LISBON SCHOOL OF ECONOMICS & MANAGEMENT
UNIVERSIDADE DE LISBOA

MASTER OF SCIENCE IN

FINANCE

MASTERS FINAL WORK

DISSERTATION

A STUDY ON THE DETERMINANTS OF TAX REVENUES IN AFRICA

OLUWATOSIN ROLAND ARIWAYO

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SUPERVISOR:

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Abstract

Tax revenues efforts in Africa over the years is still well below a threshold that is sustainable for capital and human developments. Existing literatures on the subject of the determinants of tax revenue in Africa had used time series data for specific countries and panel data for group of countries. Most empirical studies focused mainly on Sub Saharan Africa, excluding North Africa from the sample of countries used, also very little attention had been given specifically to the determinants of corporate tax revenue which is a major constituent of total tax revenue in this region.

In this dissertation we hope to contribute to the set of studies on the determinants of tax revenues in Africa. To achieve our objective, we obtained yearly unbalanced panel data from 1997 to 2016. We excluded countries and years with missing observations for the dependent variables. Considering the fact that the diagnostic test for the residual of the regression shows violations of some basic assumption of the OLS. Hence the need for a robust OLS standard error approach. We used the Driscoll and Kraay(1998) standard error for the coefficient estimated by the pooled OLS, fixed(within) regression. The results indicates that total tax revenue (as a percentage of GDP), is positively correlated with our determinant variables which are, public spending, industry share, control of corruption and government effectiveness, whereas the log of GDPpercapita, inflation and agriculture share indicates a negative correlation. Regarding corporate tax revenue (as a percentage of GDP), we find evidence of been positively correlated to inflation and trade openness , while public debt indicate a negative correlation.

JEL: H21; H25; C23

Keywords: Tax revenues, Corporate tax revenues, Panel data analysis

Resumo

O esforço da receita fiscal em África nos últimos anos continua abaixo do nível considerado sustentável para o desenvolvimento humano e do capital. A literatura sugere a utilização de séries temporais para países específicos e dados em painel para um conjunto de países, no estudo dos determinantes da receita fiscal em África. A maior parte dos estudos empíricos foca-se principalmente na região da África subsariana, excluindo da amostra os países da região do norte de África. É, também, dada pouca atenção aos determinantes da receita fiscal das empresas que é a maior fonte de receita do total de receitas fiscal nesta região.

Nessa dissertação esperamos contribuir para a literatura nos estudos dos determinantes da receita de fiscal em África. Para alcançar o nosso objetivo, consideramos uma base de dados não balanceada, com dados em painel, desde 1997 a 2016. Excluímos da amostra países e anos com valores não observados para a variável dependente. Consideramos o facto de o teste diagnóstico para os resíduos da regressão mostrar violação de alguns pressupostos do OLS. Por isso a necessidade da utilização de um OLS robusto. Utilizamos o erro padrão de Driscoll e Kraay(1998) para os coeficientes estimados a partir do pooled OLS, fixed(Within) regression. Os resultados indicam que a receita fiscal total (como percentagem do PIB) está positivamente correlacionada com os nossos determinantes,public expenditure, industry share, control of corruption e government effectiveness, enquanto que o log do GDPpercapita, inflation e agriculture share indica uma correlação negativa. Relativamente a receita fiscal das empresas (como percentagem do PIB), verificamos evidencia de correlação positiva com inflation e trade openness, enquanto que public debt apresenta uma correlação negativa.

Classificação JEL: H21; H25; C23

Palavras-Chave: Receita fiscal total, Receita fiscal das empresas, Dados em painel

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List of Abreviations

ARA- Autonomous Revenue Authority

BEPS- Base Erosion Profit Shifting

DRM- Domestic Revenue Mobilization

FDI- Foreign Direct Investment

FM- International Monetary Fund's Fiscal Monitor

GDP- Gross Domestic Product

IFS- International Monetary Fund's International Financial Statistics.

LAC- Latin American and the Carribeans

MENA- Middle East and North Africa

ODA- Official Development Assistance

OECD- Organisation for Economic Co-operation and Development

OLS- Ordinary Least Square

SSA- Sub- Saharan Africa

UNCTAD-United Nations Conference on Trade and Development

VAT- Value Added Tax

WAEMU- West African Economic and Monetary Union

WDI- World Bank's World Development Indicators

WGI- World Bank's World Governance Indicators

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1 Introduction

Despite the increase pressure of education, social and infrastructural expenditures, African countries over the last years have not been able to maintain fiscal discipline, making fiscal imbalance a norm in this continent. The main causes of fiscal imbalance are poor design of income taxation, weak revenue mobilization and fast expansion in expenditure and declining or low revenue level (Lewis, 1984; Drummond et al, 2012; Nashashibi & Bazzoni, 1994). Having being faced with persistent revenue shortages, several Sub-Saharan African countries had adopted in the last thirty years measures to improve their ability to raise taxes (Ahlerup et. al, 2015).

The need for African governments to engage in aggressive tax revenues mobilization cannot be overemphasized based on the declining relative importance of foreign aids[1] on the basis that this source has largely dried due to the recession in the industrialized nations (Cnossen, 2015; Mubiru, 2010).

Tax revenues largely surpass the inflows of foreign capital (Fig. 1) such as official development assistance (ODA) and foreign direct investments (FDI) (Sy & Sow, 2016). Gupta (2007) finds that foreign aids improves revenue performance significantly while debt does not. In the same vein, Bhushan & Samy(2012) find that foreign aids has no significant impact on taxation in Sub Saharan Africa. In addition, Ebeke & Ehrhart (2010) find that foreign aid acts as a buffer mechanism to counter the detrimental impact of the instability of tax revenues on the public capital spending. However, foreign aids received from the respective donors includes details on spending plan or the required projects to be executed with the funds, thereby could constitute a constraint for government spending on immediate priorities.

Furthermore, Gambaro et al (2007) find no evidence that foreign aids substitute for domestic tax revenues, though find a positive association between aid inflows (in form of grants as opposed to loan) and tax revenues. In contrast, Ghura (1998) find that increase in the level of external grants are associated with lower tax ratios. Bhushan & Samy(2012) mentioned that the structure of the economy is important than the amount of aid a country receives. The Africa Tax Outlook(2017) report shows that a country´s economic structure

[1] Official development assistance (ODA): Foreign aids data include grants and loans but are net rather than gross, that is, current loan repayments are subtracted. Net aids equals aid disbursement minus repayment of principal(Brautigam and Knack, 2004)

might also determine its ability to raise revenue, it explained that sectors marked by high levels of informal activity are more difficult to tax. According to Sy & Sow(2016), Africa continent is currently a net creditor to the world, despite the levels of ODA and FDI received. This can be explained by the large outflow of capital from the continent driven by high amount of unrecorded capital flows, also known as illicit financial flows[2](IFFs)

At the inception of global financial crisis starting in 2008, it was widely suggested by several authors, not only for Africa countries but for OECD as well, that much efforts is required towards mobilizing domestic tax revenues as a measure to stabilize dwindling, declining and eroding tax bases via effective tax structures reforms and also to review existing tax policy to checkmate increasing activities such as Base Erosion and Profit shifting(BEPs) rampant among Multinationals, illicit financial flows and tax evasion(Oguttu , 2016 ; Crivelli et al, 2016; Baunsgaard & Keen, 2010)

Tax revenues as a percentage of GDP, estimated to be around 15 or less in more than half of all the countries on the Africa continent, which is much lower than the optimal threshold of 25% required to finance investments in capital development(Cnossen,2015, African Economic Outlook, 2018). Mascagni et al (2014) confirmed that, sequel to a lower tax efforts indices[3] as obtainable in developing countries compare to the OECD, the tax revenues to GDP ratio is 10-20% for developing and 30-40% for OECD. Chimilila (2018), finds that Sub Saharan Africa countries have the lowest tax performance. A recent study conducted on behalf of the European Parliament's Committee on Development shows that " Latin America and the MENA region (Middle East and Northern Africa) have seen larger increases in tax revenue in recent years than Sub-Saharan Africa" (Mascagni et al,2014).

Most empirical studies focused mainly on Sub Saharan Africa, excluding North Africa from the sample of countries used, also very little attention had been given specifically to the determinants of corporate tax revenue which is a major constituent of total tax revenue in this region. We intend to understand the performance of tax revenues in African countries and as well empirically determine the main economic, sector and

[2] Kar & Freitas(2013) report estimates that, in 2009, illicit financial flows out of Africa were three times the amount of ODA received

[3] revenue collections relative to estimated revenue potentials(Mascagni et al,2014)

institutional variables that influence the tax revenues(%GDP) and corporate tax revenues(%GDP)in Africa.

The knowledge of the main determinants of tax revenues and corporate tax revenues can be helpful to policy makers in the sense that they can optimize the collection of tax revenues through required structural reforms of economic, institutional and fiscal policies. The study also contributes to the pool of scientific tax journal with emphasis on how to increase tax revenues performance and efforts.

To perform our study, we obtained yearly unbalanced panel data from 1997 to 2016. We excluded years where data was not found for the dependent variables of interest which gave a final data set of 36 countries and 13 countries for Tax revenue(%GDP) and Corporate tax reveneue(%GDP) respectively. Considering the fact that our diagnostic test on the regressions residuals, indicates a violation of some basic assumption of the OLS, hence the need for a robust OLS standard error approach, to avoid a biase estimate. We used the Driscoll and Kraay(1998) standard errors for the coefficient estimated by the pooled OLS, fixed effect(within) regression.

The results indicates that total tax revenue (as a percentage of GDP), is positively correlated with our determinant variables which are, public spending, industry share, control of corruption and government effectiveness, whereas the log of GDPpercapita, inflation and agriculture share indicates a negative correlation. Regarding corporate tax revenue (as a percentage of GDP), we find evidence of been positively correlated to inflation and trade openness , while public debt indicate a negative correlation.

The dissertation is structured as follows: we begin by discussing the relevance of tax revenues as a panacea to inadequate government revenue . In section 2, we review literatures generally and specifically on Africa on tax revenues and corporate tax revenues. In section 3, we discussed the data, methodology, diagnostic test on the variables. In section 4, we discussed the results obtained, its implications and explain some descriptives on differents tax mix in Africa. The final section, discussed the conclusion, limits and consideration for possible future work

2 Literature Review

2.1 Main Concept

Hinrisch (1966) studies on the evolution of tax system, which forms the basis concerning the choice and behaviour of taxes during a development process, used two methods to explain several broad empirical generalizations based on the size and structure of government revenue system at different phases of socio-economic development. These two methods are: static cross-section analysis of different countries at the same time and dynamic study of specific countries at different times. Subsequently, (Ahmad & Stern, 1989; Burgess & Stern, 1993) stated that the impacts of socio-economic development such as increased diversity of "tax handles[4]", broadening of existing tax bases and improved administrative skills to harness these available means has the capacity to raise tax ratio. Chimilila (2018) shows that features common to structure of taxation in developing countries are: narrow tax bases, barely progressive taxes, widespread of exemptions and many "hard to tax" (informal) economic activities. Kenny & Toma (1997) mentioned that the reliance on tax source increases as; the base for the tax grows, administrative cost fall or total revenue needed increases. As suggested by Keen & Mansour (2009), concerning tax structure, they show that there has been downtrend in trade taxes and an upward trend in indirect taxes, while income taxes almost remain constant(Fig. 2 and Fig. 4)

The design of tax structures[5] implemented by different countries greatly impacts on their level of taxation. Alt(1983), stated that tax structures vary from country to country based on: the level of revenue extracted, shares of total revenues raised by different kinds of taxes based on different classifications, centralization of administration, amount of redistribution achieved by the tax system and the complexity of the tax system, different rates of taxes and the associated range of exemptions. Edmiston et al (2003) argue that, in transition countries the design of the tax structure and the way in which it changes over time can critically affect the level of risk and transaction costs associated with foreign direct investments. In addition, he find that complexity and uncertainty with respect to multiple tax rates, unclear language in the tax laws and inconsistent changes in

[4] Elements of a country's tax base (Ghura, 1998). Leuthold(1991,p175) refers to it as tax bases that lend themselves to taxation

[5] The tax structures measures the composition of tax revenues by different tax types. This is an important indicator, since different taxes have different economic & social effects(OECD,2017)

the tax laws, have a significant negative effects on inward FDIs. Furthermore, Khujamkulov (2016) find that GDP percapita growth leads to changes in the composition of taxes and the tax structures in transitional economies. He concluded that, in specific transitional countries, the higher the national income, the degree of openness, the share of the non-agricultural sector, the rate of population growth, the extent of urbanization, the density of population, the proportion of younger population and the employment rate, the higher the ratio of taxes to GDP.

Developing countries tax structures vary widely, while that of the industrialized nations are similar to a certain extent (Tanzi, 1992; Zee, 1996). As shown by Revenue Statistics of Africa (2017), the average tax structures of the African countries is similar to that of the Latin America & the Caribbean (LAC) region, except that social security contributions were more significant in LAC. Burgress & Stern(1993) discovered that corporate income taxation has limited scope and personal income tax require sophisticated administration, while the domestic taxes on goods & services(VAT) are accessible wherever markets or productions exist. According to Zee (1996), he finds that income and consumption taxes comprised more of total tax revenues from developing countries. Likewise that the level of taxation obtainable in the developing countries is half that of the developed as the latter tends to rely more on income taxes and much less on trade taxes. In addition, trade tax revenues(Fig. 2, Fig. 3 & Fig. 4) was found to be more unstable among the different tax mix in Africa(Zee, 1996).

