Corruption, governance and tax revenues in Africa

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Abstract:

In this paper we analyze the effects of institutional variables (corruption and governance), structural variables (per capita income, trade openness, inflation and share of agriculture in GDP), and policy variables (tax rate and tariff rate) on total tax revenues, direct taxes, indirect taxes and trade taxes using panel data set for 30 African countries over the 1996-2016 period. All estimates are based on fixed effects (FE) and random effects (RE) models. Using Hausman test, RE is earmarked to be the more preferred model in this paper. The RE regression results show that corruption and governance are two main determinants of tax revenues in Africa. While corruption has a significant negative effect on tax revenues, good governance measured in terms of government effectiveness, regulatory quality, rule of law and voice and accountability tends to raise tax revenue generation and in particular, indirect taxes. In the same vein, governance in form of political stability tends to have a very significant effect on direct taxes and international trade taxes. The basic intuition behind these results is that higher institutional capacity and lower corruption enhance tax revenue generation in the economy. Intriguingly, empirical results show that tariff rates tend to have a strong negative effect on total tax revenue but at the same time they have a strong positive effect on trade tax revenue. Moreover, trade openness tends to have a strong positive relationship with tax revenue. Overall, results suggest that to raise more tax revenue, governments should reduce corruption, improve tax and customs administration and raise revenues from tax categories that are less susceptible to corruption. They should as well enhance trade openness.

JEL Classifications: F10, F14, F15

Keywords: Tax revenue, corruption, governance, institution, panel data

1. Introduction

Corruption is arguably a major problem to developing countries, where administrative officers use public fund for private gain. These countries are unable to generate sufficient amount of revenue from taxation because they face corruption in tax administration in the process of revenue generation. Corruption in tax administration increases because of the lacking rule of law and accountability of the governance (Abed & Gupta, 2002). Also, political instabilities in developing countries significantly reduce tax revenue generation and hurt economic growth and development. In this context, the quality of governance as a whole is a critical factor for development process of any country. Attila (2008) and Tanzi & Davoodi (2000) argue that lower taxation levels result from inefficient tax systems due to corruption. Corruption in the public sector erodes tax compliance and leads to higher tax evasion (Djumashev, 2007; Joulfaian, 2009; Fjeldstad, 2005; Torgler, 2004; Alm & Martinez-Vazquez, 2003). This in turn, reduces a country's capacity to finance government expenditures. Similarly, the fact that corruption reduces the distributive function of tax collection, it contributes to higher income inequality. Some studies (see for example Torgler, 2004; Gupta et al., 2002) suggest that corruption is associated with higher poverty. Generally, the costs of corruption are substantially high in Africa. It reduces

government revenues by encouraging tax evasion and incentives to pay taxes, leaving less money available for public investments in infrastructure, health care and education.

In many low-income countries, taxation and spending at the local level is very low, and central governments may have few incentives to change that situation by empowering local authorities with a potentially large source of revenue (Mascagni et al., 2014). Tax administrations in developing countries may not have the necessary infrastructure to implement taxes effectively. As Mascagni et al. (2014) point out, some taxes for example property registers, which are the basis for the assessment of the property tax, may contain outdated information and may require substantial human and financial resources to be updated.

Revenue loss due to corruption, tax evasion, tax avoidance and overall weak tax administration is substantial in developing countries. For example, in 2011, developing countries lost US$ 946.7 billion in illicit outflows (Kar & LeBlanc, 2013). Between 2002 and 2011, developing world lost US$5.9 trillion to illicit outflows (Kar & LeBlanc, 2013). Africa is losing more than US$50 billion every year in illicit financial outflows as governments and multinational companies engage in fraudulent schemes. By and large, Sub-Saharan Africa revenue loss due to illicit outflows averages 5.7 percent of GDP annually. This revenue loss, in turn, impedes development projects and denies poor countries access to crucial services.

Many developing countries also suffer from weak institutional capacity and extensive informal sectors, and therefore they are unable to effectively respond to tax evasion by improving tax collection or widening narrow tax bases. Consequently, these countries have been experiencing fiscal crises over the past three decades. They receive much lower tax revenues as a percentage of their total national incomes than the revenue levels received by higher-income countries. Tax revenues among low-income countries average only about 13 percent of GDP (IMF, 2011). Indeed, this is less than half the average of 35 percent amongst members of the Organization for Economic Cooperation and Development (OECD). In low income countries, income tax is excessively low compared to OECD countries. Income taxes for low-income countries accounts for 3.5 percent of GDP while in OECD countries it accounts for 12.9 percent of GDP (IMF, 2011). By contrast, governments in the low income countries tend to concentrate on easy to collect taxes such as trade taxes. Nonetheless, low income countries are not utilizing their full capacity of tax revenue. Their tax effort is less than unity (Begum, 2007). Lack of institutional capacity and corruption are main culprit for this low tax effort.

Low tax revenue generation due to corruption, weak institutions and weak tax administration present a serious challenge to economic development of developing countries. Without the ability to raise revenues effectively, governments in low income countries are limited in the extent to which they can meet basic needs and foster economic development. According to World Governance Indicators (2017), many low income countries such as Somalia, Equatorial Guinea, Libya, Afghanistan, South Sudan, Sudan, Angola, and Zimbabwe are highly corrupt countries in the world. It is worth noting that lower taxation levels in low income countries are highly linked to the inefficient tax system due to corruption. However, the relationship between corruption and taxation is still a complex issue. In fact, low tax levels in developing countries may be due to a combination of many factors. For example a study by Imam and Jacobs (2007) shows that real per capita income, share of agriculture in GDP, trade openness, inflation and corruption are the most important determinants of tax collection. Similarly, Gupta (2007) reveals that structural factors like per capita GDP, share of agriculture in GDP, trade openness foreign aid, foreign debt and institutional variables namely corruption and political stability are statistically significant and strong determinants of revenue performance. Notwithstanding, in many African countries, the relationship between tax revenue and institutional and governance variables is still unexamined. Therefore an empirical analysis of corruption, governance and tax revenues for the African countries is significant.

