SSA?

Studies such as Lien (2015), Syadullah and Wibowo (2015), Epaphra and Massawe (2017), Drif and Rawat (2018), and Abebe and Fikre (2020) delve into the above question. However, none focuses on SSA countries only. For instance, Syhadullah and Wibiwo (2015) cover ASEAN countries, Drif and Rawat (2018) focus on emerging and growth-leading economies (EAGLEs), while Abebe and Fikre (2020) use a sample of developed and developing countries. These studies show that governance indicators

have significant effects on tax revenue, but the magnitude and nature of effect are not the same in groups of countries at different levels of development. For example, political stability has a significant positive impact on tax revenue in low-income countries, but not in high-income countries (Syadullah & Wibowo, 2015). One major gap from the previous studies is that none considers the effects of governance on SSA countries as an isolated group.

This study is thus an attempt to cover this gap in empirical literature by examining the impact of corruption and other governance indicators (political stability and absence of violence, rule of law, government effectiveness, regulatory quality and voice accountability) on tax revenue performance in Sub-Saharan African countries. A dynamic panel data modelling approach is employed to achieve the study objectives, as against the static approach used by most of the previous studies (e.g., Epaphra, & Massawe, 2017).

The paper is structured into five sections. This section contains the introduction. Section two reviews relevant literature. Section three presents the methodology. Section four provides and discusses the results. Section five concludes the paper.

2. Review of Literature

Institutional factors such as corruption and governance have been identified in literature to influence tax revenue in many countries (Bird, Martinez-Vazquez & Togler, 2004; Ajaz & Ahmad, 2010). Most countries with pervasive corruption and bad governance are also battling with low tax revenue (Bengum, 2007). Many empirical studies argue that corruption has a negative effect on tax revenue (Tanzi & Davoodi, 1997; Ghura, 1998; Gupta, 2007; Ajaz & Ahmad, 2010; Aghion, Akcigit, Cage & Willliam, 2016; Kassim, 2016; Drif & Rawat, 2018; Jahnke & Weisser, 2019; Abebe & Fikre, 2020). For example, Ghura (1998) finds strong statistical evidence that a rise in the level of corruption lowers the tax revenue-GDP ratio in a sample of 39 SSA countries. Attila **(**2008) observes that corruption has a direct negative effect on both tax revenues and public expenditure, while Jahnke and Weisser (2019) demonstrate that the harmful effect of corruption on tax revenue operates mainly through lowering taxpayers' morale to pay taxes. Similarly, Abdu, Jibril and Muhammad (2020) use firm-level dataset on SSA to show that corruption breeds a culture of non-compliant behaviour among taxpayers. On the other hand, Ajaz and Ahmad (2010) find good governance to be essential for appropriate planning and efficient revenue generation in a country. With good governance, the government would be able to get the priorities of citizens right, control corruption and provide what the citizens want. This will enhance citizens' trust in the government and encourage them to be tax-compliant. Thus, government tax revenue can be increased by improving the governance structure and controlling corruption (Ajaz & Ahmad, 2010; Alm *et al.*, 2014).

In addition to the institutional variables, the effects of the economic and structural factors on tax revenue have also been examined by a number of studies (Ghura, 1998; Tanzi & Davoodi, 2000; Bird *et al.*, 2004; Aizenman & Jinjarak, 2005; Gupta, 2007; Imam & Jacobs, 2007; Ajaz & Ahmad, 2010; Epaphra, 2014; Kassim, 2016; Epaphra & Massawe, 2017). The economic and structural variables considered include per capita GDP, share of agriculture in GDP, trade openness, foreign aids and foreign debts on tax revenue. Most of the studies reveal that an increase in foreign aids, relative share of old-age population, the degree of monetisation and the rate of inflation result in

lower tax revenue. Also, the share of agricultural value added and natural resource dependency have been found to have negative impacts on tax revenue (Aizenman & Jinjarak, 2005; Gupta, 2007; Mahdavi, 2008; Ajaz & Ahmad, 2010; Pontalar *et al.*, 2010; Drummond, Daal, Srivastava & Oliveira, 2012; Epaphra, 2014; Kassim, 2016). The reviewed literature suggest that very few studies have examined the influence of corruption and various institutional factors individually on tax revenue performance in a sample of Sub-Saharan African countries.

3. Methodology

3.1 Theoretical Framework and Empirical Model

The generic model for this study which is presented in equation (1) contains institutional, economic and structural variables, while the linear specification based on the specific measures of tax base, economic policies, structural variables, corruption and indicators of governance is presented in equation (2). The theoretical framework for the models specified in equations (1) and (2) is derived largely from the theoretical tax model developed by Heller (1975) and modified by Ghura (1998). The theoretical model used by these studies, as well as empirical literature including Ajaz and Ahmad (2010) show that institutional factors—corruption and governance—can influence tax revenue. Corruption is expected to have negative effect on tax revenue, while good governance is expected to improve tax revenue through increase in voluntary tax compliance and improvement in efficiency of revenue administration. Foreign aid as an explanatory variable is included in the model in line with McGillivray and Morrisey (2001). Other common economic and structural variables are included because of their theoretical and empirical roles in potential and actual tax revenue generation (Aizemman & Jinjarak, 2005).