Moore (2013), in a bid to answer the question on why governments of low income countries (LIC) could not raise more taxes, used comparison among countries and potential benefits of reforms in tax policy and administration. He finds the economic structure, rent taking, inefficient tax administration, underused property taxes compare to other countries, the design of the country's political & government institutions as the cause of low tax takes. Also, Ghura (1998) finds that countries that have implemented structural reforms on a sustained basis have raised their tax revenue higher than those that did not. Furthermore, Burgress & Stern (1993) explained that a typical element of tax reform in developing countries are efforts to broaden the tax base. In response to the same question, Cnossen (2015) shows that it may be difficult to generalize such reasons on the ground that different political and economic structures holds in the low income countries. Mansour & Keen (2009) find that African governments approach in the provision of tax

incentives to attract foreign investments was not properly structured. In addition, Drummond et al (2012) find that increased mobility of tax bases owing to trade liberalization, mobility of investments and capital income, tariffs[6] and other trade taxes are major complication to mobilizing adequate fiscal revenue in SSA (Agbeyegbe et al,2006). Takumah (2014) was of the opinion that tax base needs to be widened and tax rates reduced in order to generate more revenues. Likewise Gillis (1989a) opined that as tax bases widen, the tendency to impose high rates on the narrow tax bases is reduced and this may have a positive effect on enforcement and the amount of revenue realized.

In addition, African tax system have been characterized by huge Informal sector.[7]Joshi et al (2014) show that with respect to revenue, it represents a potentially significant source of tax revenue for governments in dire need of funds. According to Auriol & Warlters (2005) find that higher entry fees, set as barriers into the formal economy, is a deliberate government policy, resulting to a large informal sector and revenue at low administrative cost. In addition, it estimated that a 1% increase of the entry sunk cost increases the informal sector by 14 %(Auriol & Warlters, 2005); as a result, large proportion of total tax collection in developing countries is linked to few taxpayers. This in a way has also contributed to narrow tax base and had paved way for the economic stance on shadow economy[8]. According to Schneider et al (2011), based on their estimate for the period from 1999 to 2007, they find that the weighted average size of the shadow economy(as a percentage of GDP) in SSA is 37.6% , in Europe and Central Asia(mostly transition countries) 36.4% and in high OECD countries 13.4%.They concluded that an increase burden of taxation(direct and indirect ones) with labour market regulations and the quality of public goods & services as well as the state of the official economy are the driving forces of the shadow economy

Despite the huge improvement in tax revenues in African countries. Stotsky & WoldeMariam(1997) find variation in the tax revenue performance from the region. Drummond et al (2012) find that only few low income countries in SSA, were not able to

[6] Other pressure on tariff revenue is the formation of free trade zones and customs unions, which could narrow the tax base(Drummond et al,2012)

[7] Originally proposed by Keith Hart (1973), it initially referred to employment outside of formal labor markets. The focus is on legal status of the business (Joshi et al, 2014). Some authors have preferred the term “hard-to-tax” due to the ambiguity with the term Informal sector.

[8] Shadow Economy: Defined by Smith (1994, p.18) as “the market-based production of goods & services, whether legal or illegal, that escapes detection in the official estimates of GDP”. It’s a broader category than the informal sector or economy(Joshi et al,2014)

increase tax ratio (at least once in the last two decades) by more than 2pp of GDP in the short to medium term. More studies have recently shown a major setback which portends negative impact on tax efforts, though not limited to Africa, and have been a major concern on the scene of the International tax system, "inter alia", are corruption, base erosion and profit shifting (tax avoidance) and tax evasion, spillover effects[9] and vicious cycle of low tax collection (Gupta, 2007; Gambaro et al, 2007; Drummond et. al, 2012; Cozmei, 2015; Crivelli et al, 2016; Amoako-Tuffour, 2015).

2.2 Determinants of Tax Revenues

In literatures, the standard approach is to model the tax revenue to GDP ratio as determined by variables chosen to proxy for the tax base and structure of the economy (Gupta, 2007).

The determinants of the tax revenues to GDP (or GNP) ratio most commonly used in previous literatures are : the sectoral composition of value added(agriculture share, industry share, mining share, manufacturing share, services), the stage of development(GDP per capita), demographic features(population density, rate of population growth & urbanization), degree of openness to international trade, inflation, Institutional quality(as measured by the worldwide governance indicators), Shadow economy, Foreign aids and rents received from natural resources(Stotsky & WoldeMariam,1997; Teera,2002;Gupta, 2007 ; Piancastelli, 2001).

The Sectoral composition of value added constitutes a key element of the tax base and is likely to be an important influence on the tax share because some sectors of an economy are amenable to taxation and generate different taxable surpluses(Stotsky &WoldeMariam, 1997 ; Ghura, 1998; Kodila-Tedika & Mutaseu, 2013). Agbeyegbe et al (2006) summarize that variables reflecting the share of different industries in the economy capture the differences in the ability to tax component of the economy. Stoksy and WoldeMaria(1997) find that both agriculture and mining share are negatively related to the tax ratio, while export share and percapita income have positive impacts.

[9] spillover effects are the impact of one country's tax policy on the tax bases of other countries which could be either through investments or shifting of profits (Crivelli et al, 2015)

The share of agriculture in the economy may be an important determinant of taxable capacity in developing countries(Stotsky & WoldeMariam, 1997). In developing countries, higher share of agriculture in the economy are said to be associated with lower tax to GDP ratios in many studies(Addison & Levin, 2012; Khujamkulov, 2016). However, a large share of agriculture may reflect an export industry in certain crops, which might be more amenable to taxation. Agriculture is a challenging sector in many developing countries owing to the fact that most people in this sector are on low incomes and are not registered for tax purposes, also there is less taxation of the agricultural sector in Africa due to a high level of informality and a low level of monetization.

The Mining share can generate large taxable surpluses. They are usually only a few large firms engaged in this sector, which facilitates tax administration. Nevertheless, since foreign investment in mining and oil extraction is common, countries may give significant tax concessions to foreign investor, limiting potential revenue collections from this source (Stotsky &WoldeMariam,1997). In addition, Kodila-Tedika & Mutaseu(2013) opined that the mining sector may be useful to generate significant tax revenues to the economy if these areas attract large companies. However, Gupta(2007) find that the effects of mining share and revenue performance is ambiguous. Furthermore, the industry share may proxy for mining share in low income countries. Piancastelli(2001) finds that tax ratio is positively related to the share of industry in GDP. This implies, the greater ease of taxing the profits of industry.In addition, he finds that the share of industry and service sectors also matters in explaining the differences in tax ratios. The Manufacturing share, consist of enterprises that are easier to tax , since business owners keep better books and records. This sector can generate large taxable surpluses if production is efficient (Stotsky & WoldeMariam, 1997).

GDP per capita or Per capita income is typically considered the best proxy for the overall level of development that is expected to reflect administrative capacity and tax collection efficiency (Tanzi, 1992; Stotsky & WoldeMariam, 1997). Tanzi (1992) finds a positive and significant relationship between the share of taxes in GDP and log of Per capita income. Teera (2002) finds a positive relationship between per capita income and total tax revenue. Gupta (2007) finds evidence that log GDP per capita is significantly positive in all random effect regression and in most fixed effect specifications. Baunsgaard &Keen (2010) finds that log GDP per capita is negative and insignificant with respect to domestic tax revenue. Mahdavi (2008) finds that inverse of the GDP per

capita is strongly and negatively correlated with the level of taxation, which implies that the level of taxation rises with the level of economic development. Ebeke & Ehrhart (2010) find a negative association between GDP percapita instability and tax revenues. Kodika-Tedika & Mutaseu (2013) find that GDP percapita is negatively significant and is the main tax base for tax revenues.

The International trade share in the economy is a measure of openness. A number of studies used different measures of trade openness/trade liberalization to assess the effect of trade policy reform on total tax revenues and trade tax revenues in developing countries(Gnangnon,2017). Openness referred to the ratio of the sum of the export and import (ie trade volume) to GDP and represents the relative size of the international trade & transaction sector in the economy (Mahdavi, 2008; Stotsky & Woldemariam, 1997). International trade sector is a well-organized and monetized sector(given that imports and exports take place at specified locations) which makes the collection of trade taxes easier than income taxes for developing countries and particularly the low income countries(Ghura, 1998). Drummond et al (2012) find that the degree of trade openness may also matter for revenue performance. He further explained that imports and exports are amenable to taxes because these activities take place at specified locations. As a result of the declining trade taxes due to trade liberalization, Baunsgaard & Keen (2010) comment that, further trade liberalization may not be feasible, hence the need for many developing countries to find alternative sources of revenues such as excise taxation and broad based consumption taxes. In addition, Ebeke & Ehrhart (2010) finds that a lower reliance on trade taxes and higher dependency on domestic indirect taxes lead significantly to low levels of instability of tax revenues. Stotsky & WoldeMariam (1997) suggest that the trade volume measure of openness is of questionable relevance as it combines imports and exports, since both are taxed with applicable tax rates varying in different ways. It was considered more helpful to distinguish the import to GDP ratio as an indicator of the tax base for tariffs from the export to GDP ratio that can be interpreted as an indicator of the performance of major sectors of the economy.

Institutional quality as measured through the world governance indicators, is an important determinant of tax revenues (Gould & Baker, 2002; Kenny & Winer, 2006; Gupta, 2007; Timmons, 2010; Monteiro, 2012; Ahlerup et al, 2015). Gupta (2007), finds that among the institutional factors, corruption has a significantly negative effect on revenue performance.Kenny & Winer (2006) show that democracies rely substantially

more on income taxation, due to the fact that this tax source requires higher degree of voluntary compliance. According to Addison et al (2002), they concluded that Public revenues plunges to very low level in conflict affected countries, sequel to this, revenues from indirect taxes fall owing to battered economic activity, decline of the quality of tax institution and more dependence on import duties and other trade taxes by government. Ahlerup et al (2015) find that the level of institutional quality affects the effectiveness and productivity of Autonomous Revenue Authority (ARA) with positive effect on tax revenues in the short and medium run, though not consistent over time. ARA and VAT are the two measures of tax innovation used in the study. However, they found that Tax innovation are not a panacea to overcome the revenue shortages in Africa countries, but are helpful in the short and medium term. Surprisingly, VAT has no effect on total tax revenues in the study. In addition, Addison & Levin(2012) find that the overall tax to GDP ratio is higher in more open and less agricultural dependent economies, less populous and peaceful countries

Shadow economy has been found to have a significant and negative impacts on tax revenues in Africa (Kodika-Tedika & Mutaseu, 2013; Teera, 2002; Drummond et al, 2012). Kodika-Tedika & Mutaseu (2013) find evidence that for African government to maximize the collected tax revenues, the "control" of shadow economy cannot be over-emphasize. Teera (2002) proxy for the size of hidden economy which indicates tax evasion and lead to loss of government tax revenues. Drummond et al (2012) find that it is a significant determinant of tax revenues with important policy implications.

Inflation might have a detrimental effects on tax collection as a general proxy for macroeconomic conditions (Agbeyegbe et al, 2004). It is also a proxy for expansionary monetary and fiscal policies (Ghura,1998). Gnangnon(2017) opined that inflation would lead to an appreciation of the real exchange rate and encourage imports, thereby generating higher trade tax revenues. On the other hand, inflation would depress domestic revenue. Generally, higher inflation would likely be associated with lower domestic tax revenue and higher trade tax revenue. Ghura (1998) finds that among the economic policy related variables, inflation has the largest impacts on tax revenues to GDP. Mahdavi (2008) finds that the level of taxation is lower when the rate of inflation is higher, with negative and significant effects on tax revenues. Agbeyegbe et al (2006) find a negative and significant effect on total tax revenues. Bhushan & Samy (2012) find that high inflation rates are expected to reduce the real value of taxes collected. Khujamkulov

(2016) finds that inflation is positively and strongly correlated with tax revenue in general, including or excluding social security contribution. in addition, the positive effect of the inflation rate on tax revenue suggests that higher rates of inflation mean more tax collected, which however, is worth less on account of the fall in the value of money.

Demographic factors have been found to be an important determinants of tax revenues in literatures. Khujamkulov (2016) finds that the higher the rate of population growth, the extent of urbanization, population density and the proportion of younger population the higher the ratio of taxes to GDP. In addition, among the demographic variables, urbanization and population density variables positively and strongly affect all tax revenues. This is due to the concentration of industries and population density of the urbanized areas where more tax payers live, which therefore, facilitate overall tax revenue collection and contribute to a higher share of revenues. Teera (2002) finds that population density affect all taxes. Mahdavi (2008) argue that revenues from certain tax types are likely to grow with the extent of urbanization and the density of population. He cited that property taxes are expected to gain as the values of land and real estate rise faster in more urban and densely populated areas than in rural or sparsely populated areas.

A high ratio of foreign aid to GDP, in previous literatures has been found to slow tax revenue collection(Leuthold,1991: Tanzi,1992; Mahdavi,2008). In contrast, Gupta(2007) finds that recepients of larger foreign aid tend to mobilise more tax revenues. He proposed that it is important to distinguish the type of aid, as aid in the form of loans may induce policy makers to mobilise higher tax revenues. However, aid in the form of grants may decrease the incentive to increase the tax base.

In Africa, the level of reliance on natural resource rent was found to be positively linked with the instability of government revenues. This is due to the instability of oil prices leading to a situation of macroeconomic uncertainty and difficulties in the execution of fiscal and developmental policies (Baunsgaard & Keen, 2010). Having failed to take advantage advantage of her resource revenue to develop non resource activities so as to broaden the tax base.

2.3 Determinants of Corporate Tax Revenues

Corporate tax system is an important source of revenue that must be retained (Avi-Yonah, 2015) owing to the fact that a larger proportion of many African countries tax bases are corporate taxes from multinationals, due to limited domestic corporate tax base(Durst,2014). Hence the need to preserve this tax base and since it has the potential to contribute greatly to domestic revenue mobilization (Mansour & Keen, 2009; Durst, 2014). In addition, developing countries raise more revenues from corporate income tax than from individual income taxes (Tanzi,1992; Burgress & Stern, 1993; Gupta, 2007).

