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# Tax revenue inefficiency and political risk factors: The Hen or The egg?

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### MANAGEMENT | LETTER

# Tax revenue inefficiency and political risk factors: The Hen or The egg?

Agumas Alamirew Mebratu<sup>1\*</sup>

Abstract: Better tax administration and revenue mobilization can increase tax revenue performance while also strengthening the connection between the state, the business sector, and civil society. Despite efforts over the previous two decades, the ratio of tax receipts to GDP and tax effort in Sub-Saharan Africa remains low when compared to OECD nations. This is due to inefficient tax revenue collection. As a result, the primary objective of this study was to investigate experimentally the sources of tax revenue inefficiency in Sub-Saharan African nations between 2000 and 2021 using a secondary data set and half-normal, exponential-normal, and truncated-normal estimate techniques. According to the empirical findings, tax revenue inefficiency has a positive and significant relationship with corruption, democratic accountability, law and order, and religious tensions, and it has a negative and significant relationship with bureaucratic quality, internal conflict, government stability, and military in politics. The study concludes that, depending on the estimating approach used, political risk variables have a significant impact on tax revenue inefficiencies. Before formulating tax policy, tax policy makers shall first determine the extent of tax revenue inefficiencies.

#### Subjects: Economics; Political Economy; Finance

Keywords: Tax revenue inefficiency; Sub Saharan Africa; stochastic frontier analysis; halfnormal; exponential-normal; truncated-normal

### 1. Introduction

ABOUT THE AUTHOR

Sufficient tax collection appears to be less troublesome in resource rich countries, however it is a heated concern in developing countries across the world due to a number of obstacles impacting

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their tax performance. The tax effort technique clearly gives information as a measure of a country's tax revenue performance. In sub-Saharan Africa (SSA), enhancing taxation to meet developmental needs is one of the major challenges going through the area. The average tax-to-GDP ratio in sub-Saharan Africa has accelerated from much less than 15% of GDP in 1980 to extra than 18.2% in 2018 (IMF, 2018). Non-resource-related revenue increased by using much less than 1% of GDP over 25 years. Even in useful resource-rich countries, non-resource related revenue has basically been stagnant. Interest in rising revenue overall performance has received extended momentum in the latest years across several growing countries.

Developing countries are highly in need of additional financial resources to address the huge development challenges they are facing; given the recent progress towards achieving the Millennium Development Goal (MDG), a large proportion of people are still suffering from poverty, malnutrition, vulnerability to natural disaster and preventive diseases, among others. All these implying that taxation is an issue of great concern to acquire domestic revenue through investigating empirically the maximum tax revenue potential, effort and performance of Sub Saharan African countries.

Governments' incapability to induce acceptable income to cover critical public provision charges is a common financial concern in utmost developing nations. Over the former decade, arising nations have collected levies totaling just roughly 13 of GDP (World Bank, 2021). It is still below the World Bank's estimated leaning juncture of 15 of GDP (Junquera-Varela & Haven, 2018). In addition to profitable enterprises, institutional problems similar to weak governance and high situations of corruption, as well as comprehensions of unjust duty systems, play an important part in this problem (Besley & Persson, 2014; Moore & Prichard, 2020). Complex and ineffective duty systems are a result of poor governance, which also raises duty elusion and the expenditure of duty rectification (Everest-Phillips & Sandall, 2009). Wide corruption in duty administration, particularly during the duty-collecting process, is a result of the complexity of the taxation system (Fjeldstad, 2006; Rahman, 2009). Similar circumstances will weaken a nation's duty system and capability to collect earnings, leading to a considerable reduction in the quantum of plutocrats available for the delivery of public services (translucency International, 2014). In the long-term, corruption may damage the morals of taxpayers and undermine public confidence in governmental institutions (Nawaz, 2010). Thus, strengthening the duty administration system and upgrading the trying system are two pivotal rudiments that work in tandem to increase income (Brondolo et al., 2008).

This study explores the relationship between institutional characteristics and tax profit inefficiencies in emerging nations. There have been numerous empirical explorations on this subject. Still, the endogeneity issue with institutional factors is generally ignored. For case, Syadullah (2015) calculated the effect of government effectiveness and quantum of corruption on duty income in 7 Southeast Asian nations between 2003 and 2012. The authors discovered that controlling corruption has a considerable negative influence on the tax rate, but the rule of law and the quality of nonsupervisory factors had a favorable impact on the tax rate. Using data from 30 African nations from 1996 to 2016, Epaphras and Massawe (2017) discovered that corruption and institutional quality had a lesser effect on circular duty collections than other forms of levies (direct levies and trade levies). Grounded on data from ten Arising and Growth-Leading husbandry (EAGLE) from 2001 to 2015, Arif and Rawat (2018) verified the critical significance of the institutional terrain in affecting the position of duty collection. Hassan et al. (2021) employed data from Pakistan from 1976 to 2019. They set up that excellent governance is a pivotal resource for adding duty income in the short and long run similar as Ajaz and Ahmad (2010) in developing nations and Imam and Jacobs (2014) in the Middle East, may honor the issue of endogeneity in the model. They stated that because patient duty earnings are believed to be endogenous to their pause, it might conceivably beget specification bias in the model. They employed the dynamic panel SGMM estimator to attack this problem. They discovered that corruption is the major reason for poor duty bills in underdeveloped nations and the Middle East. The difficulty with their exploration is that it doesn't address questions similar," Do nations with advanced duty performance have better governance pointers?" likewise, the SGMM is infelicitous for dealing with endogeneity when the variables persist across time, and the IV system is far superior. Hwang (2002) and Martinez-Vazquez Bird et al. (2008) are most likely the only exploration of this content that deals with institutional variable endogeneity. According to Hwang (2002), an increase in incidents of corruption will reduce government income.