$$\text{TRV} = f(\text{institutional factors, economic and structural variables}) \quad (1)$$

The relation in equation (1) can be expressed in a linear form as:

$$TVR_{it} = \tau + \partial PCI_{it} + \sigma OPN_{it} + \varphi INF_{it} + \omega AGV_{it} + \gamma IDV_{it} + \pi URB_{it} + \epsilon AID_{it} + \delta CORR_{it} + \emptyset GOV_{it} + \mu_{it} \quad (2)$$

Equation (2) is a panel data model, where *TVR* is the ratio of tax to GDP, *PCI* is the per capita income, *INF* is inflation rate, *AGV* is agriculture value added, *OPN* is trade openness, IDV is industrial value added, URB is urbanisation, AID is foreign aids, *CORR* is corruption, *GOV* represents governance indicators and μ_{it} is the error term. Detailed description of the variables and measurement are contained in Table 1.

A major issue associated with equation (2) is endogeneity problem which occurs as a result of the nature of the error term. The error term can thus be expressed as:

$$\mu_{it} = \rho_i + \varepsilon_{it} \quad (3)$$

If equation (3) is true, then estimates of equation (2) obtained from the application of ordinary least squares (OLS) estimator will be biased and inconsistent (Baltagi, 2005). Therefore, equation (2) can be expressed as follows, assuming the country-specific effect is fixed:

$$TVR_{it} = \tau + \partial PCI_{it} + \sigma OPN_{it} + \varphi INF_{it} + \omega AGV_{it} + \gamma IDV_{it} + \pi URB_{it} + \epsilon AID_{it} + \delta CORR_{it} + \emptyset GOV_{it} + \rho_i + \varepsilon_{it} \quad (4)$$

It is however possible that the tax revenue for a year may be related with its previous value, which makes it imperative to incorporate dynamics into the model. Thus, the dynamic transition of the static model earlier stated becomes:

$$TVR_{it} = \tau + \alpha TVR_{it-1} + \beta TVR_{it-2} + \partial PCI_{it} + \sigma OPN_{it} + \varphi INF_{it} + \omega AGV_{it} + \gamma IDV_{it} + \pi URB_{it} + \epsilon AID_{it} + \delta CORR_{it} + \emptyset GOV_{it} + \rho_i + \varepsilon_{it} \quad (5)$$

$$i = 1,2,3 \ldots\ldots\ldots N, t = 1,2,3 \ldots\ldots\ldots\ldots T$$

In order to overcome the problem of endogeneity brought about by the introduction of the dependent variable as one of the regressors, Arrellano and Bover (1995) and Blundell and Bond (1998) built on the work of Arrelano and Bond (1991) to develop a GMM instrumental variable estimation method where the first lagged dependent variable is instrumented with further lagged levels. This estimation technique has been found to be capable of accommodating a dynamic specification as in equation (5) and at the same time accounting for the time-invariant specific characteristics (Cameron & Trivedi, 2009). Therefore, this study makes use of system GMM to estimate equation (5).

3.2 Scope, Nature and Sources of Data

The study covers 29 Sub-Saharan African countries (Appendix I) for the period 2002–2016. The scope is predicated by availability of data, particularly on institutional variables (i.e., corruption and governance indicators). The data on all the concerned variables is gathered from secondary sources. In specific terms, data on corruption and governance indicators are sourced from the World Governance Indicators (WGI), while data on other control variables are sourced mainly from the World Development Indicators (WDI) for various years published by the World Bank. Data on tax revenue is calculated based on data sourced from the African Statistical Yearbook for various years.

3.3 Description of Variables

This section presents a detailed description of the variables (both dependent and independent) that are included in the empirical models, as well as how they are measured. The description begins with the dependent variable, and then the independent variables. Table 1 summarises the description of the variables and sources.

Dependent variable

Tax Revenue (TRV): Tax revenue is the sum of revenue generated from taxation. The ratio of tax revenue to GDP is one of the indicators of how successful a country is in its fiscal management. This measure is the most appropriate since the study involves several countries which vary in economic size.

Independent variables

The independent variables are divided into structural, economic and institutional factors.

Structural and economic factors

Share of Agricultural Output in the GDP (AGV): Agriculture is a major economic activity in SSA countries. Hence, it could serve as a tax base indicator. An increase in the contribution of agriculture to the GDP will result in higher tax base and revenue. This study measures it as the agriculture value added. However, since the bulk of

agricultural activities are carried out largely by the poor in the informal sector where tax revenue is difficult to collect, a negative relationship is expected between agriculture value added and tax revenue at country level.

Share of Industrial Output in the GDP (IDV): This is another indicator of a country's tax base. A higher contribution of industrial sector to GDP will result in a higher tax base which brings about higher tax revenue. It is measured here as industry value added. Industrialisation comes with urbanisation and formalisation of economic activities, and also results in higher per capita income. Thus, a priori, a positive relationship is expected between industry value added and tax revenue to GDP ratio.