The determinants of corporate tax revenues based on previous literatures are: tax system, unemployment rate, size of the economy, corporate tax competition, Inflation, real exchange rates, degree of openness, and GDP per capita (share of the corporate sector)

The Tax system is the legal system for assessing and collecting taxes. Clausing (2007) used a tax system dummy, indicating whether countries have a tax credit system, a mixed system or a territorial system. A territorial system of corporate income taxation excludes the foreign income of resident from taxation. A tax credit system taxes foreign income, but allows a foreign tax credit for taxes paid to foreign governments. This credit is typically limited to the domestic tax liability. The mixed tax system contain elements of both the territorial and the tax credit systems. He concluded that tax credit countries receive statistically significantly more corporate tax revenues relative to GDP than those with territorial system. Kewano & Slemrod (2012) find the type of tax system as one of the factors that consistently have a significant effect on corporate tax revenues. Gupta (2007) finds that country that rely more on income taxes, profit taxes and capital gain taxes perform much better

Tax rate increase has apparently no impact on revenues in Africa(Abbas & Klemm , 2013). The possible explanation why tax increases in Africa seem not to translate to benefits in revenues, is due to the prevalence of special regime, which implies that the standard tax rate is irrelevant or that firms react to tax rate increases by shifting profits or real activity elsewhere so as to cancel the effect of the higher tax rate . Furthermore, they find that despite tax competition, tax revenues are function of the tax rate (except in Africa), although the relationship is weakened in the presence of special regimes.

Furthermore, many factors other than tax rates affect the revenues that government receive. Revenues depend not just on the statutory tax rates set by legislators, but also on the breadth of the tax base, the opportunities for tax avoidance, the aggressiveness of corporate tax planners, the enforcement efforts exerted by government tax authorities, economic conditions that determine the profitability of firms, and the share of the corporate sector in the economy(Clausing, 2007). Kewano & Slemrod (2012) find that tax policies that broaden the tax base are associated with increase in corporate tax revenues. Furthermore, they find a weak relationship between corporate tax rates and corporate tax revenues, this is due to the persistent differences in tax policy and business environment across countries.

The most important barrier to the effective control of base erosion is the pressure of tax competition (Durst, 2014). Mansour & Keen (2009) find that corporate tax competition commonly takes two main forms: countries may offer a low statutory rate of corporate tax, available to all firms and the provision of selective preferential tax treatment[10], targeted on particular categories of investment or particular tax payers. Countries may offer a low statutory tax rate based on the national advantages it provides such as: lowers the average effective tax rate[11], reduces the incentive for tax planning[12]. In addition, they also cited that one of the central challenges that globalization poses for revenue mobilization in SSA is corporate tax competition. They concluded that corporate income tax revenue largely increase despite a reduction in rates and also find evidence of base narrowing mainly through the provision of tax holidays in investment codes and free zones. Cozmei (2015) find no evidence that downward pressure on corporate tax rates are not translated on a fall in corporate tax revenues over the time. Furthermore, Abbas & Klemm(2013) find evidence of a partial race to the bottom on the basis that countries have been under pressure to lower tax rates in order to lure and boost investment. However, for Africa, a race to the bottom is evident among special regimes[13].

[10] Such as tax holidays, often through free zone laws which apply to exporters, investment tax credits restricted to particular activities(such as R&D or investment located in particular region)
[11] An important factor in investors' decisions as to where to locate their investment.
[12] Through transfer pricing and financial arrangements to shift taxable profits to foreign jurisdiction offering lower tax rates
[13] Special regime was included as a dummy variable in the model, which entails: partial tax holidays, temporarily reduced rates & increased investment allowances. The impact of an increase in tax rate is reduced by half as a result of the effect of the special regime

GDP per capita is used to proxy for the size of the corporate sector (Clausing, 2007; Abbas & Klemm, 2013). Ohno et al (2015) find that rise in the share of the corporate sector was the principal contributing factor in pushing up the ratio of corporate tax revenue to GDP. Gambaro et al (2007) find that GDP percapita has strong positive association with revenues from income & corporate taxes with respect to high income countries. Also, Cozmei (2015) find that GDP percapita is strongly correlated with corporate tax revenues (%GDP).

Unemployment rate was found as one of the factors that consistently have a significant effect on corporate tax revenues (Kewano & Slemrod, 2012). Monterio et al (2011) used unemployment rate as a proxy for cyclical variables that should influence the profitability of corporate firms.

A country's degree of openness measured by Clausing (2007) as the relative ratio of FDI to GDP. Clausing (2007) finds that revenue maximizing tax rate decrease as economies are smaller and integrated with the world economy. In addition, smaller and more open economies will have lower revenue maximizing tax rates than do bigger and more closed economies. A larger, more closed economies tend to have higher revenue maximizing corporate tax rates. A good explanation for it, is the fact that more closed economies are less affected by external, international factors and tax competition in general (Clausing, 2007). Mahdavi (2008) finds that open economies should experience higher revenues at low tax rates and lower revenues at higher tax rates.

Inflation interacts with corporate taxation through the deductions of capital expenditures(depreciation allowances) and interest payment on debt(Finocchiaro et al, 2018; Agbeyegbe et al, 2006). In addition, they explain that due to the fact that investment expenditures are usually computed at their historical cost, inflation reduces the real value of the deductions.Hence, it raises the firm's net of depreciation taxable profits and consequently increases the distortionary effects of corporate taxation, while the value of interest deductions from corporate taxation rises with inflation owing to tax shield benefit from debt.

A decline in the real exchange rate of a country that import relative to the currency of the country that export, would raise the relative cost of the imported goods used by corporations as inputs into production and this increase in cost would tend to

lower profitability and thereby reduce corporate tax revenue available to the government (Agbeyegbe et al, 2006).

2.4 Studies on Africa

The need for domestic revenue mobilization have gained increasing relevance in the policy debate in developing countries as a result of the potential benefits of taxation for state building, long term independence from foreign assistance and the shifting aid paradigm, the fiscal effect of trade liberalization, the increased prominence of fiscal issues in the nations of North America and Europe with developed capitalist economies, due to the financial and debt crisis, and the continuous severe financial needs of this region(Mascagni et al, 2014). Chimilila (2018) in his studies on the impacts of DRM on long term economic growth in Tanzania. He finds a positive long run effect of DRM on growth, though the short run effect is negative and statistically significant. This can be explained by the distortionary effect[14] of taxes in the short run.

In view of Africa's response to the OECD BEPS Actions Plan[15]. Oguttu (2016) argue that BEPs concerns for developing countries such as Africa, may not necessary be the same as those for the developed countries, as the needs and capacities of all countries should be considered. Owing to the fact that there is need for Africa to come up with unique solutions to protect its own tax base, so as to ensure domestic resource mobilization. The two OECD's BEPs action plans prioritised in most African countries are : the limit of base erosion via interest deductions and to prevent treaty abuse[16]. This is due to the common drawback amongst most African countries concerning base eroding interest payments and abuse of tax treaties.

The impacts of trade liberalization on tax revenues was examined (Baunsgaard & Keen ,2010) . Domestic tax revenue was proposed as a viable option to ensure recovery of revenue loss from trade liberalization. They found that high income countries were able to recover the loss from trade liberalization through domestic tax revenue, for middle income countries, a robust signs of strong replacement both concurrently with revenue

[14] Distortionary effects are in one way a result of a tax system that targets few easy to tax individuals and corporations due to a large informal sectors(Chimilila,2018)
[15]BEPs Action Plan is Intended to ensure that profits are taxed where the economic activities generating those profits are performed and where value is created
[16] Action 4 and 6 respectively.

loss and essentially dollar for dollar in the long run and while for low income countries sign of significant recovery are flimsier, though country experiences differ.

The tax structures of developing countries have responded differently to the impacts of trade liberalization to tax revenues. Tosun(2003) finds that unlike other Non-OECD countries, the MENA countries did not increase their reliance on domestic consumption taxes in response to trade liberalization, owing to the fact that trade liberalization didn't seem to have a strong impact on major revenue sources of the MENA countries, instead there is an increasing reliance on international trade taxes. The findings is in contrast with the response of some developing countries which liberalize trade and concurrently reform their tax structures by raising domestic consumption taxes.

Despite the natural resources endowment in this region, revenue performance in most African countries is below expectation (Ndikumana & Abderrahim, 2010). They found that in Sub Saharan Africa, countries that rely heavily on natural resources have not outperform their resource scarce counterparts with respect to revenue mobilization. Furthermore, among several causative factors, two were identified. Firstly, countries in this category lack the capacity to optimize the revenue generation from natural resources. Optimize in the sense that, it needs to put in place designs and contract negotiation skills that will also encourage foreign direct investments. Secondly, the failure to take advantage of resource revenue to develop non resource activities so as to broaden the tax base. According Agbeyegbe et al (2006), though taxes constitute the largest share of revenues for most SSA countries, the main exception are those that rely heavily on natural resources. In addition, Bothole et al(2012) , provide evidence that natural resources are only detrimental to tax revenue mobilization in the absence of good governing institutions. He further explained that resource rich countries with good institutions are likely to develop a stronger tax system.

3 Methodology, data and Variables

This section states the objective and explain the data, variables empirical methodology used.

3.1 Research questions and Objectives

The objective of this dissertation is to provide answer to the following questions

i. *How is Tax Revenues in Africa?*

ii. What are the determinants of Tax revenues in Africa?

iii. What are the determinants Corporate Tax revenues in Africa?

3.2 Data & Descriptive statistics of variable

We obtained data on economic, sector and institutional variables from sources such as: World Bank database (governance & development indicators), IMF International Financial statistics and Revenue statistics for Africa 2017 with yearly data starting from 1997 to 2016. We used an unbalanced short panel data set originally made up of 54 cross-section (countries) and 19 timeseries. We excluded countries and years where data was not found for the dependent variables, which gave a final data set of 36 countries and 13 countries for total tax revenue(%GDP) and corporate tax revenues(%GDP) respectively.

From Table VII, we found evidence for significant variation in the trends of the variables over the period of consideration.This shows the wide difference between the min and max values.

3.3 Dependent variables

The choice of the dependent variables used is based on the objective of the dissertation, which is to estimates the determinants of Tax revenues (as a percentage of GDP) and Corporate tax revenues (as a percentage of GDP).

Tax revenues (as a percentage of GDP): are the total yearly revenues collected from different tax mix (tax structure) for each country in sample. Onakoya et al (2016) find that tax revenues is positively related to GDP and it promotes economic growth in Africa. In addition, Takuma (2014) also find that tax revenues exerted a positive and statistically significant effect on Ghana's economic growth both in the long and short run. We obtained the data from World Bank's world development indicator

Corporate tax revenues(as a percentage of GDP): This is a yearly revenue collected from incorporated companies in African countries and it's accessed from the profits of the company. Durst (2014) finds that a larger proportion of most African countries tax bases are from multinationals. In addition, Tanzi (1992) finds that developing countries raise more revenues from corporate income tax than from individual income tax. We obtained the data from Revenue statistics for Africa (2017).

3.4 Diagnostic test on dependent variables

I. Residuals Normality with outliers:This test is also known as Leverage[17] versus Normalized residual squared as shown in Fig. 5 & Fig. 8 for the total tax revenue and corporate tax revenue respectively. The plot provides us a means of simultaneously identifying outliers and high leverage data. The mean normalized residual is represented by the vertical line, while the mean leverages is represented by the horizontal line, which makes it easier to identify data that are above mean data points.

II. Kernel density estimate: This plot as shown in Fig. 6 & Fig. 9 is useful in verifying if residuals are normally distributed by the plot showing a density graph of the residuals with a normal distribution super imposed on the graph.

III. Standardized normal probability plot: This plot as shown in Fig. 7 & Fig. 10 is more sensitive to deviances and it check for non-normality in the middle range of the residuals.

3.5 Independent variables

Based on the objective in view, which is to provide answers to the three research questions which are: How is tax revenues collection performing in Africa and its major challenges, estimate the determinants of tax revenues in Africa, estimate the determinants of corporate tax revenues in Africa. Hence the need to identify relevant variables for this analysis. The selected variables were grouped as economic variables, sector variables, institutional variables. Table VI, shows the source of the explanatory variables, expected sign from literatures and the reasons.

I. Economic variables

LogGDP Per capita: is the log function of GDP per capita. Generally used as the proxy for the overall development of the economy. Cozmei (2015) also used it as a proxy for return on investment and for wages. Kodika-Tedika & Mutaseu (2013) mention that it is the main tax bases for tax revenues. Countries with high income tend to have a more monetized economy and better tax administration. Hence, it is expected that it has a certain positive significant correlation with tax revenue as a percentage of GDP (tax

[17] Leverage is a measure of how far an observation deviates fro the mean of that variable. A point with high leverage is an observation with extreme value on a predictor variable.

performance). We obtained the data from World Bank's, world development indicator database

Public Spending: It is the general government final consumption as obtained from the World Bank. It exerts a positive effects on total tax revenue (Agbeyegbe et al, 2006). In addition it proxy for government revenue needs and is considered to have a positive impact on corporate taxation (Cozmei, 2015)

Trade openness: Openness referred to the ratio of the sum of the export and import (ie trade volume) to GDP and represents the relative size of the international trade & transaction sector in the economy (Mahdavi, 2008; Stotsky & Woldemariam, 1997).

Inflation(consumer prices, annual %): is an indicator that capture changes in price level of all goods and services in an economy. It is expected to have a negative sign. We obtained the data from World Bank's, world development indicator database.