Meanwhile, Martinez-Vazquez Bird et al. (2008) used a country's legal origins (English) and fractionalization as instruments of institutional variables and discovered that perfecting voice or responsibility and reducing corruption is an important prerequisite for a further satisfactory position of duty profit in both developing and developed countries. Their exploration, still, has certain downsides. The authors ignored the patient nature of tax profit, which can lead to specification bias in the model (see, for illustration, Ajaz & Ahmad, 2010; Imam & Jacobs, 2014), and they only control profitable factors while ignoring other implicit control variables similar as population size, public trust, and the shadow frugality. As a result, the primary donation of this study is likely to be a discussion of the crossroad of motifs not preliminarily covered by any affiliated studies. To carry out this paper, this research was examining political risk factors on tax profit inefficiency using panel data from 48 developing countries from 2000 to 2021.

The rest of the study organizes as follows. Section 2 discusses literature. Materials and methods are presented in Section 3. The results are presented in Section 4 and the last part, section 5 concludes the study.

#### 2. Literature review and hypothesis development

#### 2.1. Concept of tax revenue inefficiency

In this paper, it interprets tax revenue inefficiency as a lack of tax effort. The key concern of the researchers in estimating the inefficiency term is to decide on the distribution function of the research. Up to now, Aigner et al. (1977) proposed half-normal, Stevenson (1980) used to truncate normal, Greene (1980) preferred gamma, and finally, Beckers and Hammond extended exponential distribution function for the inefficiency component of the error term. Although it is predominantly difficult to opt for the best-fit distribution, prior theoretical insights from researchers shape this decision-making process. Cole et al., (2006) highlight the notion of parsimony in favor of selecting the less complicated ceteris paribus. Half-normal and exponential distributions are therefore better candidates with simpler structures than other options mentioned above (Coelli et al., 2005: 252). In this paper, the three distributions were used to estimate the tax revenue inefficiency after estimating the tax revenue potential and the tax revenue effort using the stochastic frontier normal/half-normal, normal/truncated-normal and normal/exponential-normal model. Since these models allow for the separation of the error term into its statistical noise (Vi) components and inefficiency (ui), and that is the main aim of this paper examined the inefficiency and its determinants.

#### 2.2. Drivers of tax revenue inefficiency

The driver of tax revenue inefficiency specifically governance or institutional quality variables for political risk factors were scarcely researched. In this paper, therefore, the following variables will be included as drivers of tax revenue inefficiency as the newly added variable extracted from the International Country Risk Guide (ICRG, 2018). The ICRG has three components that are a financial, economic and political risk. Since this paper aim wants to investigate the inter-linkage between tax revenue inefficiency and institutional qualities, it gives a special emphasis to components of political risk effects on tax revenue inefficiency. The political risk factor has 12 components, but this paper concentrates on the nine components which have closely related to tax revenue inefficiency.

#### 2.3. Corruption

Richard M. Bird et al. (2004) concluded that the rule of regulation and control of corruption is a vital prerequisite for a greater high-quality revenue attempt. For example, terrible law and order

situations in the economic system induce people to avoid tax and non-tax bills. If corruption is higher in a financial system, a huge part of the enterprise network might work underground by paying bribes to head off high revenue payments. If societies have felt that it properly represents their pursuits are properly on authorities' stage and they may be glad about the quality and quantity of public items like health, training and so forth, there would pay taxes. The preceding empirical proof suggests that high corruption reduces revenue collection and hence increase tax revenue inefficiency.

Abed and Gupta (2002) and Gupta (2008) stated that taxpayers who cope with rampant corruption are less inclined to pay taxes. Corruption, similarly, depresses overseas investment, which negatively impacts monetary pastime and the tax base. It measures corruption with the ICRG's evaluation of corruption within the political risk component tool. Lower rankings that suggest high government officials are probably to call for unique payments and that illegal payments are commonly predicted throughout decrease ranges of authorities in the form of bribes related to import and export licenses, trade controls, tax evaluation, police protection, or loans. Lower rankings that imply high authority officials are likely to demand special payments and that unlawful bills are commonly anticipated throughout decreasing stages of government within the form of bribes connected with import and export licenses, alternate controls, tax assessment, police safety, or loans (ICRG, 2018).