We carry out panel data estimation for the 1996-2016 periods for 30 African countries namely Angola, Benin, Botswana, Burkina Faso, Central African Republic, Congo, Rep., Cote d'Ivoire, Egypt, Ethiopia, Ghana, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritius, Morocco, Mozambique, Namibia, Nigeria, Rwanda, Senegal, Seychelles, Sierra Leone, South Africa, Tanzania, Togo, Tunisia, Uganda, and Zambia. The countries are chosen on the basis of availability of data. In the empirical analysis, the paper uses four tax revenue series namely, total taxes, direct taxes, indirect taxes and trade taxes. It is worth noting that, investigating the relationship between tax revenue performance, corruption and governance is very important because little attention has been given to the need for quality of institutions and governance in the process of tax revenue generation and policy design in many African countries.

The rest of the paper is organised as follows: in Section 2 we review a few studies that provide theoretical and empirical background of this paper. Section 3 describes the data and variables used for analysis. Section 4 discuses the graphical and baseline regression analyses. Section 5 concludes and provides the policy implication of the results of this paper

2. Literature review

Various studies investigate the determinants of tax revenue performance. By and large, previous studies include variables such as per capita GDP, inflation, sectoral composition of output, trade openness, foreign debt and institutional factors such as corruption and political stability as determinants of tax revenue performance (see for example Teera, 2003; Weiss, 1969; Tanzi and Zee, 2000, Gupta, 2007 and Imam and Jacobs, 2007). Notably, Tanzi (1992) reveals that half of the variation in the tax ratio in developing countries is explained by per capita income, import share, agriculture share and foreign debt share. An important explanation in the case of per capita income is that, a higher per capita GDP implies higher level of development, which ultimately generates a higher capacity to pay taxes as well as a greater capacity to levy and to collect them (Gupta, 2007 and Chelliah, 1971).   Similarly, the share of goods and services provided by the government is expected to rise with income (Chelliah, 1971 and Bahl, 1971). Wagner's law implies that economic development is associated with an increased request for public goods and services, which need to be financed *inter alia* by increasing tax revenue since the demand for public services is income elastic (Tanzi,1987).

The sectoral composition of output also matters because certain sectors of the economy are easier to tax than others. For example, agricultural activities are difficult to tax, especially in low income countries, where most agricultural activities are organized on a small-scale basis (Agbeyegbe et al., 2004) and it is dominated by a large number of subsistence farmers (Gupta, 2007). Moreover, it may be politically infeasible to tax the agriculture sector. Hence, a negative relationship could be expected between the share of agriculture sector and tax revenue performance. Ghura (1998) provides empirical evidence for a negative effect of agriculture share on tax revenue performance. By contrast, manufacturing sector can generate large taxable surpluses. The implication here is that a shift from agricultural to industrial production and a change in consumer demand from basic necessities to manufactured goods and services may lead to rising shares of tax revenue in national income.

The degree of international trade which is measured by the share of exports and imports may have some effect on tax revenue performance. Imports and exports are amenable to tax as they take place at specified locations (Gupta, 2007). To shade light in this argument, Agbeyegbe et al. (2004); Stotsky & WoldeMariam (1997) show that trade liberalization exerts a positive effect on total tax revenue. Also, Leuthold (1991) reveals a positive effect of trade share on tax revenue performance for sub Saharan Africa. Nevertheless, the effect of trade liberalization on tax revenue generation may be ambiguous. In fact, trade liberalization, particularly a reduction of import tariffs, could lead to revenue reduction

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(Tupy, 2005 and Gaalya, 2015). This leads to an argument whether trade liberalization is a potential source of tax revenue losses, especially for low income countries which have high dependency on international trade revenue. By contrast, Keen and Simone (2004) point out that tax revenue may increase provided trade liberalization occurs through tariffication of quotas, eliminations of exemptions, reduction in tariff peaks and improvement in customs procedure. In general however, these arguments require an empirical analysis to determine whether trade liberalization has a positive or negative effect on tax revenue performance in Africa. This is very important because any low income country which commits itself to any form of trade liberalization is likely to be concerned about how to mitigate the probable revenue loss.

Economic stability of a country is controlled by the inflation rate. A stable macroeconomic environment indicates less investment risk which in turn promotes development and higher taxation. This also implies that the worse the macroeconomic situation, the lower the revenues from different taxes. In an inflationary environment, according to Tanzi (1978), when actual tax payments lag the transactions to be taxed, tax obligations are lower in real terms at the time of tax payments. Similarly, excise taxes on some products such tobacco, alcohol and gasoline may be levied at specific rates that may not necessarily be adjusted in line with inflation (Tanzi, 1989). Also, Ghura (1998) argues that high inflation rates may shrink the tax base to the extent that individuals tend to protect their wealth against the negative effect of inflation by substituting towards assets such as livestock that are less likely to be domestically taxed and/or postponing investment plans. Overall, tax revenue share may decline as inflation increases. However, despite the fact that the literature regarding the impact of inflation on tax revenue performance is extensive, it may be difficult to describe this phenomenon. If governments rarely index higher tax thresholds in line with inflation, personal tax revenues and national insurance contributions increase as wages increase. This means inflation pushes more people into higher rate tax brackets. Also, provided that inflation is fairly low and does not change too quickly, business profits increase in line with inflation in the economy, suggesting that corporation tax revenue increases with inflation.

Recently, some studies have looked at the importance of institutional and governance factors in determining tax revenue generation. While some corruption studies propose that corruption can be an efficiency-enhancing force in tax revenue collection by motivating tax officers to work harder and lowering the level of tax evasion, other studies such as (Fjeldstad & Tungodden (2003) show that this paradox does not justify policies to stimulate corruption. In fact, presence of corruption reduces tax revenues in the long run. To shade light to this proposition, Gupta (2007) and Ghura (1998) show that corruption has a significant negative effect on revenue performance. The negative effect of corruption on tax revenues is also empirically supported by Tanzi & Davoodi (1997) and Imam and Jacobs (2014). In particular, Tanzi & Davoodi (2000) show that corruption is associated with lower individual income taxes and taxes collected from VAT, sales and turnover tax. According to Tanzi & Davoodi (2000), corruption has a larger impact on direct taxes in developing countries and that a 4 point reduction in corruption can increase direct taxes in developing countries, as a group, by 7.2 percent of GDP. By contrast, Thornton (2008) reveals that the effects of corruption on tax collection in Middle East and African economies is especially evident in the case of taxes on domestic goods and services and international trade transactions. Thornton (2008) suggests that the efforts to combat corruption in tax collections should focus on indirect taxes. These mixed results imply that corruption affects both direct and indirect taxes. In fact, Abed & Gupta (2002) find that there is a negative effect of corruption on both direct and indirect taxes.