Public Debt: It is the African central government debt. Higher debt burdens induce government to resort to higher taxes to finance them (Bhushan & Samy, 2012; Teera, 2002) and also have significant impact in explaining half of the variation in tax ratio. The expected sign is positively correlated with the tax ratio

II. Sector variables

Agriculture: is used as an explanatory variable to control for the difficulty in collecting taxes from this sector. In low income countries agricultural activities organized on a small scale basis are difficult to tax due to high level of informality and a low level of monetization. Most studies found a negative relationship between the share of agriculture and the total tax revenue ratio (Oguttu, 2016; Agbeyegbe et al, 2006).In addition to, Gardebrock&Peerlings(2013) decomposed the ratio into five defining factors which are: the ratio of net value added and production in agriculture, the ratio between agricultural & food production, self sufficiency of food products, share of food in total consumption and share of consumer expenditure in GDP. We obtained the data from World Bank's, world development indicator database.

Industry: The industry share in low income countries may be proxy with mining share (Agbeyegbe et al, 2006). It might be expected to have a positive relationship with total

tax revenue due to greater ease of taxing the profits of the industry. We obtained the data from World Bank's, world development indicator database.

Services: used as a control variable (Piancastelli, 2001). It is expected to be positively related to total tax revenue to GDP. We obtained the data from World Bank's, world development indicator database.

III. Institutional variables

Rule of Law: The variable reflect the degree to which the citizens of a country are willing to accept the established institutions to make and implement laws and adjudicate disputes. We obtained the data from World Bank's worldwide governance indicators

Governance effectiveness: It is the quality of public service provision, the quality of bureaucracy, the competence of civil servants, and the independence of the civil service from political pressure and the credibility of the government's commitment to policies. The expected sign either positively correlated with tax ratio. We obtained the data from World Bank's worldwide governance indicators

Control of Corruption: measures the extent to which public power is exercised for private gain, including both petty and grand forms of corruption as well as capture of the state of elites and private interest. We obtained the data from World Bank's worldwide governance indicators, where the higher the index the less the corruption indicated.

IV. Dummy variable

Financial cisis dummy:is a dummy that equal 0 if year is below 2008 and 1 if year is 2008 and above.

Oil prices crisis dummy: is a dummy that equal 0 if year is below 2014 and 1 if year is 2014 and above.

3.6 Test on Independent variables

In order to confirm the robustness and validity of regression model result, the following test were conducted

I. Multicollinearity: We used the correlation matrix (Table VIII), to identify the coefficients of explanatory variables with values equal to or higher than the threshold of ± 0.6, which is identified as a near multicollinearity problem, while those that equal to 1 indicate perfect multicollinearity problem.

II. Heteroscedasticity: To check if the homoscedastic assumption of the error term in OLS is violated or not, we used the Breusch pagan test. We soundly reject the null hypothesis of homoscedasticity at 1% significance level .

III. Wald test(Wald chi-squared test): This test is used for testing the significance of explanatory variables in a statistical model. If the wald test is significant, then we would conclude that the variables are not zero, so the variable should be included in the model. If the wald test is not significant then these explanatory variable can be omitted from the model. In this case, the variables were significant.

IV. Hausman test: is used to choose between fixed effect model and random effect model. The null hypothesis underlying the Hausman test is that the fixed effect model and random effect model estimators do not differ substantially. The test statistic developed by Hausman has an asymptotic chi-square distribution. If the null is rejected, the conclusion is that random effect model is not appropriate and that we are better off using the fixed effect model. in this case, we find the fixed effect model to be appropriate for the estimation.

3.7 The Econometric Model

The estimating technique to use in a panel data study depends on whether we have a short or long panel data[18]. The Hausman test was in favour of the fixed model. The fixed model, for a two way estimate, incorporating time and individual country effects is:

$$y_{it} = \beta_0 + \alpha_i + y_t + \beta x_{it} + \varepsilon_{it} \qquad (1)$$

This model has an overall constant term(β_0) as well as a "group effect" for each country(α_i) and a time "effect" for each period (y_t) , while (x_{it}) captures the explanatory variabls, y_{it} is the dependent variable of interest and (ε_{it}) is the error term . We study

[18] Panel data models examine group (Individual or country specific) effects, time effects or both. These effects are either fixed or random. A fixed effect model examines if intercept vary across groups or time periods, where as a random effect model explores differences in error variances. If it assumed that the error component and the independent variables are uncorrelated, random effect model may be appropriate, where as if they are correlated, fixed effect model may be appropriate

total tax revenue (%GDP) and corporate tax revenue (%GDP) by means of the following model using the Driscoll and Kraay(1998) standard errors estimator for the pooled OLS regression.

$$y_{it} = \beta_0 + \beta_1 loggdppercap_{it} + \beta_2 tradeopennes_{it} + \beta_3 pdebt_{it} + \\ + \beta_4 pspend_{it} + \beta_5 serv_{it} + \beta_6 agric_{it} + \beta_7 ind_{it} + \beta_8 rlaw_{it} + \\ \beta_9 govef_{it} + \beta_{10} corrp_{it} + \beta_{11} infl_{it} + \varepsilon_{it} \qquad (2)$$

Where:

y_{it} stands for the dependent variables of interest which are Total tax rev (%GDP) and Corporate tax rev(%GDP), while i and t are country and time indicators respectively; $loggdppercap_{it}$, $tradeopenness_{it}$, $pdebt_{it}$, ,$pspend_{it}$, $serv_{it}$, $agric_{it}$, ind_{it}, $infl_{it}$, $rlaw_{it}$, $govef_{it}$, $corrp_{it}$ are log of GDP per capita, tradeopenness, central government public debt(%GDP), public spending(%GDP), services share(%GDP), agriculture share(%GDP), industry share(%GDP), inflation, rule of law, government effectiveness and control of corruption respectvely.

In order to ensure valid statistical inference when some of the underlying regression model's assumption are violated, the need to rely on "robust" standard errors cannot be over emphasized. In addition, an attempt to ignore this measure can lead to several biased statistical result. Hence, the motivation for the use of the Driscoll and Kraay(1998) standard errors(with syntax: xtscc) for coefficient estimated by pooled OLS/WLS, fixed-effect(within)[19] or GLS random effects regression is based on the assumed heteroskedastic error structure, autocorrelation up to some lag and possibly correlation between the groups(panels). It is a non-parametric technique of estimating standard errors which does not place any restriction on the limiting behavior of the number of panels. Consequently, the size of the cross-sectional dimension in finite samples does not constitute a constraint on feasibility, even if the number of panels is much larger than the timeseries(T). This estimator works for both balanced and unbalanced panel data and capable to handle missing data.

[19] The Fixed-effect within group estimator is one way to eliminate fixed effect,β_{it} by expressing the values of the dependent & explanatory variables for each countries as deviations from their respective mean values. The resulting values are called the "de-meaned" or mean corrected values. The estimator takes into effect the heterogeneity among the 30 countries(i.e. the country specific characteristics) not by the dummy variable method but by eliminating it by differencing sample-observations among their sample means

Other methods such as Parks-Kmenta method (Stata syntax: xtgls.) are not appropriate with short panel data and it produces unacceptable small standard errors. In addition, the OLS coefficient estimate with panel corrected standard errors (Stata syntax: stpcsc) are poor when the panel's cross-sectional dimension, N is large compared to the time dimension. For instance, the White standard errors are robust to certain violations of the regression model assumption, as it does not consider cross-sectional correlation.(Beck and Katz,1995).

4 Results

4.1 Descriptive on Tax revenues

According to the estimate from African Development Bank as shown in Fig. 2 & Fig. 3, it can be deduced that among the different tax revenue mix in Africa, during the period from 2005 to 2015, resource revenue were higher, though suffer a setback from the year 2012, owing to the declining crude oil prices. The subject of dependence on resource revenue has been a major source of discussion in several literatures as the main reason for low tax effort in this region(Ndikumana and Abderrahim, 2010). On the other hand, for the non-resource rich countries(Fig. 4), indirect taxes takes the lead, followed by direct taxes in terms of their share in total tax revenues.

To motivate the regression results, it is instructive to examine the scatter plots of tax-GDP ratio(y-axis) against the explanatory variables(x-axis). The most striking stylized fact is the negative association between the tax ratios[20] and the share of agriculture in GDP and Inflation. As shown in Fig. 11, higher shares of agriculture in GDP are associated with lower tax ratio in African countries. Also, higher inflation are associated with lower tax ratio(Fig. 18 & Fig. 22).

Though the data are quite revealing with regards to the determinants of tax revenue in Africa, further empirical estimation is required to validate the answer to the research questions.

[20] Total tax revenue(%GDP) and Corporate tax revenue(%GDP)

4.2 Results on Tax Revenues

We have considered only significant variables in our results in this section and the next. Table X , shows our results for the Total tax revenue (as a percentage of GDP). Regarding the economic variable, we find evidence that, *public spending* tend to increase tax revenue (as a percentage of GDP). Concerning, *pubic spending*, Gnangnon (2017) find that government expenditure is expected to have a positive impact on tax revenue, base on the fact that tax payers are encourage to pay their taxes when they see the benefits of their contributions.

On the other hand, with respect to the economic variables, our result shows that the *log of GDPpercapita* and *inflation* reduce tax revenue (as a percentage of GDP). With respect to the *log of GDPpercapita,* Kodika-Tedika & Mutaseu(2013), find that the log of GDPpercapita have a negative and significant relationship with tax revenue. A possible explanation, is based on the fact that the GDPpercapita growth rate in African countries is increasing more than the tax revenues growth rate. Furthermore, Ebeke & Ehrhart(2010) find a negative association between GDPpercapita instability and tax revenue. Mahdavi(2008) finds that the inverse of the GDPpercapita is strongly and negatively correlated with the level of taxation, which implies that the level of taxation rises with the level of economic development. With respect to *Inflation*, Bhushan & Samy(2012) find that high inflation rates are expected to reduce the real value of taxes collected. Ghura(1998) find a negative correlation with tax revenue and has the largest impact on tax revenue to GDP among the economic policy variables.In addition, Mahdavi(2008) also find a negative relationship with tax revenue, which implies the level of taxation is lower when the rate of inflation is higher.

Regarding the sector variables, we find evidence that *industry share* increase tax revenue (as a percentage of GDP). This result is consistent with that of Piancastelli(2001), which state that tax ratio is positively related to the share of industry share in GDP. This implies, the greater ease of taxing the profits of industry. Agbeyegbe et al(2006) obtained the same result using both collected tariffs and external trade in GDP as a measure of trade liberalization.

On the other hand, regarding sector variable our result show that *agriculture share,* reduce tax revenue (as a percentage of GDP), in agreement with Tanzi(1992), which found a negative correlation between the tax revenue and the share of agriculture. In addition,

Ghura(1998) finds that tax revenue to GDP ratio rises with reductions in share of agriculture. Gupta(2007) also find a strong negative and significant relationship between agriculture share and revenue performance. A possible explanation is that, agriculture share in GDP involves less taxation due to high level of informality and a low level of monetization. Furthermore, in Africa, most people in this sector are not registered for tax purpose.

Regarding the institutional variables, we find evidence that *control of corruption* and *government effectiveness* tend to increase tax revenue as a percentage of GDP. With respect to control of corruption, our result is in agreement with that of Mahdavi(2008) and Gupta(2007) which found a positive relationship with tax revenue to GDP. This implies that, tax revenue rises with control of corruption.

Regarding government effectiveness, our result is consistent with the expected sign. Considering the fact that, quality of public service provided , the quality of bureaucracy, the competence of government workers, independence of the civil service from political pressure and the credibility of the government's commitment to policies, all of which defines the concept of government effectiveness, can lead to increase tax revenue(Oasis & Mihai, 2013).

4.3 Results on Corporate Tax Revenues

Table XI shows our results for the corporate tax revenue (as a percentage of GDP). Concerning the economic variable, we find evidence that *inflation rate* and trade openness increase corporate tax revenue as a percentage of GDP. Regarding the inflation rate sign from the result of corporate tax revenue as a percentage of GDP which is contrary to the apriori expectation. Inflation interacts with corporate taxation through the deductions of capital expenditures or depreciation allowances (Finocchiaro et al, 2018; Agbeyegbe et al, 2006). In addition, they explain that due to the fact that investment expenditures are usually computed at their historical cost, inflation reduces the real value of the deductions. Hence, it raises the firm's net of depreciation taxable profits, as a result increase the corporate tax revenue available to the government.

Furthermore, concerning trade openness, Drummond et al (2012) find that the degree of trade openness may also matter for revenue performance. Clausing (2007) finds that

revenue maximizing tax rate decrease as economies are smaller and integrated with the world economy.

On the other hand, regarding economic variables, we find evidence that *government public debt* reduce corporate tax revenue as a percentage of GDP. Our result is consistent Gupta(2007) which found that public debt is negatively correlated with revenue performance, though not strongly correlated. This implies that a higher debt share is associated with a lower revenue performance. Furthermore, owing to the huge government public debt in this region, there is tendency for high corporate taxes as a means to offset the debt. However, firm's(especially multinational firms) will always respond in a way that is expected to reduce their tax liability through base erosion and profit shifting. In addition, Abbas & Klemm(2013) summarize that firms react to tax rate increases by shifting profits or real activity elsewhere so as to cancel the effect of the higher tax rate.

Concerning the institutional variables, we find no significant evidence for the impact of the institutional variables on corporate tax revenue as percentage of GDP.A possible explanation, is the fact that foreign investors seems to prioritise market support institutions. It is possible that, multinational institutions may see low institutional quality in the countries in this region has a blessing in disguise.

5 Conclusion, Limits and Future work

Tax revenues efforts in Africa over the years is still well below a threshold that is sustainable for capital and human developments. Existing literatures on the subject of the determinants of tax revenue in Africa using time series data for specific countries and panel data for group of countries. Most empirical studies focused mainly on Sub Saharan Africa, excluding North Africa from the sample of countries used, also very little attention had been given specifically to the determinants of corporate tax revenue which is a major constituent of total tax revenue in this region.