Trade Openness (OPN): This indicates the extent to which a country's economy is opened to the rest of the world. In other words, it shows the extent of a country's economic relationship with other countries of the world. This is measured as the ratio of total trade (export plus import) to the GDP. Trade openness is expected to have positive impact of tax revenue.

Urbanisation (URB): This is used to capture the level of development in a country. This study measures urbanisation as a ratio of people living in the urban area to the total population (i.e., urban population divided by the total population). Thus, the a-priori relationship expected between urbanisation and tax revenue to GDP ratio is positive.

Table 1: Variable Descriptions and Measurement

Variable	Measurement	Source
Tax revenue (TRV)	Ratio of tax revenue to GDP	Computed based on data provided in the African Statistical Yearbook published by AfDB for various years (2002-2016)
Per Capital Income (PCI)	Total GDP divided by total population	WDI, 2002-2016
Inflation (INF)	Change in reported consumer price index	WDI, 2002-2016
Trade Openness (OPN)	Export plus import as ratio of GDP	WDI, 2002-2016
Agriculture (AGV)	Agriculture value added	WDI, 2002-2016
Industry (IDV)	Industry value added	WDI, 2002-2016
Urbanisation (URB)	Urban population as a ratio of total population	WDI, 2002-2016
Corruption ($CORR$)	Control of corruption multiplied by -1 so that lower score means lower corruption and higher score means higher corruption	WGI, 2002-2016
Foreign Aids (AID)	Measured as the yearly aids received by each country as percentage of GDP	WDI, 2002-2016
Governance (GOV)	World Governance Indicator which comprises of 5 sub-indicators, namely: government effectiveness(GEF), political stability and absence of violence (PSAV), voice and accountability(VAA), rule of law (ROL) and regulatory quality (RGQ)	WGI, 2002-2016

Source: Authors' compilation

Per Capita Income (PCI): This is another indicator of the level of development. It is measured as the ratio of GDP to population. It is also an indicator of the country's level of development. The a-priori expectation as regards the relationship between per capita income and tax revenue is positive.

Inflation (INF): This is a measure of macroeconomic uncertainties which may affect tax revenue in either way. Thus, the direction of the relationship between inflation and tax revenue to GDP ratio is uncertain. Inflation is measured here using changes in consumer price index (CPI).

Institutional factors

Corruption (CORR): This is used to capture the extent to which the public power is used for private benefit. It is captured by an index that measures the extent to which bribes are generally accepted by government officials in order to provide public service (Tanzi, 1998). In this study, corruption is measured via 'control of corruption'. The control of corruption is on a scale of -2.5 to 2.5 where -2.5 is the worst performance in corruption control and the upper extreme (2.5) means best performance. For ease of interpretation, the values are multiplied by -1 to rescale the measurement so that -2.5 means lowest corruption and 2.5 is the highest corruption.

Governance (GOV): This is another institutional factor which may affect the success of a country in public revenue mobilisation through taxation. In addition to control of corruption, governance is gauged from six aggregate indicators, namely; voice and accountability (VAA), political stability and absence of violence e(PSAV), government effectiveness (GEF), lack of regulatory burden (RQG) and rule of law (ROF) (see WGI, 2021). The respective estimates of the country's score in each of the aggregate indicator are measured in units of a standard normal distribution, ranging from approximately -2.5 to 2.5. These scores are based on several hundred underlying variables taken from a wide variety of existing data sources and views of respondents, including private and NGO sector experts worldwide. Higher scores reflect better performance.

Government Effectiveness (GEF): This measures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressure, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Estimate gives the country's score on the aggregate indicator in units of a standard normal distribution, ranging from approximately -2.5 to 2.5.

Political Stability and Absence of Violence/Terrorism (PSAV): This captures perceptions of the likelihood that the government will be destabilised or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution ranging from approximately -2.5 to 2.5.

Rule of Law (ROL): This captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular, the quality of contract enforcement, property rights, the police and the courts, as well as the likelihood of

crime and violence. Estimate gives the country's score on the aggregate indicator in units of a standard normal distribution, ranging from approximately -2.5 to 2.5.

Regulatory Quality (RGQ): This captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, ranging from approximately -2.5 to 2.5.

Voice and Accountability (VAA): This captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association and a free media. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.

3.4 Method of Data Analysis

The study adopts the two-step system GMM with robust errors since it has been proven to perform more efficiently than the one-step system GMM (Baltagi, 2005; Roodman, 2009). Since a number of the explanatory variables in the model are likely to be endogenous, GMM is considered a better method compared to OLS or GLS (Hayashi, 2000); hence, the choice of system GMM estimation which also ensures consistency and efficiency, while dealing with heteroscedasticity and serial correlation. It also handles the potential bias that could be created by inclusion of dependent variable in the regression. All dependent variables are instrumented by their own lag. The validity of the instruments and the entire model are tested with the help of post-estimation diagnostic tests including the Sargan and Hansen test of overidentifying restrictions and the Arrelano and Bond autocorrelation (AR) tests.