This is an evaluation of corruption within the political machine measured with the ICRG's evaluation. Such corruption is a danger to overseas investment for many motives: it distorts the monetary and economic environment; it reduces the efficiency of presidency and commercial enterprise by enabling humans to expect positions of strength through patronage as opposed to capacity; and, last however not least, introduces an inherent instability into the political procedure. The maximum common form of corruption met without delay by using commercial enterprise is economic corruption in the shape of needs for special bills and bribes linked with import and export licenses, alternate controls, tax exams, police safety, or loans. Such corruption can make it hard for behavior business successfully, and sometimes may force the withdrawal or withholding of funding. Although this research degree takes such corruption into consideration, it's a far greater concern with real or capability corruption in the shape of excessive patronage, nepotism, activity reservations, desire-for-favors, secret celebration funding, and suspiciously near ties between politics and commercial enterprise. In this research view, these insidious types of corruption are potential of a lot of extra danger to overseas enterprises in that they can cause popular discontent, unrealistic and inefficient controls of the state financial system, and inspire the development of the black market. The best threat in such corruption is that it will become so overweening, or a few important scandals may be abruptly revealed, as to provoke a popular backlash, ensuing in a fall or overthrow of the authorities, a chief reorganizing or restructuring of the country's political establishments, or, at worst, a breakdown in law and order, rendering the country ungovernable (ICRG, 2018).

Many papers addressed the causes of tax inefficiency (Pitt & Lee, 1981; Battese, 1995; Battese & Coelli, 1992). Corruption is seen as an important factor in reducing tax revenue and being able to add rents to pay officially pay taxes. Corruption can reduce the burden of corporate taxes (Good Speed et al., 2011); they sometimes argue a marginal corporate tax is sometimes (Olken et al., 2011). There are two ways that corruption can vitiate efforts to increase taxes. First, corruption is an unregulated tax levy on tax payments that results in a higher effective tax on taxpayers than is calculated from public accounts. Attempts to increase taxes are likely to be met with more resistance and greater evasion. Second, the payment of corruption does not contribute to the financing of public goods and services. If higher taxes lead to higher rates of corruption, taxpayers will try to avoid it even more. Third, corruption results from the negotiating position given to tax collectors by tax policy decisions. Higher tax rates increase the bargaining position of tax collectors, enabling them to collect higher incomes from taxpayers.

Either corruption is only an input variable that influences potential revenue collection by reducing the tax base is not clear, or it is also the determinant of technical inefficiency. By creating permanent instability in the political system, corruption will increase technical inefficiency in the tax system (Cyan et al., 2013). Therefore, it is assumed a negative relationship between this variable and technical inefficiency as the variable reflects the risk of corruption, with higher values meaning lower risk. Therefore, one can hypothesise that:

H1: The higher the corrupt practices in the country, the higher tax revenue inefficiency.

#### 2.4. Democratic accountability

Democratic accountability measures how responsive the government is with its human beings. There is not any consensus within the empirical literature supporting the importance of political variables inclusive of the quantity of democracy and the duration of a political regime as determinants of tax revenues. On the only hand, regular with authors like Boix (2003) and Acemoglu and Robinson (2006), democracy is a great element for dispensing profits from the rich to the poor that creates an enlarged welfare kingdom, and a stronger and additional inexperienced tax tool, based totally more on direct taxes than on indirect taxes. Also, below a non-democratic regime the size of the general public region would be specifically small, because a large a part of residents is excluded from the choice making machine. Thus, a transition in the direction of democratic authorities may coincide with the boom in taxes and public spending, according to the idea of the median voter, transferring in the route of a better redistribution of wealth (Dioda, 2012). On the opportune hand, some authors like Barro (1979) and Wittman (1989), bear in mind that the maximum drivers of public coverage are not political factors. Also, Mulligan et al., did not find out evidence that democracy can offer a reason behind the modifications in tax revenue. Democracy can be measured by the International Country Risk Guide measurement scales. This is a degree of ways responsive government is to its humans, at the idea that the less responsive it's miles, the more likely it is that the authorities will fall, peacefully in a democratic society, however probably violently in a non-democratic one. The points on this trouble are provided on the idea of the kind of governance cherished, by means of the country in question. As a result, it can hypothesize that:

H2: The higher existence of responsible authority in the country leads lower occurrence of tax revenue inefficiency.

#### 2.5. Bureaucratic quality

Bureaucratic quality shows institutional power and excellence of the rules and regulations. It gives high points to nations where the rules and regulations have the strength and information to manipulate without drastic adjustments in policy or interruptions in authorities' services and hence increases tax revenue performance. In those low-hazard countries, the bureaucracy is fairly independent of political stress and to have a longtime mechanism for recruitment and training. Countries that lack the cushioning effect of a robust rule and regulations get hold of low factors and hence reduce tax revenue performance. The highest ratings imply an established mechanism for recruitment and training," autonomy from political pressure," and strength and understanding to manipulate without drastic adjustments in policy or interruptions in government offerings while governments alternate (ICRG, 2018).