In this dissertation we hope to contribute to the set of studies on the determinants of tax revenues in Africa. To achieve our objective, we obtained yearly unbalanced panel data from 1997 to 2016. We excluded countries and years with missing dependent variable observations. Considering the fact that the diagnostic test for the residual of the

regression shows violations of some basic assumption of the OLS. Hence the need for a robust OLS standard error approach. We used the Driscoll & Kraay(1998) standard error for the coefficient estimated by the pooled OLS, fixed(within) regression. The results indicates that total tax revenue (as a percentage of GDP), is positively correlated with our determinant variables which are, public spending, industry share, control of corruption and government effectiveness, whereas the log of GDPpercapita, inflation and agriculture share indicates a negative correlation. Regarding corporate tax revenue (as a percentage of GDP), we find evidence of been positively correlated to inflation and trade openness, while public debt indicate a negative correlation.

Concerning the limitation of this study, we were limited by the unbalanced data used, having left out countries and years with missing dependent variables of interest and possible variations as a result of the different sources of the data. Future researchers are encourage to repeat this study with a more wider data set and possibly use a balanced data set. In addition, they can also perform same study using a different econometric methodology and also use proxies other than GDP(such as GDP percapita and population) to scale the tax revenues. A final suggestion is to group countries based on their natural resource capacity, that is in the form of resource rich countries and non resource rich countries, this is to ensure a form of analysis that is even in its assessment.

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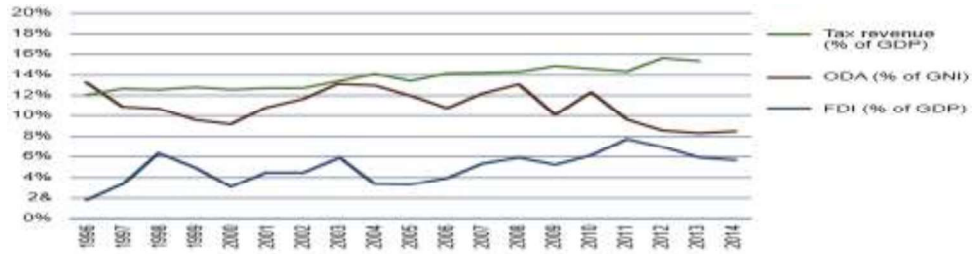
Appendix

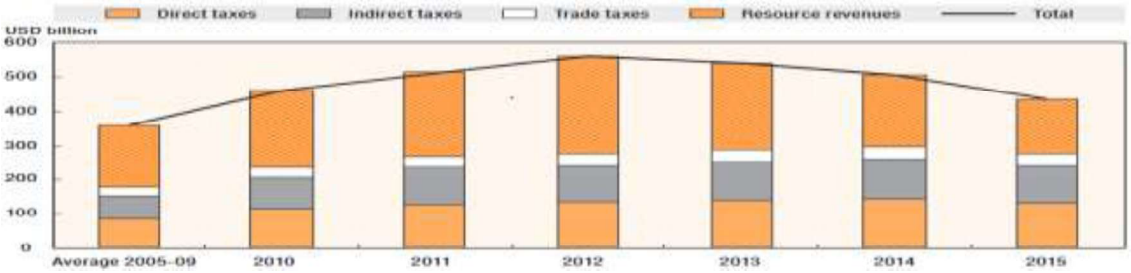
Figure 1: Evolution of financial flows sub-Saharan Africa, 1996-2014This figure presents the evolution of tax revenues as a % of GDP (Gross Domestic Product), of ODA (official assistance development) as a % of GNI (Gross National Incomeand (FDI (Foreing Direct Investment) as a % of GDP



Source: UNCTAD, World Economic Outlook, World Development Indicator, Prichard et al(2014)

Figure 2: The tax revenue mix in Africa, 2005-15

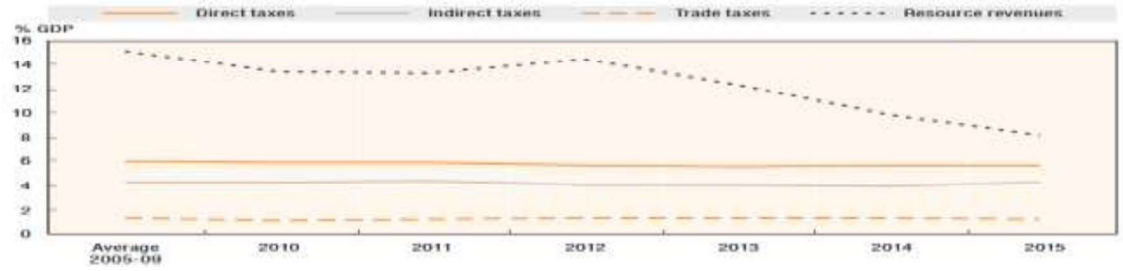
This figure shows the different tax mix in African countries, with Resource revenues as the highest contribution to total tax revenue and Trade taxes the lowest



Source: Data collected by the African Development Bank through the African Economic Outlook's data

Figure 3:The tax revenue mix in Africa's resource-rich countries, 2005-15

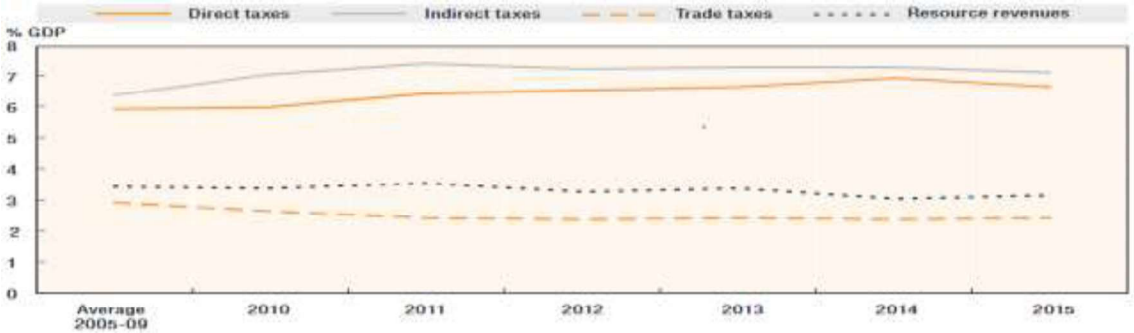
This figure shows the economic trends of the tax revenue mix over the period in view in resource-rich countries in Africa



Source: Data collected by the African Development Bank through the African Economic Outlook's data

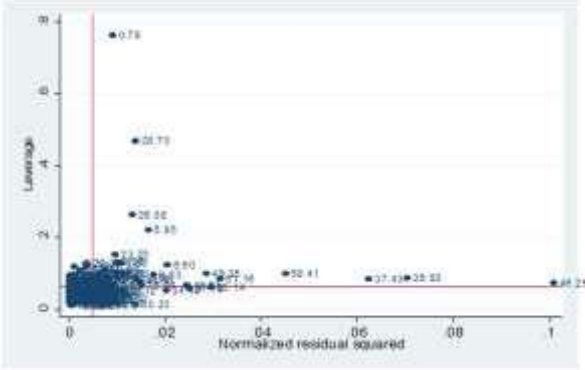
Figure 4: The tax revenue mix in Africa's non resource-rich countries, 2005-15

This figure shows the economic trends of the tax revenue mix over the period in view in non resource-rich countries in Africa



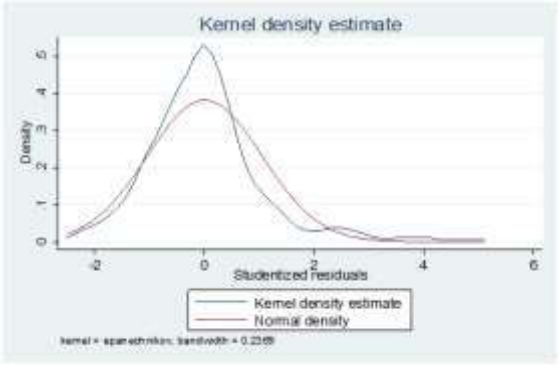
Source: Data collected by the African Development Bank through the African Economic Outlook's dat

Fig. 5: Residual Normality with Outliers (Total tax rev%GDP)



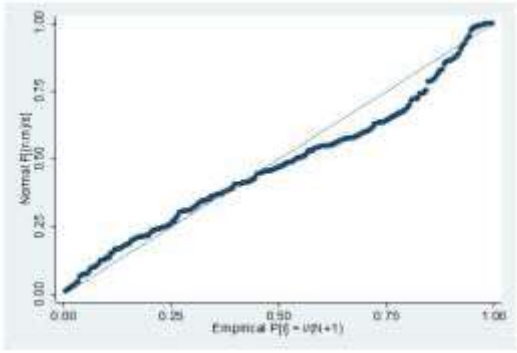
Source: Stata 14 Output

Fig. 6: Kernal density estimate (Total tax rev%GDP)



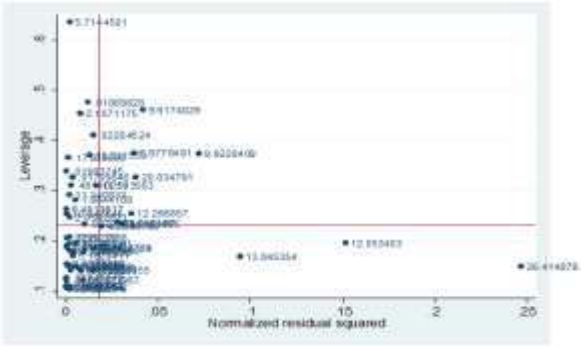
Source: Stata 14 Output

Fig. 7: Standardized Normal Prob. plot (Total tax rev%GDP)



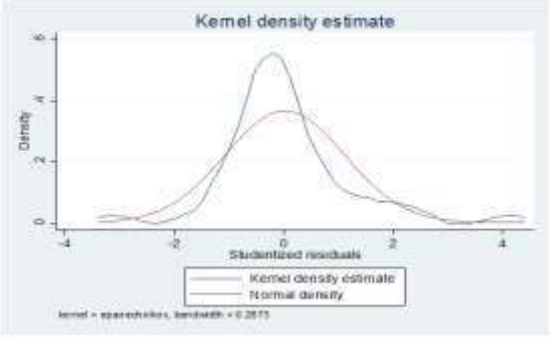
Source: Stata 14 Output

Fig. 8: Residual Normality with Outliers (Corp. tax rev%GDP)



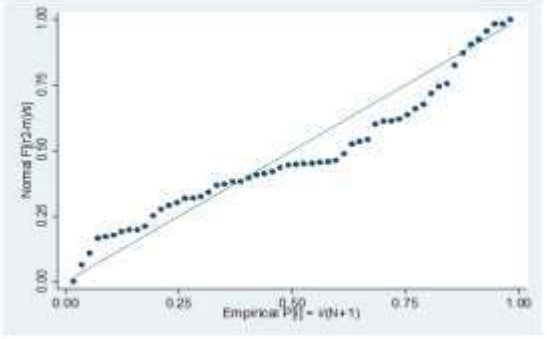
Source: Stata 14 Output

Fig. 9: Kernal density estimate (Corp. tax rev%GDP)



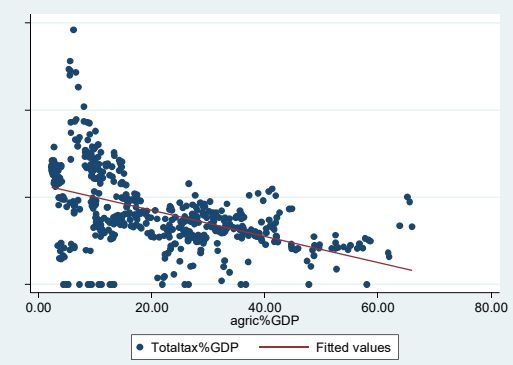
Source: Stata 14 Output

Fig.10: Standardized Normal Prob. plot (Corp. tax rev%GDP)