Similarly, Bird et al. (2004) reveal that factors such as corruption, rule of law and entry regulations play key role in tax revenue determination. Higher levels of corruption and lack of good governance in tax administration tend to significantly distort trust in tax authorities, which in turn lead to lower tax revenue generation. Since corruption undermines the quality of the bureaucracy and trust in the administration, it can

discourage investment in the official economy leading to an increase in informal economies (Nawaz, 2010). As the size of the informal economy grows at the cost of the official economy, the tax revenue base is further eroded (Dreher & Herzfeld, 2005).

Good governance brings good tax system (Ajaz & Ahmed, 2010). Good tax system positively depends on good governance (Everest-Phillips & Sandall, 2009). A fair domestic taxation system promotes good governance because efficient tax system allows population to pay fairly (Everest-Phillips & Sandall, 2009). Notwithstanding, studies such as Ghosh & Neanidis (2010), Dos Santos (1995), Tanzi (1998) and Keen (2003) suggest that there are factors related to the tax system and factors related to tax administration that cause corruption, which in turn reduces tax revenue generation. Specifically, complexity of the tax system and high tax rates are the factors related to tax system while low wages of the tax administration is suggested to be the factor related to tax administration. Sanyal et al. (1998) point out that corrupt tax administration leads to Laffer curve behaviour; that is, a higher tax rate leads to smaller net revenue. The main argument here is that net revenue earned from a truth revealing audit probability always exceeds net revenue through audits, taxes, and penalties in the cheating region. Also, Fjeldstad (2005) shows that pay level of employees in revenue authorities is one of the factors affecting the behaviour of tax officers. When tax officers are not well paid would opt to go for the opportunities of corruption. Van Rijckeghem & Weder (2002) and Torgler (2004) reveal that an increase in civil servants salaries in relation to the private sector reduces corruption. However, Aizenman & Jinjarak (2008) suggest that efficiency in tax revenue collection is determined by the penalty on underpaying and probability of audit. Likewise, as has been mentioned, tax revenue collection depends positively on well organised administration; trust in government, and political stability.

It is worth noting that corruption not only lowers the tax-GDP ratio but also causes long-term damage to the economy by detracting investment, increasing the size of the informal economy, distorting tax structures and corroding the tax morality of taxpayers (Nawaz, 2010). This implies that corruption not only reduces collection of tax revenue from the current economy, it also hinders economic growth, thereby adversely affects future tax revenue performance.

High-income countries have arguably improved institutions and their tax effort is correspondingly high. This implies that tax effort of a country is highly responsive to governance structure or institution. On one hand, good governance and effectiveness of tax administration bring good tax system and taxpayers' willingness to pay tax. On the other hand, tax base erosion due to tax incentives is compounded by the lack of transparency and clarity in the provision, administration, and governance of tax incentives. Administrative discretion in the management of incentives can increase the risk of corruption and rent seeking. Furthermore, studies show that countries with a more unstable political system have an inefficient tax structure leading to low tax effort. Empirical studies such as Cukierman et al. (1992), Volkerink & De-Haan (1999), Aizenman & Jinjarak (2008), and Melo (2007) reveal that the efficiency of tax revenue collection is affected by the greater polarization and political instability. The implication here is that the reduced political stability determines a low efficiency of tax collection.

The low ratio of tax to GDP in developing countries is due to narrow tax base as a result of low income, high inflation rate, dominance of agriculture and informal sectors in the economy. Also, revenue losses from the process of trade liberalization, i.e. major reduction of import tariff may lead to low tax ratio in low income countries because they depend more on international trade taxes than high income countries. Equally important, low tax administration and growing practice of tax evasion and corruption reduce the capacity of low income countries to generate tax revenue. However, few attempts have been made to analyze the linkage between corruption, governance and the composition of government revenue in Africa, in which overall tax ratio is low, while corruption is widespread and tax administration is arguably weak. The basic intuition here is that an improved tax to GDP ratio can be achieved by using a combination of good governance,

improved tax administration, best macroeconomic policies and other discretionary tax measures. This scenario serves the motivation of this paper.

3. Data description

This paper uses a panel dataset that covers 30 African countries over the 1996-2016 period. Table 1 presents the individual countries that are considered in this paper by income group and geographical region in Africa. As has been stated, the choice of countries and study period is primarily motivated by the availability of data.

TABLE 1. LIST OF COUNTRIES USED IN THE REGRESSIONS

COUNTRY NAME	ORDER	NATURAL RESOURCES	INCOME GROUP	REGION IN AFRICA
Angola	1	Resource rich	Upper middle income	Southern Africa
Benin	2	Not resource rich	Low income	West Africa
Botswana	3	Resource rich	Upper middle income	Southern Africa
Burkina Faso	4	Not resource rich	Low income	West Africa
Central African Republic	5	Not resource rich	Low income	Central Africa
Congo, Dem. Rep.	6	Resource rich	Low income	Central Africa
Côte d'Ivoire	7	Resource rich	Lower middle income	West Africa
Egypt	8	Resource rich	Lower middle income	North Africa
Ethiopia	9	Not resource rich	Low income	East Africa
Ghana	10	Resource rich	Lower middle income	West Africa
Kenya	11	Not resource rich	Lower middle income	East Africa
Liberia	12	Resource rich	Low income	West Africa
Madagascar	13	Not resource rich	Low income	Southern Africa
Malawi	14	Not resource rich	Low income	Southern Africa
Mali	15	Not resource rich	Low income	West Africa
Mauritius	16	Not resource rich	Upper middle income	Southern Africa
Morocco	17	Not resource rich	Lower middle income	North Africa
Mozambique	18	Not resource rich	Low income	Southern Africa
Namibia	19	Resource rich	Upper middle income	Southern Africa
Nigeria	20	Resource rich	Lower middle income	West Africa
Rwanda	21	Not resource rich	Low income	East Africa
Senegal	22	Not resource rich	Lower middle income	West Africa
Seychelles	23	Not resource rich	High income: non OECD	East Africa
Sierra Leone	24	Resource rich	Low income	West Africa
South Africa	25	Resource rich	Upper middle income	Southern Africa
Tanzania	26	Not resource rich	Low income	East Africa
Togo	27	Not resource rich	Low income	West Africa
Tunisia	28	Not resource rich	Upper middle income	North Africa
Uganda	29	Not resource rich	Low income	East Africa
Zambia	30	Resource rich	Lower middle income	Southern Africa

Source: Authors and African Economic Outlook (2017).