4. Presentation and Discussion of Results

This section presents the results obtained from both descriptive and panel data regression analyses. The descriptive statistics are presented first, followed by the results of the dynamic panel regression models, and then a brief discussion of the results.

4.1 Descriptive Statistics

The summary statistics of the variables are presented in Table 2. On the average, the share of tax in GDP for the 29 SSA countries during the sampled period stands at 18.48 percent with a minimum and maximum of 7.67 percent and 62.46 percent respectively. The average share falls short of the 25 percent minimum recommended by the World Bank and the International Monetary Fund (IMF). This suggests that the tax revenue performance in SSA is still very low. On the average, 38.3 percent of the population live in urban areas, while about 61.7 percent dwell in rural areas. The most urbanised country has about 66.19 percent of the population living in urban areas, while the least urbanised has only about 8.68 percent in the urban area. The result suggests that the level of urbanisation in SSA is low. It is therefore not surprising that agriculture contributes 23.39 percent to GDP on the average, with a minimum contribution of 2.03 percent and maximum of 79.04 percent. Many countries in the region are surviving on exports of natural resources including crude oil, and imports of finished products. The average index of trade openness or globalisation stands at 78.21 percent, suggesting a high level of trade dependency in the region. The average inflation rate is 7.28 percent.

Meanwhile, average income per capita in the countries for the period covered is $1,745, with a minimum of $193.87 and a maximum of $9,812.55. The high standard deviation for PCI (2,086.93), which is greater than half of the mean value, suggests that there is high income inequality among countries in the region. Aids received as a share of GDP average 7.46 percent, with a minimum and maximum of 0.306 percent and 105.15 percent respectively. With an average score of 0.46, which is above the mean of 0 on the corruption ranking scale, it suggests that corruption is high in the region. The minimum and maximum corruption scores are -1.22 and 1.53 respectively. Each of the five governance indicators has an average score that is negative, suggesting that the SSA countries are characterised by poor governance and weak political institutions.

The correlation matrix presented in Table 3 shows some revealing findings about the relationship between tax revenue (dependent variable) and each of the explanatory variables, and also between the explanatory variables. For instance, the pairwise correlation coefficient of -0.29 suggests that there exists a negative linear relationship between tax revenue and corruption. However, a very weak positive correlation exists with each of the five indicators of good governance. The correlation coefficients range between 0.09 and 0.22. Meanwhile, there exist strong positive correlations between tax revenue and per capita income, industrial value added and urbanisation. Agriculture value added however correlates negatively with tax revenue. Also, there exist strong negative correlations between agriculture value added and per capita income, as well as between agriculture value added and urbanisation. These results suggest that tax revenue and per capita income are lower in countries where the agricultural sector dominates the economy. Also, governance may not be a strong determinant of variation in tax revenue in SSA countries.

Table 2: Summary Statistics of Variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
TRV	444	18.48305	9.090597	7.671105	62.46405
URB	465	38.33376	15.11693	8.682	66.187
AGV	433	23.39237	14.68556	2.032283	79.04232
IDV	438	25.4704	12.06364	3.242873	77.41366
OPN	428	78.2115	36.72895	14.37688	311.3553
INF	460	7.28234	6.522791	-35.83668	44.39128
PCI	465	1745.81	2086.931	193.8669	9812.546
AID	464	7.45848	8.968764	0.3067828	105.1491
CORR	465	0.46251	0.5983338	-1.216737	1.525243
GEF	465	-0.59007	0.5789811	-1.745683	1.049441
PSAV	465	-0.37451	0.8806684	-2.523785	1.200234
RGQ	465	-0.48221	0.5328251	-1.857852	1.12727
ROL	465	-0.50374	0.5960926	-1.813444	1.07713
VAA	465	-0.34793	0.6876966	-1.697053	1.015621

Source: Author's Computation.

Table 3: Correlation Matrix

	TRV	*URB*	*AGV*	*IDV*	*OPN*	*INF*	*PCI*	*AID*	*CORR*	*GEF*	*PSAV*	*RGQ*	*ROL*	*VAA*
TRV	1.00													
URB	0.30	1.00												
AGV	-0.53	-0.39	1.00											
IDV	0.70	0.35	-0.66	1.00										
OPN	0.53	0.28	-0.16	0.30	1.00									
INF	-0.04	-0.19	0.13	-0.06	-0.01	1.00								
PCI	0.41	0.45	-0.69	0.40	0.27	-0.10	1.00							
AID	-0.21	-0.16	0.51	-0.37	0.19	0.19	-0.37	1.00						
CORR	-0.29	-0.25	0.51	-0.07	-0.19	0.11	-0.64	0.20	1.00					
GEF	0.22	0.22	-0.58	0.09	0.02	-0.07	0.74	-0.34	-0.85	1.00				
PSAV	0.20	0.24	-0.44	0.07	0.20	-0.16	0.46	-0.21	-0.74	0.67	1.00			
RGQ	0.09	0.15	-0.53	0.01	-0.07	-0.12	0.68	-0.42	-0.80	0.92	0.63	1.00		
ROL	0.18	0.18	-0.51	0.01	0.11	-0.08	0.66	-0.29	-0.88	0.91	0.78	0.89	1.00	
VAA	0.13	0.28	-0.30	-0.06	0.09	-0.05	0.52	-0.12	-0.67	0.73	0.61	0.69	0.78	1.00