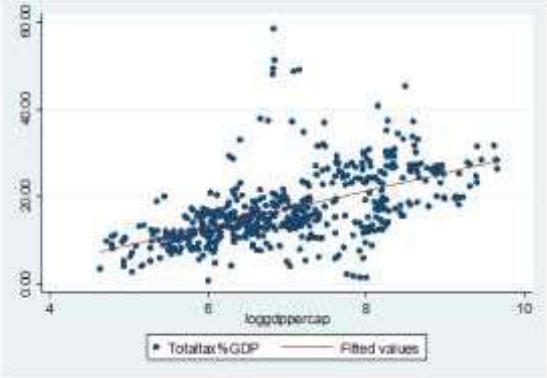
Source: Stata 14 Output

Fig.11 Total tax rev%GDP vs Agric share%GDP



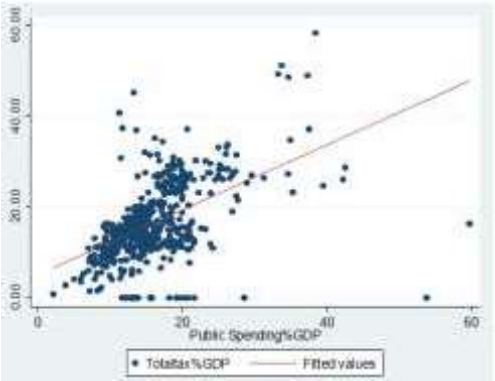
Source: Stata 14 Output

Fig.12 Total tax rev%GDP vs LogGDP per capita



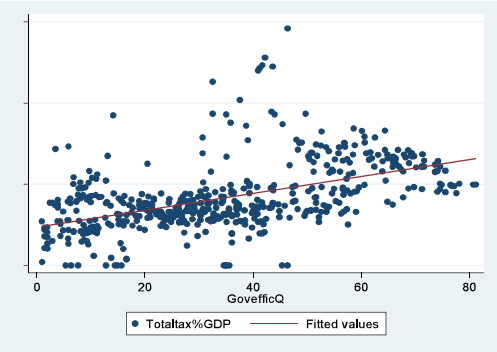
Source: Stata 14 Output

Fig.13 Total tax rev %GDP vs Pub. spending %GDP



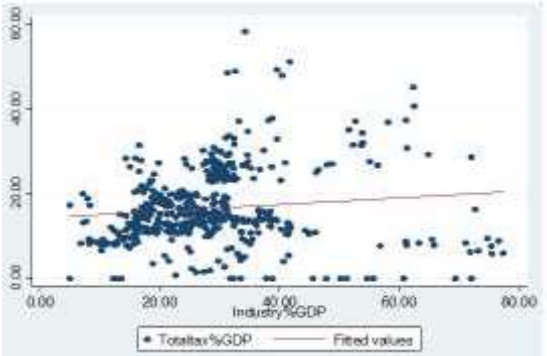
Source: Stata 14 Output

Fig.14 Total tax rev %GDP vs Govt. effectiveness %GDP



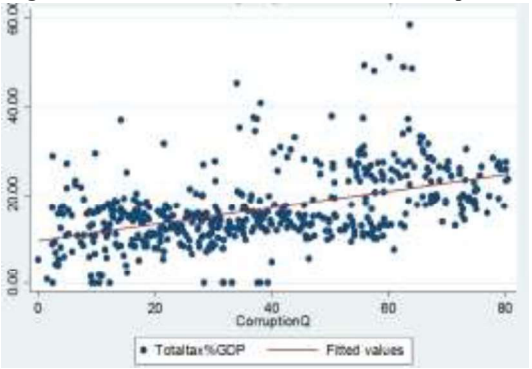
Source: Stata 14 Output

Fig.15 Total tax rev %GDP vs Ind. share %GDP



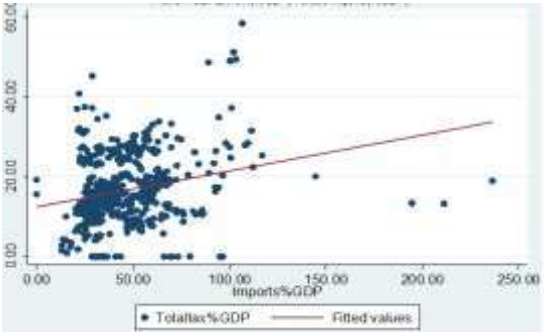
Source: Stata 14 Output

Fig.16 Total tax rev%GDP vs Control of Corruption



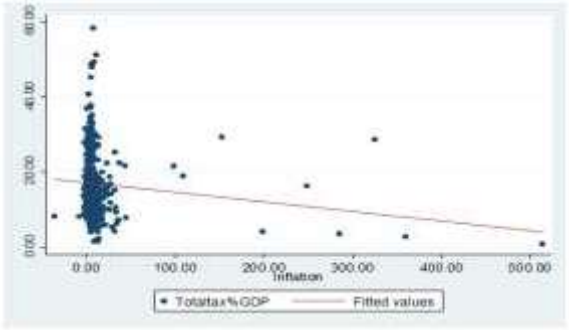
Source: Stata 14 Output

Fig.17 **Total tax rev%GDP vs import share%GDP**



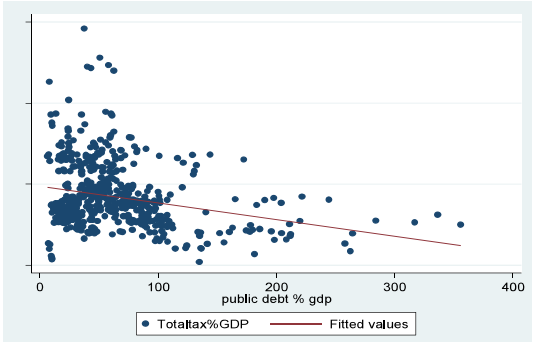
Source: Stata 14 Output

Fig.18 **Total tax rev%GDP vs inflation**



Source: Stata 14 Output

Fig.19 Total tax rev %GDP vs Public debt %GDP

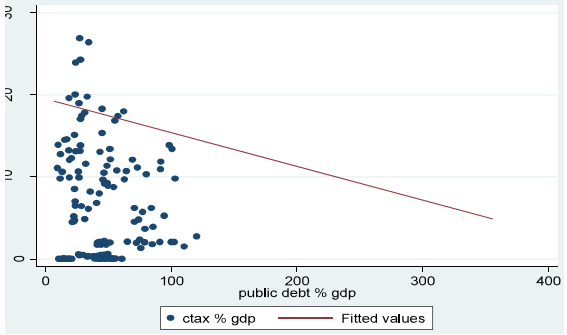


Source: Stata 14 Output

Fig.20 Corp tax rev %GDP vs Industry%GDP

Source: Stata 14 Output

Fig.21 Corp tax rev %GDP vs Public debt%GDP



Source: Stata 14 Output

Fig.22 Corp tax rev %GDP vs Inflation

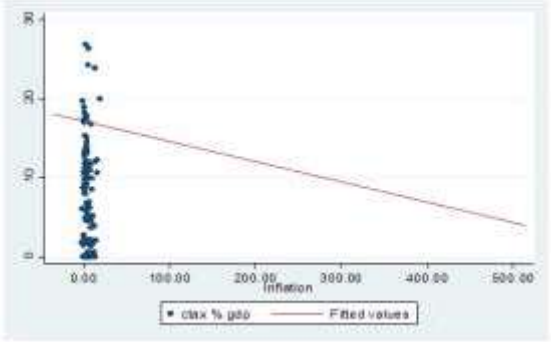


Table 1: Literature Review for Empirical Studies on Africa

Author(year)	R(Country)	Period	Methodology	Dep Var.	Indep. Var.	Main Conclusion
Ghura,1998	Sub-Saharan Africa	1985-1996	IV-GLS Instrumental variable generalized least square	T[21]/GDP	Log(1/PCI)[2] A[3]/GDP OPENESS OIL MINE INFL RERG(% change in real effective exchange rate)	• Tax rev to GDP rises with income and the level of openness of the economy& reductions in the share of agriculture in GDP • Tax rev to GDP ratio declines with rising inflation & corruption • Countries that have implemented structural reforms on a sustained basis have raised their tax revenue higher than those that did not • Among the economies policy related variable, inflation has the largest impact on tax rev. to GDP ratio, followed by implementation of structural policies
Teera,2002	Uganda	1970 - 2000	OLS ECM[6] & ADF unit root test	TT/GDP[7] ES/GDP[8] I/GDP[9] M/GDP[10]	GDPPC[11] M/GDP AID/GNP POPDEN[12] A/GDP MA/GDP[13] ED/GDP[14] SHVAR[15]	• The effects of the variables on individual taxes varies. • In general, Agricultural ratio, population density & tax evasion affect all taxes
Agbeyegbe et al,2006	Sub Saharan Africa	1980-1996	Dynamic panel model,	TT/GDP I/GDP	LDVar[18] LGDPPC[19] A/GDP	• The relationship between Trade liberalization(TL)&Total revenue(TR) is sensitive to the measure used to proxy TL

[21] Share of Tax Revenues [6] Error correction model [7]Total tax to GDP [8]Excise & Sales tax to GDP [9]Income tax to GDP [10]Import tax to GDP [11]GDP per capita [12]Population Density [13]Manufacturing to GDP [14]External Debt to GDP [15]Proxy for the size of hidden economy, the shadow variable reflect tax evasion [18]Lagged dependent Variable [19]Real GDP Per capita

Table 1: Literature Review for Empirical Studies on Africa

Author(year)	R(Country)	Period	Methodology	Dep Var.	Indep. Var.	Main Conclusion
			GMM framework & Sargan spec. test	ITax[16] TGS[17a]	IND[20] GC[21] NAID[22] TOT[23] EXCH[24] INFL[25] OPEN[26] CFA[27] Yr dumies	
Gupta,2007	Africa	> 25yrs	FRE specs. Dynamic Panel Spec. Difference & System GMM[31] estimators	CGR[22]	LogGDPPC A/GDP M/GDP AID/GDP D/GDP Corruption Law&order GStability[28] PStability[29] EStability[30]	• Revenue performance of LIC & MIC are expected to improve, if corruption is reduced & political stability is increased • Countries that rely more on income taxes, profit taxes and capital gain taxes perform much better • Among the institutional factors, corruption has a significantly negative effect on revenue performance • Foreign aid improves revenue performance significantly while debt does not
Baunsgaard & Keen(2010)	Africa & OECD	1975-2006	2SLS Fixed effect spec. Diff. & Sys.GMM	Domestic tax rev to GDP	LDTR[32] Trade tax rv OPENESS	• Many developing countries should find alternative sources of revenue such as excise taxation and broad based consumption taxes as further trade liberalization may not be feasible

[22] Central govt.Revenue (excluding grant) [16]International taxes [17a]Taxes on goods & Serv. [20]Industrial(Mining) activities in GDP [21]Real govt. consumption share in GDP [22]Net transfers of Aid [23]Terms of trade: is the ratio of export price index to import price index [24]Real effective exchange rate [25]Inflation [26]Index of trade liberalization [27]Currency dummy [28]Govt. Stability [29]Political Stability [30]Economic Stability [31]Generalized method of moment to control for endogeneity [32]Lagged domestic tax revenue

Table 1: Literature Review for Empirical Studies on Africa

Author(year)	R(Country)	Period	Methodology	Dep Var.	Indep. Var.	Main Conclusion
					LogGDPPC LogINF AID/GDP A/GDP Rev.replace—ment	• High income countries have been able to recover lost revenue owing to TL from domestic taxes • MIC, substantial evidence of replacement in short & long run • LIC, replacement is in progress
Ebeke & Ehrhart,2010	Sub-Saharan Africa	1980-2005	OLS Newey-West standard errors Country &Year. FE	TRI[23]	Tax Compositn-variables[33] Structural factors-variables[34] Shock variables[35]	• Foreign aid acts as a buffer mechanism to counter the detrimental impact of the instability of tax revenue on the public capital spending • A lower reliance on trade taxes & higher dependency on domestic indirect taxes lead significantly to low levels of instability of tax revenues
Drummond, et al 2013	Sub-Saharan Africa	1980-2009	Panel estimation method	T/GDP	GDPPC A/GDP INFL DOP[40] OIL RENT NRR[41] AID STD[42] FDI CAB[43]	• The panel estimates suggest that structural factors such as Such as per capita GDP, share of agriculture in GDP, inflation, degree of openness, and rents received from natural resources are important determinants of tax revenue • At least once in the last two decades, Only few SSA-LICs were not able to increase revenue ratios by more than 2pp of GDP in the short to medium term • weak revenue mobilization is the root cause of fiscal imbalances in several countries.

[23] Total tax revenue Instability [33] Trade taxes dependency, Domestic taxes dependency, Ratio Domestic/Trade taxes, Direct taxes dependency, Domestic Indirect taxes dependency [33] GDP per capita, Population, Trade Openness, Natural resources rents [34] GDP per capita Instability, Inflation volatility, Terms of trade volatility [36]Petroleum Profit tax [37]Custom& excise tax [38]Infrastructural Development [39]Interest rate [40]Degreee of Openness [41]Natural Resource rents [42]Short term debt [43]Current account balance

Table 1: Literature Review for Empirical Studies on Africa

Author(year)	R(Country)	Period	Methodology	Dep Var.	Indep. Var.	Main Conclusion
					CORRUPT SHECON[44]	
Bhushan & Samy,2012	Sub Saharan Africa	1972-2008	Base line regression and extensions	Tax Rev/GDP [24]	LogGDPPC AID/GDP A/GDP Trade LogINFL LogDebt Democracy Conflict	• Aid has had no significant impact on taxation in Sub-Saharan Africa • The structure of the economy is important than the amount of aid a country receives
Kodika-Tedika &Mutaseu,2013	Africa	1999-2007	OLS Panel model approach Robust standard error	T/GDP	SHECON Import share Agric share Governance LogGDPPC Tax rev(-1)	• The Shadow economy has a significant & negative impact on tax revenues • Find evidence, that the African governments in order to maximize the collected tax revenues, should better "control" the shadow economy Shadow Economy: Defined by Smith(19994,p.18) as "the market-based production of goods & services, whether legal or illegal, that escapes detection in the official estimates of GDP"

[24] Baseline dependent var. include (Trade tax rev, Indirect tax rev, Income tax rev, Resource rev) while two other dependent variables exclude trade taxes and the other exclude trade & resource taxes [44]Shadow Economy
[45]Total tax Rev [46]Govt. Expenditure t [47]Gross fixed capital formation [48]Labour force

Table 1: Literature Review for Empirical Studies on Africa

Author(year)	R(Country)	Period	Methodology	Dep Var.	Indep. Var.	Main Conclusion
Takumah,2014	Ghana	1986-2010	ADF, Philips Perron, Cointegration test, Granger Casuality test	LogRGDP	LogTTR[45] LogFDI LogCPI LogGExp[46] LogGFCF[47] LogLF[48]	• Tax revenue exerted a positive and statistically significant effect on economic growth both in the long-run and short-run implying that tax revenue enhances economic growth in Ghana. • Tax base need to be widened and tax rates reduced in order to generate more revenue
Ahlerup et. al,2015	Sub Saharan Africa	1980-2010	OLS Country & year fixed effects	T/GDP TINOV	VAT ARA TVC (time control variables)	• Autonomous Revenue Authorities(ARAs) effect for some taxes varies depending on the level of institutional quality • Income & Corporate taxes have become more & trade taxes less important as a share of total tax revenue

Table II: Literature Review for Theoretical Studies on Africa

Author(Year)	Type of Analysis	Main conclusion
Nashashibi & Bazzoni (1994)	Provide an analysis of the trends in revenue and expenditure, as well as economic performance in the region during 1980-91	• Rapid expansions in expenditure and declining or low revenue level have been the main cause of fiscal imbalance
Keen & Mansour (2009)	Evaluate the type, degree and possible responses to two of the central challenges that globalization poses for revenue mobilization in SSA[25]	• CIT revenue broadly held up despite a reduction in rates &evidence of base narrowing[57]

[25] from corporate tax competition, and from trade liberalization [57] mainly through the provision of tax holidays in Investment Codes and Free Zones [58] i. Comparison among countries ii. Potential benefits of reforms in tax policy & administration [59]Africa Tax Administration Forum

Table II: Literature Review for Theoretical Studies on Africa

Moore,2013	Two different but complementary approaches[58] are used to answer the question of why govt. of LIC not raise more tax revenue	• The design of a country's political & govt. institutions can sometimes have a significant effect on its tax capacity Tax takes are low in LIC because: • Structure of their economy • Rent taking • Patterns of political competition over fiscal issues • The configuration of governing institution • Inefficient tax administration • Underused property taxes compare to other countries
A.W.Oguttu (2016)	it studied Tax Base Erosion and Profit Shifting in Africa considering what Africa's Response to the OECD BEPS Action Plan	• African countries should liaise via ATAF[59] to participate in the OECD BEPS project and use the privilege to shape the issues in the 15 point Action plan items to address Africa´s concern

Table III: Literature Review for General Empirical Studies

Author(Yr.)	Reg (country)	Period	Methodology	Dep Var.	Indep. Var.	Main Conclusion
TanziV.(1992)	Developing	1978-1988	OLS	T/GDP	Agric/GDP LogPercapitaInc Import/GDP Debt/GDP	• Developing countries raise more revenue from CIT than from individual income taxes. • Positive correlation between the tax revenues and GDP per capita. • Negative correlation between the tax revenues and agriculture share. • Half of the variation in the tax ratio is explained by per capita income, import share, agriculture share and foreign debt share.