Furthermore, Table 2 gives definitions and descriptions of the key variables used in the analysis. The dependent variables are total taxes, direct taxes, indirect taxes and trade taxes. All taxes are percent of GDP. Total taxes are obtained from World Development Indicators, *Government Financial Statistics* (GFS) and *WEO Economic Trends in Africa* (WETA). Other categories of taxes namely, direct taxes, indirect taxes and trade taxes are obtained from *African Economic Outlook (AEO). AEO* provides tax revenue data for African countries over the 1996-2016 period.

TABLE 2. DESCRIPTIONS OF VARIABLES AND SOURCES OF DATA

VARIABLE	ABBREV.	DEFINITION	SOURCE
Tax revenue	TR_GDP	Total tax revenue to GDP ratio	WDI, 2017
Direct tax	DT_GDP	Taxes on all income sources (i.e. business profits, wages, portfolio income, income from real property, capital gains, etc)	WDI, 2017
Indirect tax	IDT_GDP	Indirect taxes include all domestic consumption taxes, such as sales taxes of various sorts, including VAT and excise taxes.	WDI, 2017
Trade tax	TT_GDP	Tax on international trade	WDI, 2017
Corruption	*Corr.*	Corruption Perception Index $Index = \begin{cases} 10: Very\ clean \\ 0: Highly\ corrupt \end{cases}$	Transparency International, 1996-2016
Growth	*Y*	GDP per capita, current US$	WDI, 2017
Degree of openness	*Trade*	Sum of exports and imports of goods and services, percent of GDP	WDI, 2017
Inflation	π	Consumer prices, annual percent	WDI, 2017
Agriculture	*Agr*	Agriculture, value added, percent of GDP	WDI, 2017
Governance index	*Gov.*	Governance index include control of corruption, government effectiveness, political stability and absences of violence, regulatory quality, rule of law and voice and accountability.	WDI, 2017
Control of Corruption	*CC*	Perceptions of the extent to which public power is exercised for private gain, including petty and grand forms of corruption. (-2.5:2.5 scale)	Worldwide Governance Indicators, 2017
Government effectiveness	*GE*	Perceptions of the quality of public services, civil service and the degree of its independence from political pressures (-2.5:2.5 scale)	Worldwide Governance Indicators, 2017
Political stability & absence of violence	*PS*	Perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism (-2.5:2.5 scale)	Worldwide Governance Indicators, 2017
Regulatory quality	*RQ*	Perceptions of the ability of the government to formulate & implement sound policies and regulations that permit and promote private sector development (-2.5:2.5 scale)	Worldwide Governance Indicators, 2017
Rule of law	*RL*	Extent to which agents have confidence in and abide by the rules of society (-2.5:2.5 scale)	Worldwide Governance Indicator, 2017
Voice and Accountability	*VA*	Perception of the extent to which citizens are able to participate in selecting their government, freedom of expression, association, and a free media (-2.5:2.5 scale)	Worldwide Governance Indicators, 2017
Average tax rate	*Rate*	Average tax rate, percent	WDI, 2017
Tariff rate	*Tariff*	Tariff rate, weighted mean, percent	WDI, 2017

Source: Authors construction.

The key regressors are the variables that capture institutional factors namely, corruption perception index (*Corr.*), control of corruption, government effectiveness, political stability and absence of violence, regulatory quality, rule of law, and voice and accountability. The *Corr.* ranges from 0 to 10, with 10 being no corruption and 0 being countries where business is totally corrupt. If the estimated coefficient on the *Corr.* index turned out positive, would mean that the higher corruption index attracts more tax revenue. The annual *Corr.* data are obtained from *Transparency International*. Information on control of corruption, government effectiveness, political stability and absence of violence, regulatory quality, rule of law, and voice and accountability is from *Worldwide Governance Indicators*. All these indices range from -2.5 to 2.5, with higher values corresponding to better quality of institutions. Other explanatory variables include per capita GDP,

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inflation, share of agriculture in GDP, share of trade in GDP, average tax rate and tariff rate. Their sources are primarily the *International Financial Statistics* (IFS) and *World Development Indicators* (WDI). Summary statistics of taxes, corruption, governance and other determinants of taxes are given in Table 3. These include the mean value, standard deviation, minimum and maximum values. The Table shows the descriptive view about the data set that it consists of 348 to 630 observations.

TABLE 3. SUMMARY STATISTICS OF VARIABLES, 1996-2016

Variable	Obs.	Mean	Std. Dev.	Min	Max
Tax revenue	630	15.43	6.24	1.5	34.6
Direct tax	630	5.04	3.40	0.49	27.4
Indirect tax	630	5.40	4.11	0.23	40.39
Trade tax	630	3.83	3.07	-0.32	18.59
GDP per capita	630	1797.5	2512.6	72.7	15687.3
Trade	630	76.16	38.26	21.1	311.4
Inflation	617	16.28	167.90	-35.8	4145.1
Agriculture	630	25.62	16.62	2	94
Corruption Perception Index	550	3.31	1.13	0.7	9.68
Control of Corruption	630	-0.45	0.58	-1.74	1.25
Government Effectiveness	630	-0.52	0.63	-1.98	1.04
Political stability	630	-0.44	0.86	-2.69	1.19
Regulatory quality	630	-0.42	0.55	-2.11	1.12
Rule of law	630	-0.50	0.63	-2.23	1.06
Voice and accountability	630	-0.41	0.65	-1.66	1.03
Tax rate	348	41.01	13.05	14.3	73.3
Tariff rate	496	9.90	5.85	0.5	32.53

Source: Authors' estimates.