Source: Authors' Computation

4.2 Model Estimation and Results

The dynamic panel model specified in equation 5 was estimated in six variants. Each variant examines the impact of one governance indicator on tax revenue at a time. This approach is adopted so as to avoid multicolinearity, which is evident from the correlation matrix in Table 3 which shows that the control of corruption ($CORR$) and the five governance indicators in the model are highly correlated. The correlation coefficients range between 0.61 and 0.91. The implication is that there could be multicolinearity issues if all the six indicators are jointly included in a single model. The results of the six variants of dynamic panel regression models are presented in columns 2, 3, 4, 5, 6 and 7 of Table 4.

Model 1 examines the impact of the control of corruption on tax revenue to GDP ratio. The result, presented in column 2, shows that corruption has a negative and statistically significant impact on tax revenue. An increase in the index of corruption by 1 point reduces the tax revenue share as a percentage of GDP by 3.77 percent. The negative (positive) impact of the perception of corruption (control of corruption) is consistent with the a-priori expectation. This also conforms to previous studies, such as Ghura (1998) and Ajaz and Ahmad (2010). The impact of agriculture value added is also negative, in line with the a-priori expectation. It is however not statistically significant even at 10 percent level of significance. Similarly, the industrial value added fails to impact significantly on the tax revenue-GDP ratio even though the coefficient appears to be positive. Also, inflation has a positive but statistically insignificant impact on tax revenue, while the coefficient of aid received from donors is not statistically significant in the model. Meanwhile, impact of trade openness or globalisation on tax revenue is positive and statistically significant. An increase in the degree of trade openness by a percentage point results in an increase in tax revenue as a percentage of GDP by 0.09 percent points, and vice versa. The positive and statistically significant impact of trade openness is in line with a-priori expectations as well as previous studies that report positive and significant impact of trade openness on tax revenue as a percentage of GDP. Per capita income has a positive and statistically significant impact on tax revenue.

The result of Model 2, which examines the impact of regulatory quality on tax revenue performance, is reported in column 3. The results show that the impact of regulatory quality on tax revenue is positive but not statistically significant. The impact of trade openness is positive and statistically significant, as found in Model 1. Per capita income also has a negative and statistically significant impact on tax revenue. Also consistent with Model 1 are the impacts of agriculture value added and inflation. The two variables have negative and positive impacts on tax revenue respectively. Industry value added and aid have positive but statistically insignificant impacts on tax revenue, while urbanisation has a negative but statistically insignificant impact on tax revenue, as in Model 1.

In Model 3, the impact of government effectiveness on tax revenue is estimated. The result, as shown in column 4, reveals that government effectiveness has a positive but insignificant impact on tax revenue. Just as observed in Models 1 and 2, trade openness has a positive and statistically significant impact on tax revenue. Agriculture value added, urbanisation, aids received and per capita income have negative but insignificant impacts on tax revenue. The impacts of industry value added and inflation are positive but also statistically insignificant.

Table 4: Dynamic Panel System GMM Results

Variable	(Model 1) SGMM1	(Model 2) SGMM2	(Model 3) SGMM3	(Model 4) SGMM4	(Model 5) SGMM5	(Model 6) SGMM6
Constant	5.368	9.653	4.303	8.610	0.0115	1.928
	(4.381)	(6.088)	(9.161)	(10.61)	(5.987)	(7.898)
$TRV_{(t-1)}$	0.850***	0.996***	0.850***	0.858***	0.856***	0.843***
	(0.117)	(0.0901)	(0.133)	(0.103)	(0.111)	(0.127)
$TRV_{(t-1)}$	-0.290**	-0.328**	-0.266	-0.251	-0.277**	-0.292*
	(0.123)	(0.151)	(0.177)	(0.162)	(0.129)	(0.158)
PCI	-0.00114***	-0.00101*	-0.000631	0.000294	-0.000783	-0.000503
	(0.000405)	(0.000557)	(0.000911)	(0.000869)	(0.000641)	(0.000705)
OPN	0.0901***	0.0503***	0.123***	0.0909***	0.109***	0.117***
	(0.0325)	(0.0132)	(0.0290)	(0.0245)	(0.0209)	(0.0276)
INF	0.0869	0.0294	0.0958	0.110	0.0781	0.0355
	(0.118)	(0.0459)	(0.203)	(0.111)	(0.123)	(0.143)
AGV	-0.0798	-0.275	-0.141	-0.168	-0.0447	-0.0597
	(0.144)	(0.171)	(0.176)	(0.209)	(0.166)	(0.168)
IDV	0.148	0.0134	0.0486	0.0220	0.175	0.179
	(0.180)	(0.139)	(0.168)	(0.137)	(0.164)	(0.166)
AID	-0.196	0.0230	-0.0837	-0.128	-0.0406	-0.0717
	(0.140)	(0.257)	(0.208)	(0.247)	(0.200)	(0.222)
URB	-0.0394	0.0288	-0.0407	-0.144	-0.0326	-0.107
	(0.0714)	(0.0856)	(0.109)	(0.212)	(0.0814)	(0.170)
CORR	-3.768*					
	(1.926)					
RGQ		2.021				
		(1.805)				
GEF			2.537			
			(3.882)			
PSAV				-0.329		
				(1.761)		
ROL					3.572	
					(2.505)	
VAA						2.887
						(2.626)
Observations	338	338	338	338	338	338
Number of cid	29	29	29	29	29	29
country effect	YES	YES	YES	YES	YES	YES

*Note: (1) Standard errors in parentheses (2) *** p<0.01, ** p<0.05, * p<0.1*
Source: Author's Computation, 2018.