The institutional strength and quality of the rules and regulations is any other shock absorber that has a tendency to limit revisions of policy whilst governments alternate. Therefore, excessive factors are given to international locations in which the bureaucracy has the strength and expertise to manipulate without drastic modifications in coverage or interruptions in government offerings. In those low-hazard international locations, the rules and regulations are relatively autonomous from political pressure and to have a longtime mechanism for recruitment and education. Countries that lack the cushioning impact of a strong bureaucracy gain, low factors because a change in government has a tendency to be annoying in phrases of policy formulation and daily administrative capabilities (ICRG, 2018). Hence, one can hypothesise that

H3: The higher existence bureaucratic quality in the country leads lower occurrence of tax revenue inefficiency.

#### 2.6. Government stability

According to ICRG (2021) government stability is an assessment of the authorities' potential to carry out its declared program(s), and its potential to live in the workplace. The danger rating assigned is the sum of three subcomponents, each with a maximum rating of four factors and a minimum score of zero points. A rating of four points equates to low risk and a score of zero points to very high risk. Therefore, it can hypothesis that:

H4: The higher existence of government stable in the country leads lower occurrence of tax revenue inefficiency.

#### 2.7. Law & order

The "law" sub-component measures the strength and impartiality of the secure unit mechanism, even as the "order" sub-issue is an assessment of the famous observance of the regulation. This variable reflects the degree to which the residents of a country will accept the setup establishments to make and put in force laws and adjudicate disputes." Higher scores imply sound political establishments, a robust court docket machine, and provisions for an orderly succession of strength." Lower ratings suggest a lifestyle that depends on physical pressure or an unlawful way to settle claims." Upon modifications in government new leaders can be less likely to accept the responsibilities of the previous regime" ICRG, 2018). A single element is created by "Law and Order," but its two elements are evaluated one by one, with each detail being scored from 0 to 3. To test the "rule" aspect, attention has been given to the strength and impartiality of the legal system, while the "order" element is an evaluation of the law's well-known observance. Therefore, a country can rejoice in a high score-three-in its judicial system works, but a low rating-1-if it suffers from a disproportionate criminal charge if the regulation is robotically omitted without effective sanction (for example, giant unlawful strikes; ICRG, 2018). This leads

H5: the higher existence of law and order in the country leads lower occurrence of tax revenue inefficiency

#### 2.8. Internal conflict

This is an assessment of political violence within the countries and its real or capacity effect on governance. The maximum score is given to the one's nation wherein there may be no armed or civil opposition to the government and the government does no longer takes pleasure in arbitrary violence, direct or oblique, in opposition to its personal humans. It gives the lowest score to a rustic embroiled in an ongoing civil battle. The hazard rating assigned is the sum of three subcomponents, every with a maximum score of 4 factors and a minimal rating of zero points. A score of 4 points equates to low very risk and a score of 0 points to very high risk (ICRG, 2018). As a result, it can hypothesis that

H6: The higher existence of internal conflict in the country leads higher occurrence of tax revenue inefficiency.

#### 2.9. Military in politics

This variable measures the army's involvement in politics. ICRG stresses that "its involvement in politics, even in a peripheral degree, is a diminution of democratic duty". However, it additionally has another giant implication. The military would possible, for instance, end up worried in government because of an actual or created internal or external risk. Such a state of affairs would mean the distortion of government coverage to meet this danger, for example, with the aid of growing the defense price range on the fee of other price range allocations. In a few countries, the chance of navy takeover can pressure elected authorities to exchange coverage or motivate its substitute by using every other authority extra amenable to the military's needs. A navy takeover or hazard of a takeover can also make up a high risk if it is a sign that the government cannot function effectively and that the country of a consequently has an uneasy surrounding for foreign businesses. A full-scale navy regime poses the greatest threat. In the short term, a military regime may also offer new stability and accordingly lessen business risks. However, in the long run, the hazard will nearly surely upward push, in part because the gadget of governance can end up corrupt and partly because the continuation of any such authorities is likely to create an armed opposition. Sometimes, navy participation in authorities may be a symptom rather than a cause of underlying difficulties (ICRG, 2018). Overall, it can hypothesis that

H7: lower threat scores suggest a more military participation in politics and a better stage of political risk and hence increase tax revenue inefficiency.

#### 2.10. Religious tensions

Religious tensions may additionally stem from the domination of society and/or governance with the aid of a single no secular institution that seeks to replace civil regulation via religious regulation and to exclude other religions from the political and/or social method; the desire of a single religious group to dominate governance; the suppression of spiritual freedom; the preference of a non-secular organization to explicit its personal identity, separate from the country. The hazard involved in those situations variety of green human beings imposing inappropriate policies via civil dissent in the civil war (ICRG, 2018). Hence, it can hypothesis that:

H8: The higher existence of religious tensions in the country leads higher occurrence of tax revenue inefficiency.