TABLE 4. CORRELATION MATRIX

	TR	DT	IDT	TT	Y	Trade	π	Agr	Corr.	CC	GE	PS	RQ	RL	VA	Rate	Tariff
Tax revenue, *TR*	1																
Direct taxes, *DT*	0.69	1															
Indirect taxes, *IDT*	0.49	0.48	1														
Trade tax, *TT*	0.28	-0.07	-0.23	1													
GDP per capita, *Y*	0.60	0.45	0.51	-0.01	1												
Trade Openness, *Trade*	0.45	0.19	0.30	0.20	0.61	1											
Inflation, *π*	-0.07	-0.04	-0.15	-0.11	-0.08	0.04	1										
Agriculture value added, *Agr*	-0.60	-0.48	-0.40	0.04	-0.68	-0.51	0.05	1									
Corruption Perception Index, *Corr*	0.65	0.48	0.46	0.19	0.61	0.30	-0.13	-0.47	1								
Control of corruption, *CC*	0.60	0.40	0.51	0.20	0.55	0.22	-0.14	-0.44	0.87	1							
Government Effectiveness, *GE*	0.62	0.53	0.62	-0.01	0.62	0.18	-0.10	-0.58	0.79	0.85	1						
Political stability , *PS*	0.58	0.29	0.37	0.36	0.47	0.41	-0.14	-0.43	0.60	0.67	0.60	1					
Regulatory quality, *RQ*	0.51	0.42	0.50	0.04	0.43	0.02	-0.16	-0.42	0.72	0.78	0.89	0.51	1				
Rule of law, *RL*	0.57	0.41	0.56	0.13	0.54	0.20	-0.13	-0.50	0.81	0.87	0.91	0.72	0.84	1			
Voice and accountability, *VA*	0.49	0.33	0.41	0.19	0.42	0.16	-0.11	-0.33	0.60	0.63	0.66	0.67	0.67	0.71	1		
Tax rate, *Rate*	-0.29	-0.28	-0.21	-0.07	-0.21	-0.16	-0.11	0.40	-0.34	-0.32	-0.37	-0.23	-0.40	-0.38	-0.22	1	
Tariff rate, weighted mean, *Tariff*	-0.29	-0.29	-0.12	0.06	-0.09	0.10	-0.03	0.23	-0.30	0.31	-0.32	-0.19	-0.49	-0.30	-0.35	0.39	1

Source. Authors computations.

As far as correlation of the variables is concerned, Table 4 suggests that there is a positive correlation between taxes and a number of independent variables namely GDP per capita, trade openness, control of corruption, political stability and absences of violence, government effectiveness, regulatory quality, rule of law and voice and accountability. The positive correlation between taxes and corruption perception index (*corr.*) suggests that taxes are high in clean economy and less in highly corrupt economy, this illustration is correct because as presented above, *corr.* ranges from 0 to 10 to imply highly corrupt to very clean economies.

In the same manner, a positive correlation between taxes and institutional indicators suggests that taxes inflow is high in economies with good governance (see for example Epaphra & Massawe, 2017). Other variables such as agriculture value added, inflation, tax rate, and tariff rate seem to have a negative relationship with total tax revenue. However, one should understand that these correlations do not necessarily mean causations. As Epaphra & Massawe (2017) report, pair-wise correlations can be spurious, reflecting the effect of the presence of unobserved country effects. Thus, it is very important to examine these relationships in a multivariate regression analysis. To avoid the endogeneity problem, the institutional variables which seem to be correlated, are applied separately in the regression analysis.

4. Empirical analysis

4.1. Graphical analysis

Before turning to the regression results, we show the observed relationship between tax revenue performance and some explanatory variables using scatter diagrams (see Figures 1-14). The observed positive relationship between tax ratio and the quality of institutions and governance in Figures 1-7 is in line with most of the findings in the literature. Countries with relative low levels of corruption such as Botswana, Seychelles, Namibia and Mauritius have higher ratio of tax revenue to GDP than countries that are highly corrupt. In Africa, countries such as Central African Republic, Republic of Congo, Nigeria, Uganda, and Madagascar are among the most corrupt countries and consequently seem to have the very low ratio of tax revenue to GDP. In general, countries with good institutions and governance would have a better tax system hence a higher tax ratio. Figures show that African countries with the best quality of institutions including control of corruption, governance effectiveness, political stability, and regulatory quality, rule of law, and voice and accountability have the highest tax ratios. By contrast, countries with the weakest institutions tend to have lower tax revenue in relation to GDP. The implication here is that good institutions and governance lead to efficient tax system which in turn allows population to pay fairly.

Another observation is that, GDP per capita which has been used in the conventional tax effort literature as proxy for level of development of a country and degree of openness measured as a ratio of import plus export to GDP have a strong positive relationship with revenue performance (Figure 8 and Figure 9). Capacity to pay and collect taxes increases with level of development. Similarly, the fact that low income countries depend mostly on trade taxes, overall tax revenue collection increases with higher degree of trade openness. This makes sense in efficiency terms, in that trade is easy to tax as it flows mainly through a few known points along the border. However, the relationship between tax revenue and trade liberalization is not straight forward. When trade liberalization occurs primarily through reduction in tariffs then tariff revenue may decline.

It also appears that agriculture share and inflation have a strong negative relationship with revenue performance (Figure 10 and Figure 11). Taxes from the agriculture sector are typically hard to collect. In Africa, the sector is largely informal. It is characterized by a large number of small producers who sell their product in informal markets. This coupled with poor or non-existent book-keeping records makes it difficult to tax. As reported in

the literature, tax performance is negatively related to inflation because tax obligations are lower in real terms at the time of tax payments. Also high inflation rate may shrink the tax base because individuals are likely to substitute towards assets that are less likely to be domestically taxed.

How responsive tax revenue is to the rate of tax applied is also a central question in tax analysis. The idea that prohibitively high tax rates reduce tax revenue is documented in literature. The basic intuition is that high tax rates cause people to work less, save less and invest less as well. Similarly, high tax rates may increase the level of tax evasion and corruption. In the presence of high tax rates, people increasingly conduct their economic activities in the subterranean economy, which in turn reduces the tax base. Ideally, lowering prohibitively high tax rate allows the economy and the tax base to growth fast enough that the extra revenue from the larger tax base is more than the revenue loss from the lower tax rate. Figure 12 reports a negative relationship between tax revenue and average tax rate. Full sample scatter diagrams that show the relationships between tax revenue and series explanatory variables are reported in the appendix. Clearly, Figures 1A-13A confirm the importance of including these variables in the tax revenue regression models.