In Model 4, where the impact of political stability and absence of violence on tax revenue is examined, a negative and statistically insignificant impact of political stability and absence of violence on tax revenue is observed. In the model, trade openness also impact positively and significantly on tax revenue as a percentage of GDP. Again, agriculture value added, urbanisation and aid received have negative and statistically insignificant impacts on tax revenue as a percentage of GDP, while industry value added, per capita income and inflation have positive and statistically insignificant impacts on tax revenue as a percentage of GDP.

The result of Model 5, reported in column 6 of Table 4, shows that rule of law has a positive but statistically insignificant impact on tax revenue as a percentage of

GDP. Urbanisation, agriculture value added and aid received all have negative but statistically insignificant impacts on tax revenue as a percentage of GDP. The impacts of industry value added, per capita income and inflation are positive.

The impact of voice and accountability is examined in Model 6. The result is presented in column 7 of Table 4, and it shows that the impact of voice and accountability on tax revenue as a percentage of GDP is positive but insignificant. In the model, urbanisation, agriculture, per capita income and aid received have negative but statistically insignificant impacts on tax revenue as a percentage of GDP, while industry value added and inflation have positive but statistically insignificant impacts, as in Model 5.

Overall, the results of the estimated models show that among all the governance indicators, only corruption has a statistically significant impact on tax revenue. This finding may be adduced to the poor performance of the sampled countries in all the indicators of governance.

4.3 Diagnostic Tests

The post-estimation tests performed to examine the validity of the six estimated models include Sargan test, and Arrelano and Bond autocorrelation test (AR test). The results of these tests are presented in Table 5.

Table 5: Results of Diagnostic Tests

VARIABLES	(Model 1) SGMM1	(Model 2) SGMM2	(Model 3) SGMM3	(Model 4) SGMM4	(Model 5) SGMM5	(Model 6) SGMM6
Hansen test	18.34	19.32	21.43	14.78	19.17	22.42
Hansen Prob	0.991	0.993	0.965	0.999	0.986	0.951
Sargan_test	36.18	47.76	36.78	36.03	37.43	39.26
Sargan Prob	0.413	0.111	0.386	0.420	0.358	0.285
AR(1)_test	-2.751	-2.531	-2.301	-2.397	-2.490	-2.358
AR(1)_p-value	0.00594	0.0114	0.0214	0.0165	0.0128	0.0184
AR(2)_test	-0.0948	-0.293	-0.226	-0.339	-0.361	-0.297
AR(2)_p-value	0.924	0.769	0.822	0.734	0.718	0.766
No. of Instruments	46	46	46	46	46	46

Source: Author's Computation, 2018.

Sargan test is a test of overidentifying restrictions, which tests whether the instruments are uncorrelated with error terms in the estimated equations. Its null hypothesis is that instruments as a group are exogenous. The Sargan test p-values reported for all the models, fail to reject the null of overidentifying restrictions in all cases. The p-values are not significant even at 10% significance level.

The second post-estimation test reported in the table is the Arellano and Bond test for autocorrelation, which has a null hypothesis of no autocorrelation and relates to the difference residuals. The AR (2), which tests for autocorrelation of second order, fails to reject the null hypothesis of no autocorrelation for all the estimated models. The results show that there is robust evidence that all the models are free from autocorrelation at all conventional levels of significance.

4.4 Discussion of Results

In Model 1, corruption is found to have a negative and statistically significant impact on tax revenue as a percentage of GDP in Sub-Saharan Africa. This result is consistent with some previous studies, among which are Tanzi and Davoodi (2000) and Ajaz and Ahmad (2010). The former finds that a one-point increase in corruption perception index results in a decrease in tax revenue to GDP ratio by 2.7 percent in a sample of 97 countries, while the latter reports a negative and statistically significant impact of corruption on tax revenue. The result also aligns with several other studies that have established a negative impact of corruption on tax revenue (Imam & Jacobs, 2007). The negative impact of corruption may be linked to the potential effects of corruption on private investment. Corruption discourages investors since it brings about a high cost of business. Also, a high level of corruption leads to leakage of tax revenue and diversion of funds by the tax collectors. With regards to the effects of governance indicators on tax revenue, the results, which show that none of the governance indicators is a statistically significant determinant of tax revenue, are contrary to other previous studies. The findings of Syhadullah and Wibowo (2015), for example, indicate that control of corruption, voice and accountability and political stability have significant negative effects on the tax ratio, but rule of law and quality of regulatory variables have positive impacts on the tax ratio.