#### 2.11. Ethnic tension

This variable measures anxiety within a country because of race, nationality, or language divisions. It gives lower scores to international locations wherein racial and nationality tensions are high because opposing groups are intolerant and unwilling to compromise. It gives higher rankings of countries where tensions are lower, even though such variations may also exist (ICRG, 2018). Therefore, one can hypothesis that

H9: The higher existence of ethnic tension in the country leads higher occurrence of tax revenue inefficiency.

#### 3. Research materials and method

Since this study mainly focuses on quantitatively examining the interaction of variables from the extant literature, the positivists' paradigm was the suitable choice and it provided quantitative patterns. The target population of this study was Sub-Saharan African countries. This study was cover all SSA countries which have 22 years' data (2000–2021 G.C.) at the time of data collection on the variable desire to investigate. The data in this study were panel dataset. It took all the data

from Transparency International (TP) and International Countries Risk Guide (ICRG). The collected data was analyzed by using both descriptive and inferential statistics. Based on model planned, a statistical software package stata version 15 was used.

#### 4. Models specification

Subsequently updated by many writers (for example, Jondrow et al., 1982; Jha, 1999; Alfirman, 2003; Ndiaye & Korsu, 2014; Castaneda & Pardinas, 2012; C. Pessino & Fenochietto, 2013; IMF, 2013b; Cyan et al., 2013; Alm & Duncan, 2014; Langford & Ohlenburg, 2016 & Garg et al., 2017) basic Model for Stochastic Frontier Analysis, as demanded by Aigner et al. (1977) and Meeusen and van Den Broeck (1977). This paper adopted this model by applying it in the stochastic analysis of the tax frontier.

$$\frac{T}{\mathsf{Yit}} = f(\mathsf{Xit};\beta).\xi it.e^{\mathsf{vit}}$$
(1)

Where

- $\frac{T}{Vit}$  is the actual tax revenue to GDP ratio for country i at time t.
- Xit, is an expression given to the production function normally in economics, but this context the vector of input X are to be transformed into revenues, in line with the parameter β,
- $\xi it$  is the tax effort for country i at time t.
- e<sup>vit</sup> represents the random shocks such as one off-windfalls, measurement errors and model specification.

Thus, the entire expression  $\frac{T}{Yit} = f(Xit; \beta).\xi it.e^{vit}$  defines the stochastic tax frontier; specifies the tax potential for the country, i at time t, and what the actual tax to GDP ratio would be if effort  $\xi it$  were equal to 1. The general model specified in equation (1) above can be further detailed as follows:

The production function component of equation (1) is assumed to take the form of Cobb-Douglas, i.e. linear in logs, as specified here below. In the definition of Qit = ln(T / Yit) where T is taxes and Y is GDP output. The following new definition is given by Defining Xit = ln(Xit), as an input vector of institutional factors, and by defining the term " inefficiency" Uit =  $-ln(\xi_it)$ .

$$Qit = \alpha + \beta' Xit + vit - uit$$
<sup>(2)</sup>

It is possible to further specify the model in equation (2) by incorporating an observable heterogeneity, i.e. environmental variables (*letitbeZ*) which are observable but not captured in the model as a direct input in to tax collection, but that could influence tax potential, *Tp*, the level of tax effort, *Te*,and inefficiency,*TIe* gives the following specification(Battese, 1995).

$$Qit = \alpha + \hat{a}'Xit + \delta p'Zit, p + vit - uit$$
(3)

Where,  $uit \sim N^+(\mu it, \sigma^2 u)$ ,  $\mu it = \delta e'zit$ , e and  $vit \sim N(0, \sigma^2 v)$ 

Here the specification vit - uit is expressed as a composite error term that incorporates both the random shock vit, assumed to be normally distributed and independent of uit, the strict positive inefficiency term. The "inefficiency" term uit is assumed to be a truncated normal distribution. This "inefficiency" will be defined in terms of lack of tax effort. Hence, the stochastic frontier is specified by  $\alpha + \beta' xit + \delta p' zit$ , p + vit, specifies (log) tax ratio that a country i could achieve in time period t, in the absence of inefficiency, i.e. uit = 0 or equivalently if effort( $\xi it$ ) = 1. The inefficiency term uit varies across time in the country and is partly influenced by the observable factors zit, e. Finally, the distribution of the estimated stochastic frontier parameters, i.e. inefficiency (lack of effort, uit), stochastic error, vit and tax effort,  $\xi it$ , all proof main specifications checked by using their respective descriptive statistics (mean and standard deviation). Following Battese and Coelli (1995), who introduced a panel data model with time-varying inefficiency that reflects observable

heterogeneity, the parameters of the stochastic frontier and the inefficiency model are estimated simultaneously to avoid bias (Wang & Schmidt, 2002) using the maximum probability.