FIGURE 1. TAX REVENUE, PERCENT OF GDP AND CPI IN AFRICA, 2010-2016
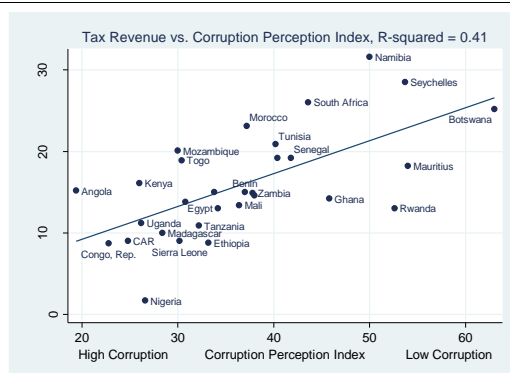
FIGURE 2. TAX REVENUE, PERCENT OF GDP AND CONTROL OF CORRUPTION IN AFRICA, 2010-2016

FIGURE 3. TAX REVENUE, PERCENT OF GDP AND GOVERNMENT EFFECTIVENESS IN AFRICA, 2010-2016
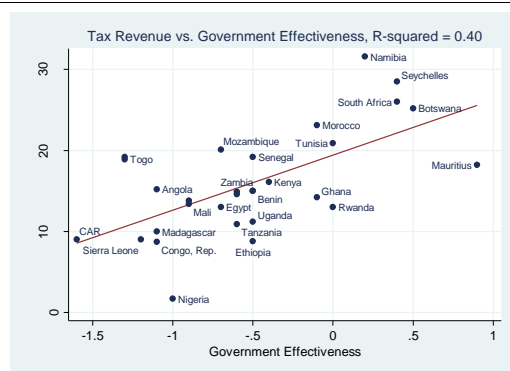
FIGURE 4. TAX REVENUE, PERCENT OF GDP AND POLITICAL STABILITY IN AFRICA, 2010-2016
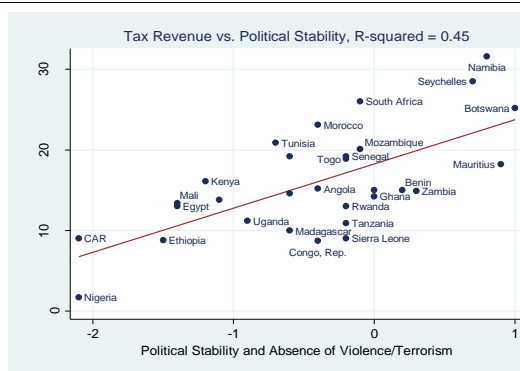
Source: Authors' estimates.

FIGURE 5. TAX REVENUE, PERCENT OF GDP AND REGULATORY QUALITY IN AFRICA, 2010-2016
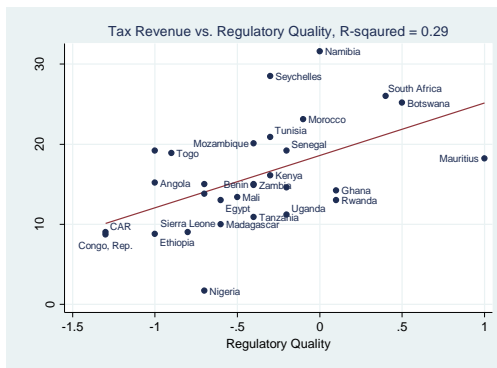
FIGURE 6. TAX REVENUE, PERCENT OF GDP AND RULE OF LAW IN AFRICA, 2010-2016

FIGURE 7. TAX REVENUE, PERCENT OF GDP AND VOICE AND ACCOUNTABILITY IN AFRICA, 2010-2016
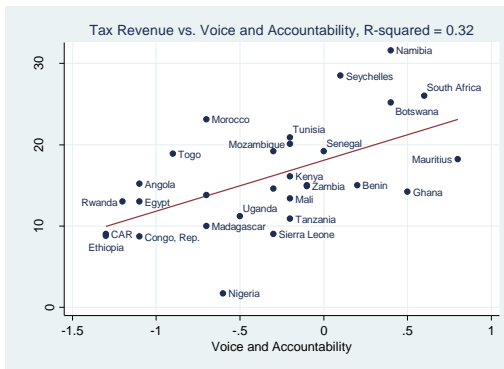
FIGURE 8. TAX REVENUE, PERCENT OF GDP AND GDP PER CAPITA IN AFRICA, 2010-2016
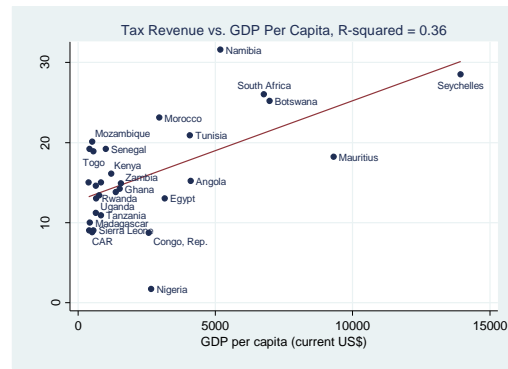
FIGURE 9. TAX REVENUE, PERCENT OF GDP AND TRADE IN AFRICA, 2010-2016
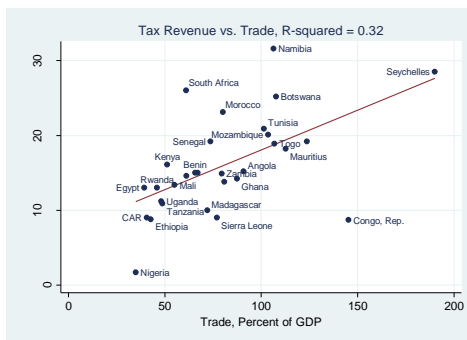
FIGURE 10. TAX REVENUE, PERCENT OF GDP AND AGRICULTURE IN AFRICA, 2010-2016