A positive and statistically significant impact of trade openness on tax revenue is found across the six models. This finding is in line with the expectation of this study. It is also consistent with previous studies such as Ajaz and Ahmad (2010), where a positive and statistically significant impact of trade openness on tax revenue is reported. This result thus reveals an overwhelming impact of trade openness on tax revenue. The implication of the result is that globalisation or trade liberalisation brings about increase in tax revenue. This revenue is expected to come largely from trade taxes. A negative and statistically significant impact of per capita income on tax revenue is also found in Models 1 and 2. The result seems to suggest that there is some evidence that per capita income has a significant impact on tax revenue as a percentage of GDP in the SSA. The negative impact of per capita income on tax revenue partly aligns with the finding of Ajaz and Ahmad (2010), who report a negative and statistically insignificant impact of per capita income on tax revenue. It implies that the level of economic development fails to positively impact on tax revenue. The finding on per capita income may be as a result of the inability of the sampled countries to witness a sufficient level of development that is enough to exact a significant positive impact on tax revenue to GDP ratio. This may be linked to the dependence of many of the countries in the region on natural resources such as crude oil and other primary products. Besides, agricultural sector, which is mainly dominated by poor farmers, is the major sector of the economies of these countries. This is affirmed by the contribution of agriculture to the GDP which averages nearly 30 percent. Overall, these findings have clear practical implications for the governments and policymakers in Sub-Saharan African countries.

5. Conclusion

The study examines the impacts of corruption and governance indicators on tax revenue in Sub-Saharan African countries and finds that the average tax revenue as a percentage of GDP in the selected SSA countries within the sample period stands at 18.48 percent. This is below the 25 percent recommended by the World Bank for sustainable economic outcomes. The panel regression results show that the prevalence of corruption has a negative and statistically significant impact on tax revenue. An increase (decrease) in the index of corruption perception (control of corruption) by one point reduces tax revenue as a percentage of GDP by 3.77 percent. However, the findings reveal that none of the 5 indicators of governance has a significant impact on tax revenue as a percentage of GDP in the SSA region. This might be due to the fact that countries in SSA are characteristically not different from one another in terms of governance.

Among the control variables included in the models, only trade openness has a positive and statistically significant impact on tax revenue in all the six estimated models. Per capita income is statistically significant in only two models (Model 1 and Model 2) where the impacts of corruption and regulatory quality are considered respectively. Therefore, for countries in SSA to boost tax revenue generation, it is pertinent for governments to control corruption. Further studies may focus on the impacts of corruption and governance on the different components of tax revenue as against the aggregate tax revenue considered in this study.

References

Abdu, M., Jibril, A., & Muhammad, T. (2020). Analysis of tax compliance in Sub-Saharan Africa: Evidence from firm-level study. *Econometric Research in Finance, 5(2),* 119-142.

Abebe, G., & Fikre, S. (2020). Econometric analysis of the effects of corruption on government tax revenue: Evidence from panel data in developed and developing countries. *European Business & Management, 6(2),* 28-35. doi: 10.11648/j.ebm.20200602.12

Aghion, P., Akcigit, U., Cage, J. & William, R. K. (2016). Taxation, corruption, and growth. *Harvard Business School Working Paper* 16-075.

Aizenman, J. & Y. Jinjarak, Y. (2006). Globalisation and developing countries—a shrinking tax base? *Journal of Development Studies*, *45*(5), 653-671.

Ajaz, T. & Ahmad, E. (2010). The effect of corruption and governance on tax revenue. *The Pakistan Development Review 49*(4), 405-417.

Alm, J., Martinez-Vazquez, J., & McClellan, C. (2014). Corruption and firm tax evasion. *ICEPP Working Papers*. 2. https://scholarworks.gsu.edu/icepp/2

Arellano, M. & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics, 68,* 29–52.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies, 58,* 277–297.

Attila, G. (2008). Corruption, taxation and economic growth: theory and evidence, HAL paper no halshs 00556668. Available at https://halshs.archives-ouvertes.fr/halshs-00556668. Retrieved on 02/04/2018.

Baltagi, B. H. (2005). *Econometric Analysis of Panel Data* (3rd Edition). John Wiley & Sons Inc., New York.

Begum, L. (2007). A Panel study on tax effort and tax buoyancy with special reference to Bangladesh. *IMF Working Paper 07/15*. Washington: International Monetary Fund.

Bertinelli, L., & Bourgain, A. (2016). Tax mobilization in Sub-Saharan Africa: The impact of tax and business law reforms. *Economics Bulletin, 36*(3), 1805-1810.

Bird, R. M., Martinez-Vazquez, J. & Torgler, B. (2004). Societal institutions and tax effort in developing countries. International Studies Programme Working Paper 04–06.

Blundell, R. & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87,* 115–43.

Cameron, C. A., & Trivedi, P. K. (2009). *Microeconometrics using Stata*. College Station, Texas: Stata Press Publication.