As Langford and Ohlenburg (2016) have stated, unobserved time-invariant heterogeneity is captured in the random effect (RE) framework (in terms of the model in (3): it captures the random effect in the uit estimation). In view of the random effect, relies on the unlikely assumption that it does not relate the effects of the explanatory variables. The choice of how to model unobserved time-invariant heterogeneity in stochastic frontier analysis (SFA) can have a substantive impact on the estimated size of inefficiency and hence, in the present context, on the size of countries' measured tax effort. In particular, country-specific characteristics that cannot be measured explicitly could be treated as differences in potential tax capacity; time-invariant aspects of inefficiency; or—perhaps most realistically—as some combination of the two. A simple random effect approach would inherently incorporate all effects into the estimate of inefficiency. Greene (2004, 2005) proposes alternative means for handling time-invariant effects as unobserved heterogeneity in the stochastic frontier, rather than as any part of inefficiency.

Therefore, to minimize the dilemma of individual estimation methods, using blended methods of estimation gives more helpful effects. Hence, to determine inefficiency half-normal, exponential—normal and truncated normal distribution might be used. This paper, therefore, aims to formulate the following equation for Sub-Saharan African countries over a span of 22 years.

$$\mathsf{Uit} = \acute{a} + \beta \mathsf{lnIQit} + \varepsilon \mathsf{it}$$

(4)

Where

*Uit* is tax revenue inefficiency which is generated from stochastic tax frontier analysis model (tax effort model of each estimation).

#### 4.1. IQ contains

- BQ is bureaucratic quality measured by item scores extracted from International Country Risk Guide political risk component.
- GS is government stability measured by item scores extracted from International Country Risk Guide political risk component.
- IC is internal conflict measured by item scores extracted from International Country Risk Guide political risk component.
- MP is military in politics, measured by item scores extracted from the International Country Risk Guide political risk component.
- RT is religions tension measured by item scores extracted from the International Country Risk Guide political risk component.
- LO is law & order measured by item scores extracted from the International Country Risk Guide political risk component.
- ET is ethnic tension measured by item scores extracted from the International Country Risk Guide political risk component.
- DA is democratic accountability measured by item scores extracted from the International Country Risk Guide political risk component.
- CR is corruption measured by item scores extracted from the International Country Risk Guide political risk component.
- $\boldsymbol{\varepsilon}$  is the error term
- See table 1 for more

Table 1. Variable De	scription			
Variable	Symbol	Expected sign	Description	Source
Dependent Variable				
Tax revenue inefficiency	TRIEFF		Tax revenue inefficiency	Generated from stochastic tax frontier analysis
Institutional Quality variables(IQ)				
Corruption	CR	-	Corruption Perceptions Index	Transparency International and ICRG
Bureaucratic quality	BQ	+	Measured by item scores extract from International Country Risk Guide political risk component.	International Country Risk Guide political risk component.
Democratic accountability	DA	+	Measured by item scores extract from International Country Risk Guide political risk component.	International Country Risk Guide political risk component.
Government stability	GS	+	Measured by item scores extract from International Country Risk Guide political risk component.	International Country Risk Guide political risk component.
Law & order	LO	+	Measured by item scores extract from International Country Risk Guide political risk component.	International Country Risk Guide political risk component.
Internal conflict	IC	-	Measured by item scores extract from International Country Risk Guide political risk component.	International Country Risk Guide political risk component.
Military in politics	MP	-	Measured by item scores extract from International Country Risk Guide political risk component.	International Country Risk Guide political risk component.
Religions tension	RT	-	Measured by item scores extract from International Country Risk Guide political risk component.	International Country Risk Guide political risk component.
Ethnic tension	ET	-	Measured by item scores extract from International Country Risk Guide political risk component.	International Country Risk Guide political risk component.

#### 5. Results

#### 5.1. Description of results

The stochastic frontier analysis develops a method that draws the greatest amount of income from certain groups of determining income characteristics and allows the estimation of inefficiencies tax revenue collection in a country and then investigates factors to determine tax revenue inefficiency within the tax income system of the Country. Therefore, in this study, only the stochastic frontier specification was used to analyze tax revenue inefficiency and its determinants. To empirically examine tax revenue inefficiency, institutional quality variables expressed in terms of political risk factor components (bureaucratic quality, corruption, democratic accountability, government stability, law & order, internal conflict, military in politics, religions tension and ethnic tension) were considered. There are three alternative specifications from the inefficiency term Ui, which are assumed in this paper with stochastic frontier models. In the first, a half-normal specification of the inefficiency term is given, in the second it is an exponential-normal specification and in the third it is a truncated-normal specification of the inefficiency term. Tax revenue inefficiency is the dependent variable of the inefficiency equation. In this equation, it also views the coefficients are also as an effect on efficiency. Therefore, the positive (negative) inefficiency variables are explained to have a negative (positive) efficiency effect. It can find the details of the three alternative specifications of inefficiency classification in Table 2.

#### 6. Multicollinearity assumption test

Multicollinearitymay emerge when there appears to be an excessive correlation between two or greater explanatory variables each other. To check collinearity or multicollinearity Pearson pairwise correlation test was used and to resolve this problem, highly correlated it uses explanatory variables in separate sorts. In the current study, Table 2 reveals Pearson pairwise correlation results for variables of institutional quality entered tax revenue inefficiency model, and the result shows that there are highly correlated variables. To test their effect, therefore, highly correlated variables entered step by step until their effect becomes significant (see, Table 2 for separate tests).