Source: Authors' estimates.
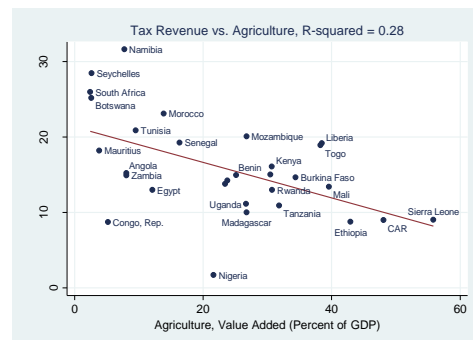
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FIGURE 11. TAX REVENUE, PERCENT OF GDP AND INFLATION IN AFRICA, 2010-2016
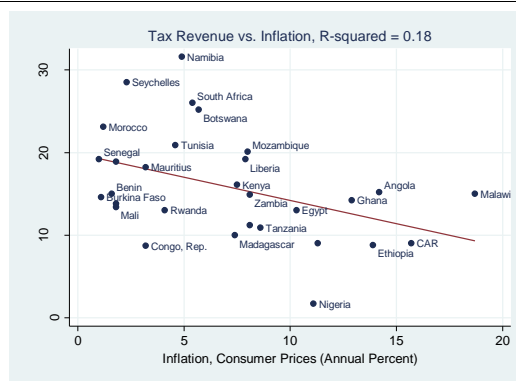
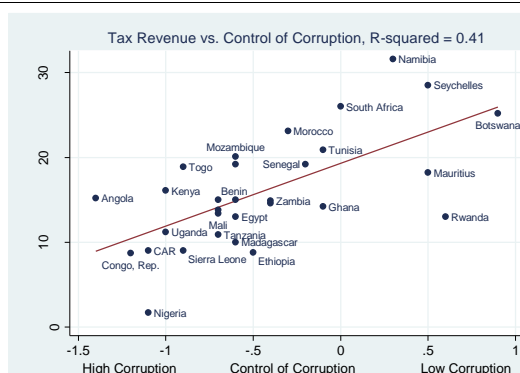FIGURE 12. TAX REVENUE, PERCENT OF GDP AND TAX RATE IN AFRICA, 2010-2016
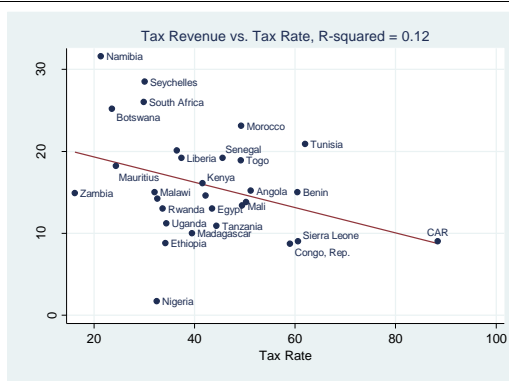
Source: Authors' estimates.
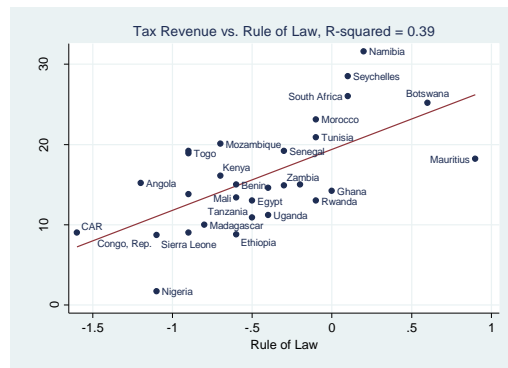
4.2. Baseline regression analysis

As has been discussed earlier, empirical studies have examined the factors that can affect tax revenue generation in developing and developed countries. Several factors such as per capita income, share of agriculture in an economy, openness of the economy, inflation, and corruption are identified as the most important determinants of tax revenue performance. This paper considers some more institutional and governance variables that can potentially affect tax revenues. Additional variables in this paper are control of corruption, government effectiveness, political stability and absence of violence, regulatory quality, rule of law and voice and accountability. The other contribution of this paper is that apart from regressing the overall tax ratio, it considers the effect of the regressors on disaggregated tax revenues namely tax taxes, indirect taxes and trade taxes for the countries in a sample. In our baseline panel regressions, we use fixed and random effects specifications. Fixed effect assumes that the individual specific effect is correlated to the independent variables while random effect assumes the individual specific effects are uncorrelated with the independent variables. The fixed specification is

$$Tax_{it}\_GDP_{it} = \alpha_i + \beta.X_{it} + \lambda.Y_{it} + \delta.Z_{it} + u_{it}, \qquad (1)$$

where $Tax_{it}\_GDP_{it}$ are the ratios of tax revenues to GDP in country i during period t. Tax ratios include total taxes, direct taxes, indirect taxes and trade taxes. α_i is the country fixed effect, X_{it} is set of structural variables, and the vectors Y_{it} and Z_{it} include institutional and policy variables. β, λ and δ are unknown parameters to be estimated, and u_{it} is the usual random disturbance term. Alternatively, the random effect specification is expressed as

$$Tax_{it}\_GDP_{it} = \alpha + \beta.X_{it} + \lambda.Y_{it} + \delta.Z_{it} + \eta_i + u_{it}, \qquad (2)$$

where η_i is the random effect or the unobserved country-specific effects. Definitions and descriptions of the variables are as presented in Table 2.

The structural variables include the log of per capita GDP, the log of share of agriculture in GDP, the ratio of imports and exports to GD, and inflation. Agriculture plays a central role in any economy development particularly in sub-Saharan Africa; it contributes a large share to the GDP. In this paper, the share of agriculture is measure by agriculture value added as percent of GDP. Per capita GDP is measured by the ratio of GDP at current US\$ prices to population. Per capita GDP is known as a good indicator for the overall development of the economy. The ratio of imports plus export to GDP measures the degree of trade openness or liberalization. Moreover, inflation which is measured by average annual percent of consumer prices captures the effect of macroeconomic policy.

The institutional and governance variables include corruption perception index *(Corr.),* control of corruption *(CC),* government effectiveness *(GE),* political stability and absences of violence (PS), regulatory quality *(RQ),* rule of law *(RL),* and voice and accountability *(VA)*. *Corr.* compares every year, the levels of corruption among public officials and politicians in a wide range of countries around the world. The index is based on the perception of business people and country analysts. The Worldwide Governance Indicators (WGI) is formed by the World Bank Research Institute. The data on governance are constructed by using six variables namely *CC, GE, PS, RQ, RL, and VA*. Lastly, the policy variables include the tax rate and average tariff rate.