Coulibaly, B. S & Gandhi, D (2018). Mobilization of tax revenues in Africa: State of play and policy option. *African Growth Initiative at Brookings*. Policy brief. Washington, D.C.

Dia, M. (1996). *Africa's Management in the 1990s and Beyond: Reconciling Indigenous and Transplanted Institutions*, Washington DC: The World Bank.

Drif, I., & Rawat, A. S. (2018). Corruption, governance and tax revenue: Evidence from EAGLE countries. *Journal of Transnational Management, 23(2-3),* 199-133.

Drummond, P., Daal, W., Srivastava, N., & Oliveira, L. E. (2012). Mobilizing revenue in Sub-Saharan Africa: Empirical norms and key determinants. *IMF Working Paper* No. WP/12/108. Washington: International Monetary Fund.

Epaphra, M. (2014). The revenue implication of trade liberalization in Tanzania. *Journal of World Economic Research, 3(3),* 25-36.

Epaphra, M & Massawe, J (2017). Corruption, governance and tax revenues in Africa. *Business and Economic Horizon,* 13 (*4*). 439-467.

Ghura, D. (1998). Tax revenue in sub-Sahara Africa: Effects of economic policies and corruption. *IMF Working Paper WP/98/135*. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=882694. Retrieved, 02/01/2019.

Gupta, A. S. (2007). Determinants of tax revenue efforts in developing countries. *IMF Working Paper*, No. 184. Washington: International Monetary Fund.

Hayashi, F. (2000). *Econometrics.* Princeton University Press. Princeton, New Jersey.

Heller, S. (1975). A model of public fiscal behavior in developing countries: Aid, investment, and taxation. *American Economic Review, 65,* 429-45.

Imam, P. A., &. Jacobs, D. F. (2007). Effect of corruption on tax revenues in the Middle East. *IMF Working Paper No.07/270*. IMF Institute and Fiscal Affairs Department.

Jahnke, B., &Weisser, R. A. (2019). How does petty corruption affect tax morale in Sub-Saharan Africa? *European Journal of Political Economy, 60,* 10175

Kassim, L. (2016). The revenue implication of trade liberalization in sub-Sahara Africa: Some new evidence. University of Kent Discussion Paper KDPE 1605: University of Kent.

Mahdavi, S. (2008). The level and composition of tax revenue in developing countries: Evidence from unbalanced panel data. *International Review of Economics and Finance, 17 (4),* 607-617.

Mawejie, J. (2019). Natural resources governance and tax revenue mobilization in Sub-Saharan Africa: The role of EITI. *Energy Policy*. 62, 176-183.

McGillivray, M., & Morrisey, O. (2001). Aid illusion and public sector fiscal behavior. *Journal of Development Studies, 37(6),* 118-136.

Muhrtala, T.O. & Ogundeji, M. (2013). Professionals' perspective of tax evasion: Some evidence from Nigeria. *Universal Journal of Accounting and Finance, 1(2),* 35-41.

Pontalar, S. K., Samini, A. J., & Roshan, A. R. (2010). Corruption and tax revenues: New evidence from some developing countries. *Australian Journal of Basic and Applied Sciences, 4*(9), 4218-4222.

Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in Stata. *The Stata Journal*, *9(1),* 86–136.

Stasavage, D. (1999). Causes and consequences of corruption: Mozambique in transition. *Commonwealth and Comparative Politics, 37(3),* 65-97.

Syadullah, M., & Wibowo, T. (2015). Governance and tax revenue in ASEAN countries. *Journal of Social and Development Sciences, 6*(2), 76-88.

Tanzi, M. V., & Davoodi, M. H. R. (2000). *Corruption, Growth, and Public Finances (Epub)* (No. 0-182). International Monetary Fund.

Tanzi, V. & Davoodi, H. (1997). Corruption, public investment and growth, *IMF Working paper*, wp/97/139: 1-23.

Tanzi, V. (1998). Corruption around the world: Causes, consequences, scope and cures. *IMF Working Paper* No. 98/63. Fiscal Affairs Department, International Monetary Fund. Washington, DC.

World Development Indicators (WDI) (2015). World Bank. Washington. DC

Worldwide Governance Indicators (WGI) (2021). World Bank. Washington DC. WGI 2021 Interactive > Documentation (worldbank.org)

Worlu, C. N., & Nkoro, E. (2012). Tax revenue and economic development in Nigeria: A Macroeconometric Approach. *Academic Journal of Interdisciplinary Studies*, *1*(2), 211-223. Retrieved from http://www.richtmann.org/journal/index.php/ajis/article/view/11650.

Appendix I

1. Benin
2. Botswana
3. Burkina Faso
4. Burundi
5. Cape Verde
6. Cameroon
7. Congo DR
8. Congo Republic
9. Ivory Coast
10. Gambia
11. Ghana
12. Kenya
13. Lesotho
14. Liberia
15. Madagascar
16. Malawi
17. Mali
18. Mauritius
19. Mozambique
20. Namibia
21. Nigeria
22. Rwanda
23. Senegal
24. Sierra Leone
25. South Africa
26. Swaziland
27. Togo
28. Uganda
29. Zambia