Richard M. Bird et al. (2004) shows that variables with a correlation above 0.80 could be troublesome, and sometimes even smaller correlation levels could cause problems. Therefore, to minimise this problem, Table 2 presents each collinear variables in a separate model based on their significant results when included in the model. Specifically, for half-normal estimation, Model 1 first includes corruption, internal conflict, ethnic tension, religious tension, and the military in politics by excluding democratic accountability, bureaucratic quality, government stability and law & order variables from this model and adding them separately to Model 2. The exponential-normal estimation, all variables when entered model 3 step by step are significant. Like that of half normal, in case of truncated normal estimation, model 4 contains only bureaucratic quality, internal conflict, ethnic tension, religious tension, religious tension, and the military in politics. The last model in truncated normal estimation is model 5 includes democratic accountability, internal conflict, ethnic tension, and the military in politics and excludes bureaucratic quality, corruption, government stability and law & order.

#### 6.1. Empirical results

Table 3 estimation result reveals that corruption has a negative and significant effect on tax revenue inefficiency in all models, meaning that a high level of this variable is linked to lower levels of tax revenue inefficiency and high levels of tax revenue efficiency. Because international country risk guide (2021) shows that the higher measured value of corruption implies existence of low corruption practice in the country. This leads to lower tax revenue inefficiency and increase tax revenue efficiency of a country.

Table 2. Test of Multicollinearity for variables included in tax revenue inefficiency									
	log_BQ	log_CR	log_DA man	log_GS	log_LO	log_IC	log_MP	log_RT	log_ET
log_BQ	1								
log_CR	0.9267	1							
log_DA	0.9282	0.9841	1						
log_GS	0.9028	0.9607	0.9576	1					
log_LO	0.9091	0.9614	0.9591	0.9463	1				
log_IC	0.8967	0.9524	0.9517	0.9876	0.9382	1			
log_MP	0.9215	0.9696	0.9698	0.9590	0.9507	0.9577	1		
log_RT	0.9019	0.9698	0.9642	0.9886	0.9486	0.9824	0.9657	1	
log_ET	0.8929	0.9301	0.9320	0.9199	0.9508	0.9131	0.9416	9353	1

Democratic accountability, which is significantly and negatively related to tax revenue inefficiency, shows that the higher existence of responsible authority in the country and lower occurrence of tax revenue inefficiency or higher levels of tax revenue efficiency. Thus, a transition toward democratic authorities may coincide with the boom in taxes and public spending, according to the median voter, transferring in the route of a better redistribution of wealth (Dioda, 2012). Some authors like Barro (1979) and Wittman (1989), remember the maximum drivers of public coverage are not political factors. Also, Mulligan et al. (2004) did not find out evidence that democracy can offer a reason behind the modifications in tax revenue.

Bureaucratic quality is positively and significantly affects tax revenue inefficiency. This shows that for those countries where institutional power and excellence of the rules and regulations are highly inappropriately exercised, there is higher tax revenue inefficiency or low level of tax revenue efficiency. This has given to nations where the rules and regulations have weak and information to manipulate with drastic adjustments in policy or interruptions in authority's services and hence decrease tax revenue efficiency.

In the estimation result models, government stability is positively and significantly affects tax revenue inefficiency implies that in those countries where there is high non-existence of the authorities' potentially carry out its declared program(s), and its potential not occur in workplace under high unstable government situations there is higher tax revenue inefficiency or lower tax revenue efficiency. The estimation analysis result also reveals that law & order has a negative and significant effect on tax revenue inefficiency. This shows for those nations the existence of strength and impartiality of the secure unit mechanism and the famous observance of the regulation reduce inefficiency tax revenue or increase efficiency of tax revenue.

Internal conflict has a significant and positive effect on tax revenue inefficiency implies that in those nations wherein there is an existence of high internal conflict, increases inefficiency of tax revenue or decreases tax revenue efficiency of a country. The analysis result shows that military in politics has a significant and positive effect on tax revenue in efficiency. This implies that there is higher involvement of military in politics and it is a diminution of democratic accountability of the government. The giant implications here are that the military would possible, for instance, end up worried in government because of an actual or created internal or external risk. Such a state of affairs would mean the distortion of government coverage to meet this danger, for example, with the aid of growing the defense price range on the fee of other price range allocations. This poses the greatest threat. In the fast term, a military regime may also offer new stability and accordingly lessen business risks in the short-run. However, in the long run, the hazard will nearly surely upward push, in part because the gadget of governance can end up corrupt and partly because the continuation of any such authorities is likely to create an armed opposition. These suggest that