Table III: Literature Review for General Empirical Studies

Author(Yr.)	Reg (country)	Period	Methodology	Dep Var.	Indep. Var.	Main Conclusion
M.Piancastelli, 2001	Developing & Developed Countries	1985-1995	Random & Fixed effects model With group dummies & time effect	T/GDP	GNPPC Trade/GDP A/GDP IND/GDP Serv./GDP	• For LIC &MIC, the share of trade in GDP is statistically significant but not the GNP per capita • The tax ratio is negatively related to the share of agriculture in GDP and positively related to the share of industry in GDP
Auriol & Warlters,2005	Developing Countries	Varying time periods	OLS Two stage-least square Hausman test	SHAD[26] TAXREV[23a]	GNP POP SUNKCOST TRANS[60] OECD[61] DENSITY[62] DEM46[63] A/GDP FEDERAL HIPC[64] LAND[65] COMLAW[66]	• Higher entry fees into the formal economy are associated with larger informal sector and with higher tax revenues • Raising barriers to entry is a deliberate govt. policy for raising tax revenue.
Gambaro et al.2007	Developing countries	1990-2004	OLS Country- fixed effect	T/GDP	Net Aid Grants Net Loans Income[67] IND/GDP A/GDP	• Find no evidence that Aid substitutes for domestic tax revenue • a positive association between aid inflows(in form of grant as opposed to loan) and tax revenue

[26] an indicator of the size of the shadow economy as a percentage of GDP: Varying time periods(1990-1993) [23a]includes both direct and indirect taxation revenues: for the different years [60] Dummy that signals a transition economy and equals 1 if the country is in transition[61] Dummy that equals 1 if a country belong to the OECD organization [62] Population per sq. km divided by 10000 [63] Dummy equals 1 for countries that have experienced 46 years of continuous democracy(1950-1995) [68]Find a revenue-maximizing tax rate of 33% for the whole sample

Table III: Literature Review for General Empirical Studies

Author(Yr.)	Reg (country)	Period	Methodology	Dep Var.	Indep. Var.	Main Conclusion
					Trade Corruption	• GDP per capita has strong positive association with revenues from income & corporate taxes wrt high income countries
Clausing,2007	OECD Countries	1979-2002	OLS	CTR/GDP	Tax rate Tax rate^2 Profit rate Corp. share Tax system Growth Unemployr GDPPC[69] Dummmy[70]	• Smaller, more open countries, will have lower revenue maximizing tax rates than do larger or more closed economies. • Countries with territorial system perform less than the ones with tax credit system wrt CIT Rev./GDP • Revenue-maximizing rate is find to decrease as economies are smaller and more integrated with the world economy.
Mahdavi,2008	Developing Countries	1973-2002	OLS	TTR/GDP TP/GDP[71] TS/GDP[72] TR/GDP[73] TG/GDP[74] ITT/GDP[76] OT/GDP[77]	PPD/GDP[27] AID/GDP NR/GDP[75] A/GDP OPENESS EAFM POP65 POPURB POPDEN	• Some variables affect both the level and composition of total tax revenue while other affect its components in opposite directions rendering their net effects on the revenue level statistically insignificant. • Tax/GDP is higher where size of International trade sector, % of Urban pop.(POPURB), Adult literacy rate(ALITR) & Percapita income are higher

[27]PPD/GDP : Is the change in the ratio of the stock of public &publicly guaranteed external debt to total tax rev and is a measure of the net flow of external loans made to the public sectors [64] Dummy that equal 1 if a country was classified as a heavily indebted poor country by the IMF and the World bank in May,2001 [65]1995 land area in millions of sq. km [66] Dummy that equals 1 if the country has a common law system(Triesman,2000) [67]Log GDP percapita[69] Proxy for the size of the corporate sector[70]International, Tax System, Big[71] Income, profits & capital gain taxes [72] Social security contributions & payroll [73]Property taxes [75] Is the ratio of govt. non tax revenues(e.g mainly property income, profits of govt. owned enterprises etc) to GDP

Table III: Literature Review for General Empirical Studies

Author(Yr.)	Reg (country)	Period	Methodology	Dep Var.	Indep. Var.	Main Conclusion
					M2/GDP INFL I/GDPPC STDGRO ALITR POLR CIVIL	• Tax/GDP is lower with increase in aid inflow, % of "old"pop.(POP65),Pop.Density(POPDEN), degree of monetization(M2/GDP), rate of inflation
NdiKumana & Abderrahim, 2010	Developing Countries	1980-2007	OLS Fixed effect spec. GMM	TR/GDP[28] Tax Rev/ GDP	Lag Rev. GDPPC Oil exports Trade A/GDP OA/GDP[78] Dummy[79]	• find that African resource-rich countries have performed poorly relative to their resource-scarce counterparts and compared to the oil-rich Middle Eastern countries

[28] Total revenue [74] Value added, general & selective(excise) sales taxes [7] [76] International trade & transactions taxes [77]"other"(residual) taxes in GDP [78] Official development aid as a percentage of GDP [79] Oil & Mineral resource endowment [80]Industry Turnover [81] Gross operating surplus & mixed income [82]Unemployment rate [83]High Tech export [84]Corruption perception index [85] Total Number of Enterprises [86]Gross operating surplus [87] The ratio tax base/profit is greater than 1, if the tax base is broad, ie if deductions are smaller than true economic costs.

Table IV: Literature Review for General Theoretical Studies

Author(Yr.)	Type of Analysis	Main Conclusion
Zee,1996	Cross-country comparison of various aspects of tax revenue data from 1975 to 1989 in a broad sample of developed & developing countries	• The level of taxation in the developing countries is half that of the developed • Developed countries tended to rely more on income tax and much less on trade tax compare to the developing • Revenue from the income &consumption taxes comprised more of DC[29] total tax revenue • Income tax was the most unstable source for both groups • Trade tax rev. was more unstable in developing countries • For Africa, significant relationship were find between growth & tax instability • For Africa, significant relationship were find between growth & level of taxation
Durst,2014	It examined the most promising directions for legislative changes and other action which developing countries might take to protect their corporate tax bases.	• Corporate tax from multinationals represents a major portion of the revenue tax base. • The most important barrier to effective control of base erosion is the pressure of tax competition.
Ohno et al.2015	Analyzed the factors behind the CTP by disintegrating the ratio of corp. tax rev to GDP into 3 elements[100]	• Rise in the share of the corp. sector was the principal contributing factor in pushing up the ratio of corp. tax rev to GDP
Crivelli et al., 2015	Apply new method to distinguish between spillover effects through real decisions, through avoidance and it revenue impact	• The spillover effects on the tax base are substantially larger in developing countries than in advanced countries. • Substantial loss of revenue from BEPs for developing countries

[29] Developing countries [100] the effective tax rate from a macroeconomic point of view, the share of the corp. sector, the size of business operations.

Table V: Literature Review Summary of Independent Variables

PANEL A: ECONOMIC VARIABLE - Economic variables help to assess how well an economy is functioning

Independent Var	Sources	Main Conclusion
Per capita income	Tanzi(1992)	positive & sig relationship between share of taxes in GDP & log PCI
	Ghura(1998)	Negative & the inverse of PCI was second in terms of impact on tax ratio
	Agbeyegbe et al, 06	• positive effect of per capita income on income taxes wrt share of external trade in GDP as a measure of trade liberalization • not significant on total tax rev, wrt collected tariff as a measure of trade liberalization
GDP Per capita	Teera(2002)	positive relationship between PCI and total tax rev
	Gupta,2007	Log GDPPC is significantly positive in all random effects regression and in most fixed effect spec.
	Baunsgaard & Keen(2010)	
	Gambaro et al.2007	LogGDPPC is negative and insignificant wrt domestic tax revenue
	Clausing,2007	strong positive association with rev from income and corporate taxes
	Mahdavi,2008	positive effect on revenues and used to proxy for the size of Corporate sector
		• inverse of the GDP per capita variable (1/GDPPC) is also strongly and negatively correlated with the level of taxation[30].
	NdiKumana & Abderrahim(2010)	positive & significant in the full sample for Africa
	Ebeke &Ehrhart,2010	Negatively associated with instability of tax revenues
	Drummond, et al 2012	Significantly positive in most specification for revenue & tax revenue
	Bhushan & Samy,2012	Positive& negative, significant in most specification
	Kodika-Tedika & Mutaseu,2013	Negative & Significant; GDPPC is the main tax base for tax revenues
	Cozmei,2015	Positive & Negative ,statistically significant
		Highly significant on the ratio of Corporate tax revenue to GDP
GNP Per capita	M.Piancastelli,2001	• For LIC &MIC, not statistically significant • significantly related to tax ratio wrt full sample & positive
Import share	Tanzi(1992)	Pos., have significant impact in explaining half of the variation in tax revenues to GDP ratio.
	Teera(2002)	significant but negative as regards total tax ratios
	Gupta,2007	Pos., significant predictor of revenue performance, with small impact in the dynamic specs
	Oasis&Mihai,2013	Positive & significant wrt the fixed effect model

[30] implying that the level of taxation rises with the level of economic development

PANEL A: ECONOMIC VARIABLE - Economic variables help to assess how well an economy is functioning

Independent Var	Sources	Main Conclusion
Debt share	Tanzi(1992)	Pos.,have significant impact in explaining half of the variation in tax revenues to GDP ratio
	Teera(2002)	Positive & the govt. needs to raise the tax rev necessary to service high debt
	Gupta,2007	negatively related with rev performance, though not strongly related
	Bhushan & Samy,2012	Positive & Higher debt burdens induce govt. to resort to higher taxes to finance them
Population density	Teera (2002)	population density is expected to have an adverse effect on the tax ratio
	Auriol & Warlters,2005	Neg., One possible explanation is that it is easier to escape taxation in highly populated areas.
	Mahdavi,2008	Negative & raise total tax revenue by raising social security contribution and pay roll taxes
Shadow var. or Economy	Teera(2002)	the shadow variable reflect tax evasion, affect all taxes and lead to loss of govt. tax rev.
	Drummond, et al 2012	Negative and significant determinant of tax revenues with important policy implications.
	Cozmei,2015	It's positively correlated to the ratio of corporate tax revenue to GDP which was not expected
real govt. consumption	Agbeyegbe et al,2006	exert a positive effect on total tax revenue
	Cozmei,2015	Proxy for revenue needs and is considered to have a positive impact on corporate taxation.
Inflation	Ghura,1998	Negative. has the largest impact on tax rev. to GDP among economic policy variables
	Agbeyegbe et al,2006	Negative & significant effect on total tax revenues wrt both measure of trade liberalization
	Mahdavi (2008)	Neg., Statistically significant. level of taxation is lower when the rate of inflation is higher
	Ebeke &Ehrhart,2010	Significantly and positively associated with instability of tax revenues
	Baunsgaard & Keen(2010)	• Positive &Negative with potential powerful rev. effect through both unindexed tax system & generation of seigniorage[31]
	Drummond, et al 2012	Significant negative impact on revenue
	Bhushan & Samy,2012	Negative &High inflation rates are expected to reduce the real value of taxes collected
Consumer price ind	Takumah,2014	Negative &Higher level of CPI represents distortion in an economy
Terms of trade	Agbeyegbe et al,2006	Exert a positive effect on total tax revenue wrt the first measure of trade liberalization
Trade(Openness)	Ghura,1998	Tax rev to GDP rises with income and the level of openness of the economy
	M.Piancastelli,2001	Positive & significantly related to tax ratio wrt full sample
	Mahdavi (2008)	Positive & Strongly correlated with the level of taxation
	NdiKumana & Abderrahim (2010)	Trade is positively related to revenue performance
		The contribution of trade openness to tax instability is less striking & ambiguous sign

[31] Seigniorage may be counted as revenue for a government when the money that is created is worth more than the costs to produce it

PANEL A: ECONOMIC VARIABLE - Economic variables help to assess how well an economy is functioning