Table 3. Tax I	revenue Ineffid	ciency under St	chastic Fronti	ier Analysis						
Half—Normal					Exponentic	al—Normal		Truncated	- Normal	
	Mod	lel 1	Mod	lel 2	Mod	lel 3	Mode	el 4	Moc	tel 5
Variables	Coef	٩	Coef	٩	Coef	٩	Coef	٩	Coef	ď
log_BQ			381	0.000**	166	0.000**	316	0.000**		
log_CR	128	0.000**			227	0.044**	411	0.000**		
log_GS			178	0.000**	242	0.000**	295	0.000**		
log_LO			335	0.000**	148	0.000**	389	0.000**		
log_DA			230	0.000**	202	0.018**			048	0.000**
log_ IC	269	0.000**			188	0.001**			034	0.000**
log_ ET	078	0.000**			185	0.002**			189	0.000**
log_ RT	810	0.000**			151	0.000**			206	0.000**
log_ MP	619	0.000**			154	0.000			007	0.723
cons	866	0.000**	866	0.000**	945	0.000**	266	0.000**	866	0.000**
Wald chi2	3.54e+11	0.000**	5.55e+10	0.000**	2098.89	0.000**	228,053.63	0.000**	73,871	30 0.000**
**sianificant at 5	% confidence level									

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Table 4. Correlation an	nong estimation Techni	ques	
	Half—Normal inefficiency	Exponential—Normal inefficiency	Truncated- Normal inefficiency
Half—Normal inefficiency	1.0000		
Exponential—Normal inefficiency	0.8121	1.0000	
Truncated- Normal inefficiency	0.9948	0.8092	1.0000

(Source: Author own computation)

a more military participation in politics and a higher stage of political risk and hence increase tax revenue inefficiency or reduce tax revenue efficiency.

The results depicted in Table 3 show that religious tension has a negative and significant effect on tax revenue inefficiency. This implies that the domination of society and/or governance with the aid of a single no secular institution that seeks to replace civil regulation via religious regulation and to exclude other religions from the political and/or social method; the desire of a single religious group to dominate governance; the suppression of spiritual freedom; the preference of a non-secular organization to explicit its personal identity, separate from the country and the hazard involved in those situations variety of green human beings imposing inappropriate policies via civil dissent to the civil war and hence increases tax revenue inefficiency or decrease tax revenue efficiency.

Ethnic Tension has a positive and significant effect on tax revenue inefficiency. This implies that there is an existence of anxiety within a country because of race, nationality, or language divisions. This occurs when lower scores are given to international locations wherein racial and nationality tensions are high because opposing groups are intolerant and unwilling to compromise and hence lower score of ethnic tension leads to higher existence of tax revenue inefficiency or lower level of tax revenue efficiency.

The determination of tax revenue inefficiency across different specifications that is the stochastic frontier analysis (Half—Normal inefficiency, Exponential—Normal inefficiency and Truncated-Normal inefficiency) is highly related and can be replaceable (see, Table 4). Because these specifications assume inefficiencies can be heteroskedastic and can be followed by the first-or second-case and allows the modelling of inefficiency variance as a function of exogenous effects. Because of these reasons, the results can be used interchangeably.

#### 7. Conclusion and recommendation

#### 7.1. Conclusion

Maintaining a good revenue system is an essential prerequisite for the success of fiscal decentralization for most developing and developed countries. Because maintaining good revenue system besides raising revenues, domestic revenue mobilisation has the power to enhance political and administrative accountability by empowering communities. However, domestic revenue potential and the effort in developing countries because of tax collection inefficiency have been often low and collection costs as high as compared with many developed countries. Therefore, empirical examination of the question of why nations tax revenue collection is low is an essential issue for developing countries specifically Sub-Saharan African nations. Therefore, this has a look at the desire to examine drivers of tax revenue inefficient of Sub-Saharan African countries.

The main interesting result of this paper is that the institutional variables derived from international country risk guide political risk factors have a significant impact on tax revenue inefficiency through the use of stochastic frontier analysis of different estimation strategies.

#### 7.2. Recommendation and further implication

This paper's major objective is to improve the governance measures that need to be implemented to boost the effectiveness of tax revenue. By creating semi-autonomous tax agencies, paying tax officers more, enhancing tax services, and minimizing interactions between taxpayers and tax officials, for instance, corruption in tax administration can be decreased. Furthermore, the institutional factors' effects on tax revenue, which are significantly stronger than their contemporaneous effects in most regressions, provide important information. To attain the highest level of tax efficiency in the future, it is imperative that the institutional environment improvement initiatives are put into action as soon as possible.

Changing an established tax structure is politically and hence practically difficult. As a result, the success of any tax revenue reform is heavily dependent on top-level political pledges, particularly to reduce tax revenue inefficiencies. Revenue reform debates must be country-specific and based on a full review of the country's inefficiency or efficiency, as well as political readiness to undertake difficult reform initiatives. Potential constraints inherent in the empirical results supporting or opposing past studies not included because first examined in this research should be granted. Despite this possible inherent constraint, the study's findings are likely to provide insight for an empirical model of systematic investigation of the determinants of tax revenue inefficiency in sub-Saharan African nations. These factors were chosen from the theoretical dimension of foreign country risk guidance that had not before been experimentally examined as a determining factor of tax revenue inefficiency. However, the results' validity was unaffected. Another researcher can duplicate this work for the purpose of comparing inefficiency between nations or within a single country.

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