Independent Var	Sources	Main Conclusion
	Ebeke &Ehrhart,2010	Negative relative to tax rate, but positive in that which concerns tax revenue
	Monteiro,et al 2011	Strong positive relationship between openness and tax revenue
	Drummond, et al 2012	Positive & statistically significant in most of the observation
	Bhushan & Samy,2012	It's negatively correlated to the ratio of Corporate tax revenue to GDP
	Cozmei,2015	
POP65	Mahdavi(2008)	Negative, strongly associated with lower level of taxation(both income & sales taxes)
POPURB	Mahdavi(2008)	Positive, Significant in the value added, general & selective(excise)sales taxes
Unemployment rate	Monteiro,et al 2011	Negative & High degree of statistical significance
FDI or FDI net inflows(%GDP)	Monteiro,et al 2011	Positively related to corporate tax revenue
	Drummond, et al 2012	Positive & Weak and non-significant relationship with tax revenue
Govt Deficit	Monteiro,et al 2011	Positive & High degree of statistical significance

PANEL B: SECTOR VARIABLE - Define variables that Influences the capacity of a country's tax system

Independent Var	Sources	Main Conclusion
Manufacturing to GDP	Teera (2002)	Positively related to the tax ratio.
Service GDP share	M.Piancastelli,2001	Positively related to total tax revenue to GDP
Share of Agriculture in GDP	Tanzi (1992)	negative correlation between the tax rev and agric. Share
	Ghura,1998	Negative, Tax rev to GDP ratio rises with reductions in share of Agriculture to GDP
	M.Piancastelli,2001	Negatively related to total tax rev to GDP
	Teera(2002)	negative correlation between the tax rev and agric. share
	Agbeyegbe et al,2006	exert a positive effect on total tax rev. when TL is measured as the share external trade
	Agbeyegbe et al,2006	exert a negative on total tax rev. when TL is measured as the collected tariff
	Gupta,2007	strong negative & sig. relationship btw agric share& rev. performance
	Mahdavi(2008)	positive but statistically insignificant in total tax revenues
	NdiKumana &	Negative& higher shares of agri. in GDP are associated with lower rev/GDP in Africa
	Abderrahim(2010)	Negative & has significant relationship with revenue performance

PANEL B: SECTOR VARIABLE - Define variables that Influences the capacity of a country's tax system

Independent Var	Sources	Main Conclusion
	Drummond, et al 2012	negatively significant impact on taxation
	Bhushan & Samy,2012	Negative & significant in respect to tax revenues wrt the random effect model
	Oasis &Mihai,2013	
Industrial value added to GDP or Industry turnover	M. Piancastelli,2001	Positively related to total tax revenue to GDP for LIC & MIC
	Agbeyegbe et al,2006	Exerts a positive effects on total tax revenue wrt both measure of trade liberalization
	Monteiro,et al 2011	Positive & Significantly related to the ratio of corporate tax revenue to GDP

PANEL C: INSTITUTIONAL VARIABLE – Its involves the quality of service in public sector and common value system in a country

Independent Var	Sources	Main Conclusion
Law & Order	Gupta, 2007	Not statistically significant in any of the group
Governance	Oasis &Mihai,2013	Negative & significant wrt tax revenues
Corruption or CIVIL(proxy for the level of corruption)	Gupta,2007	Positive & Find no significant effect
	Mahdavi,2008	Positive & Tsax revenues rises with fall in the level of corruption
	Drummond, et al 2012	negative impact on tax revenue

Table VI: Details on Explanatory Variables

Variables	Source	Expected sign	Reasons
	Economic variables		
GDP per capita	WDI	+/-	Negatively associated with instability of tax revenue . Higher income countries tend to have a more monetized economy and better tax administration.
Export share % GDP	WDI	-	Exports are zero rated,might imply a reduction of VAT.
Import share % GDP	WDI	+	Contribute to increasing tax revenue, including through VATand excise revenues
Govt. Public debt % GDP	IFS	+	Higher debt burdens induce govt. to resort to higher taxes to finance them
Pubic Spending % GDP	WDI	+	To the extent that tax payers are encouraged to pay their taxes when they see the benefits of their contribution
Inflation	WDI	-	Higher inflation would likely be associated with lower domestic tax revenue and higher trade tax revenue
	Sector variables		
Service share % GDP	WDI	+	Greater ease of taxing the profits
Agric share % GDP	WDI	-	difficult to tax due to high level of informality and a low level of monetization
Industry share % GDP	WDI	+	Greater ease of taxing the profits
	Institutional variables		
Governance effectiveness	WGI	+	Increases tax ratio
Rule of law	WGI	+	Increases tax ratio
Control of corruption	WGI	+	increases tax ratio

Table VII: Descriptive Statistics

(1)

Variables	Obs	Mean	Std. Dev	Min	Max
		Dependent variables			
Total tax rev%GDP	568	16.95	7.95	0.78	58.41
		Independent variables			
		Economic variables			
LogGDP per capita	551	6.99	1.10	4.63	9.66
Trade openness	538	79.58	38.30	0.00	311.36
Public Spending %GDP	515	15.77	5.93	2.06	59.72
Public Debt%GDP	556	63.04	49.50	6.44	356.05
Inflation	558	10.74	35.81	-35.84	513.91
		Sector variable			
Service share %GDP	494	50.81	12.48	12.87	83.04
Agric share %GDP	494	21.53	14.52	2.25	66.03
Industry share %GDP	494	27.77	12.43	5.00	77.41
		Institutional variables			
Govt. effectiveness	495	35.25	20.48	0.95	81.25
Rule of law	495	37.12	19.84	0.48	83.25
Control of corruption	495	38.28	21.42	0.00	80.48

Source: Stata 14 Output

(2)

Variables	Obs	Mean	Std. Dev	Min	Max
		Dependent variables			
Corp. Tax rev%GDP	137	6.97	6.78	0.01	26.93
		Independent variables			
		Economic variables			
LogGDP per capita	130	7.16	0.90	5.38	8.98
Trade openness	137	76.88	31.05	0.00	170.41
Public Spending %GDP	133	14.95	3.27	7.99	21.44
Public Debt%GDP	136	43.96	25.50	9.72	120.54
Inflation	135	4.70	3.83	-2.48	18.69
		Sector variable			
Service share %GDP	116	53.59	8.56	38.78	70.95
Agric share %GDP	116	18.70	10.67	2.32	42.60
Industry share %GDP	116	27.14	7.98	11.81	45.03
		Institutional variables			
Govt. effectiveness	127	35.47	20.14	0.95	75.61
Rule of law	127	35.21	19.04	1.41	73.08
Control of corruption	127	37.83	22.53	2.38	79.81

Source: Stata 14 Output

Table VIII: Correlation matrix[32]

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) tax%gdp	1.000														
(2) ctax%gdp	-0.422	1.000													
(3) loggdppercap	0.677	-0.600	1.000												
(4) pspend%gdp	0.496	-0.774	0.638	1.000											
(5) tradeopenesss	0.051	-0.351	0.340	0.278	1.000										
(6) ind%gdp	0.010	-0.346	0.526	0.315	0.561	1.000									
(7) serv%gdp	0.678	-0.337	0.672	0.410	-0.138	-0.048	1.000								
(8) agric%gdp	-0.519	0.493	-0.874	-0.530	-0.293	-0.664	-0.715	1.000							
(9) pdebt%gdp	0.247	-0.050	-0.063	0.088	-0.012	-0.476	0.239	0.152	1.000						
(10) Infl%gdp	-0.227	-0.065	-0.075	0.010	0.042	0.141	-0.216	0.066	-0.352	1.000					
(11) corrp%gdp	0.419	-0.608	0.532	0.679	0.166	0.064	0.545	-0.454	0.145	-0.094	1.000				
(12) govef%gdp	0.661	-0.479	0.603	0.509	-0.201	-0.065	0.760	-0.524	0.137	0.002	0.734	1.000			
(13) rlaw%gdp	0.588	-0.388	0.578	0.504	-0.003	-0.098	0.735	-0.483	0.247	-0.102	0.802	0.876	1.000		
(14) fincrisis	0.208	0.197	0.128	-0.109	-0.156	-0.231	0.182	0.024	-0.071	-0.048	-0.062	0.063	0.141	1.000	
(15) oil	0.157	0.205	0.017	-0.014	-0.081	-0.083	-0.014	0.066	0.115	-0.122	-0.061	-0.010	0.039	0.171	1.000

Source: Stata 14 Output

Table IX: List of African Countries

Total tax rev %GDP: Algeria, Angola, Benin, Botswana, Burkina Faso, Cabo Verde, Cameroon, Congo, Dem. Rep, Congo, Rep, Cote d'Ivoire, Eygpt, Arab Rep, Ethiopia, Gambia, Ghana, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Tunisia, , Uganda, Zambia.

Corp. tax rev % GDP: Burkina Faso, Cabo Verde, Cameroon, Dem. Rep, Congo, Cote d'Ivoire, Kenya, Niger, Rwanda, Senegal, South Africa, Swaziland, Togo, Tunisia, Uganda

[32] Loggdppercapita correlated with agric and govt. effectiveness; Public expenditure correlated and corruption; industry correlated with agric; Services correlated with agric, govt effectiveness and rule of law, the 3 governance variables(control of corruption, govt. effectiveness and rule of law) are correlated

Table X: Regression models for Total tax revenue(%GDP)

Variables	(1) taxgdp	(2) taxgdp	(3) taxgdp	(4) taxgdp	(5) taxgdp	(6) taxgdp	(7) taxgdp	(8) taxgdp
				ECONOMIC VARIABLES				
LogGDP percapita	-2.292**	-1.524	-1.332	-1.582	-0.585	-2.325**	-2.242**	-1.863*
	(0.903)	(0.905)	(0.895)	(0.940)	(0.758)	(0.921)	(0.802)	(0.877)
Trade openness	0.006	0.004	0.003	-0.000	-0.007	0.007	0.011	0.002
	(0.005)	(0.006)	(0.006)	(0.006)	(0.007)	(0.005)	(0.008)	(0.006)
Govt. Pub. debt%GDP	0.003	-0.001	-0.002	0.005	-0.003	0.004	-0.010	0.005
	(0.007)	(0.006)	(0.006)	(0.003)	(0.004)	(0.007)	(0.007)	(0.007)
Public Spending%GDP		0.189***	0.174**		0.055	0.179**	0.228***	
		(0.060)	(0.063)		(0.103)	(0.067)	(0.069)	
Inflation	-0.007***	-0.003**	-0.004**	-0.009***	-0.011***	-0.007***	-0.000	-0.006***
	(0.002)	(0.001)	(0.001)	(0.003)	(0.002)	(0.002)	(0.003)	(0.001)
				SECTOR VARIABLES				
Services share% GDP				0.023	-0.060			
				(0.040)	(0.036)			
Agric share% GDP	-0.074**					-0.086**		-0.089**
	(0.034)					(0.034)		(0.034)
Industry% GDP		0.133***	0.127***	0.111**			0.128***	
		(0.035)	(0.036)	(0.045)			(0.035)	
				INSTITUTIONAL VARIOABLES				
Govt. effectiveness		0.058***				0.048**		
		(0.014)				(0.017)		
Rule of law			0.019					0.014
			(0.017)					(0.016)
Control of corruption	0.035***						0.037**	
	(0.010)						(0.013)	
_cons	0.000	0.000	0.000	37.456***	38.565***	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(5.622)	(4.841)	(0.000)	(0.000)	(0.000)
Country effect	YES	YES	YES	YES	YES	YES	YES	YES
Time effect	YES	YES	YES	YES	YES	YES	YES	YES
N	392	392	392	451	437	403	426	403
R-sq	0.949	0.954	0.953	0.945	0.946	0.949	0.941	0.950
Number of Country	36	36	36	36	36	36	36	36

Source: Authors table

*Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1*

Table XI: Regression models for Corp tax rev %GDP

	(1) ctxgdp	(2) ctxgdp	(3) ctxgdp	(4) ctxgdp	(5) ctxgdp	(6) ctxgdp	(7) ctxgdp	(8) ctxgdp
ECONOMIC VARIABLES								
LogGDP percapita	2.050	-0.964	0.162	1.237	-2.583	0.933	0.224	1.761
	(3.048)	(4.232)	(4.218)	(2.941)	(4.705)	(3.408)	(3.857)	(2.629)
Trade openness	0.021*	0.026	0.015	0.012	0.013	0.024**	0.041	0.018
	(0.011)	(0.056)	(0.055)	(0.012)	(0.053)	(0.010)	(0.039)	(0.012)
Govt. Pub. debt%GDP	-0.030	-0.023	-0.027	-0.046*	-0.060*	--0.025	-0.038	-0.029
	(0.028)	(0.026)	(0.029)	(0.024)	(0.034)	(0.027)	(0.026)	(0.028)
Public Spending.%GDP		-0.257	--0.259		-0.422	-0.206	-0.150	
		(0.294)	(0.276)		(0.293)	(0.193)	(0.160)	
Inflation	0.235	0.236	0.242	0.309**	0.206*	0.247	0.200	0.261
	(0.159)	(0.149)	(0.141)	(0.138)	(0.110)	(0.159)	(0.136)	(0.150)
SECTOR VARIABLES								
Services share% GDP				0.103	-0.102			
				(0.165)	(0.168)			
Agric share% GDP	-0.008					0.021		
	(0.099)					(0.098)		
Industry% GDP		0.102	0.179	0.531				0.165
		(0.275)	(0.273)	(0.319)				(0.209)
INSTITUTIONAL VARIABLES								
Govt. effectiveness		0.044				0.045		
		(0.028)				(0.034)		
Rule of law			-0.012		0.003			0.005
			(0.064)		(0.075)			(0.076)
Control of corruption	-0.014						-0.005	
	(0.027)						(0.029)	
cons	0.000	0.000	0.000	-23.908	28.727	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(22.627)	(33.658)	(0.000)	(0.000)	(0.000)
Country effect	YES	YES	YES	YES	YES	YES	YES	YES
Time effect	YES	YES	YES	YES	YES	YES	YES	YES
N	106	103	103	113	112	106	114	106
R-sq	0.911	0.914	0.913	0.901	0.898	0.911	0.896	0.911
Number of Country	13	13	13	13	13	13	13	13

Source: Authors table

*Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1*