It is worth noting that endogenity arises when explanatory variables are correlated with the random error term of the model. Likewise, model uncertainty arises when we cannot fully capture the determinants of tax revenues. Thus, to test for endogeneity in the models, the Housman test (Hausman, 1978) is used in this paper. This takes the form of a comparison between the parameter estimates in both the fixed effect and the random effect model (also see Greene, 2012 and Wooldridge, 2002). The Hausman test is regularly deployed as a test for whether fixed effect or random effect can be used. Furthermore, to avoid endogeneity problem, all higher-level variance is controlled out by the higher-level entities themselves (Allison, 2009). Based on Hausman test, the random effect model is appropriate and the results are summarized in Tables 5-8. Because of the high degree of collinearity between the institutional variables, we use those variables in separate specifications. Tables 5-8 show the regression results for total tax revenue, direct taxes, indirect taxes, and trade taxes respectively. The fixed effect regression results are presented in the appendices, Tables 1A-4A.

Table 5 reports the regression results for total tax revenues in 7 models, in which the institutional variables are regressed separately. The same nature of analysis is applied to direct taxes, indirect taxes and trade taxes. As can be seen, the coefficients on corruption perception index and control of corruption in models 1 and 2 respectively, are positive and statistically significant suggesting that total tax revenue to GDP ratio is low in highly corrupt economies. The impact of corruption is also evidenced in direct taxes (Table 6), indirect taxes (Table 7), and trade taxes (Table 8). However, the response of tax revenue to corruption seems to be more substantial in indirect taxes than in direct and trade taxes. Overall, for African countries, control of corruption, that implies an increase in the corruption index would substantially increase tax revenue. Among institutional factors, the coefficients on government effectiveness, regulatory quality and voice and accountability are also positive and statistically significant. This also suggests that improved institutions would raise total tax revenue collection in Africa. These results are in conformity with our expectation that corruption cause significant leakages in tax revenue but good governance contributes to better tax administration leading to high tax revenue generation.

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Notwithstanding, there is no strong evidence on the response of total tax revenue and direct taxes to changes in rule of law and political stability and absence of violence but they seem to be major determinants of indirect tax and trade tax revenues (see **Table 7** and Table 8). Similarly, the results suggest that government effectiveness, rule of law and voice and accountability are not related to direct tax revenues but they are strongly correlated with indirect tax and trade tax revenues. The statistically insignificant effect of some of institutional variables on direct taxes could simply be due to the fact that direct taxes are in general low, so compliance may be higher.

Based on our results, tax rate has a weak negative effect on indirect taxes and none on total tax revenue. However, the negative effect of tax rate on direct taxes is more evident. Interestingly, tariff rates seem to have a strong negative effect on total tax revenue but at the same time they have a strong positive effect on trade tax revenue. These results imply that reduction in tariff rates reduces trade tax revenue but it will raise total tax revenue. The basic intuition here is that if the fall in the trade taxes due to declining tariffs following trade liberalization can easily be compensated by increase in other taxes, most obviously by strengthening domestic indirect taxes, then these will not be a problem. Indeed, as results, reported in Table 7 show, the coefficient on tariff rate is negative and statistically significant in models 16-21 suggesting that reduction in tariff raises domestic indirect taxes such as VAT and excise duties. The volume of imports tends to expand when tariffs are reduced and hence the tax base will follow suit.

TABLE 5. RANDOM EFFECT MODELS: TOTAL TAX REVENUE REGRESSIONS

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Y	0.784*	0.553	0.581	0.527	0.594	0.596	0.557
	(0.43)	(0.40)	(0.40)	(0.41)	(0.41)	(0.41)	(0.41)
	[1.81]	[1.37]	[1.44]	[1.29]	[1.46]	[1.46]	[1.38]
Trade	0.077***	0.082***	0.081***	0.080***	0.080***	0.081***	0.081***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	[9.22]	[10.25]	[10.13]	[9.94]	[9.97]	[10.04]	[10.11]
π	-0.045***	-0.041**	-0.045***	-0.047***	-0.045***	-0.046***	-0.046***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
	[-2.53]	[-2.35]	[-2.57]	[-2.65]	[-2.52]	[-2.60]	[-2.62]
Agr	-1.268**	-1.069*	-0.981	-1.258**	-1.138*	-1.108*	-1.107*
	(0.61)	(0.60)	(0.61)	(0.61)	(0.61)	(0.61)	(0.61)
	[-2.09]	[-1.76]	[-1.61]	[-2.07]	[-1.87]	[-1.81]	[-1.82]
Corr.	0.416*						
	(0.23)						
	[1.82]						
CC		1.298***					
		(0.49)					
		[2.83]					
GE			1.634***				
			(0.57)				
			[2.87]				
PS				0.070			
				(0.29)			
				[0.24]			
RQ					1.098*		
					(0.59)		
					[1.87]		
RL						0.826	
						(0.58)	
						[1.42]	
VA							1.019**
							(0.47)
							[2.16]

TABLE 5. RANDOM EFFECT MODELS: TOTAL TAX REVENUE REGRESSIONS

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Rate	-0.036	-0.038	-0.023	-0.040	-0.033	-0.035	-0.041
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
	[-1.32]	[-1.41]	[-0.85]	[-1.48]	[-1.21]	[-1.26]	[-1.51]
Tariff	-0.094***	-0.081***	-0.100***	-0.099***	-0.091***	-0.103***	-0.09***
	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.033)
	[-2.56]	[-2.46]	[-3.07]	[-2.96]	[-2.77]	[-3.12]	[-2.67]
Cons.	20.21***	19.57***	19.42***	19.74***	19.92***	19.89	19.71***
	(4.36)	(4.57)	(4.57)	(4.62)	(4.60)	(4.61)	(4.59)
	[4.36]	[4.28]	[4.25]	[4.27]	[4.33]	[4.31]	[4.29]
No. of obs	335	338	338	338	338	338	338
No. of group	30	30	30	30	30	30	30
R-squared:							
within	0.285	0.291	0.289	0.280	0.283	0.281	0.287
between	0.423	0.452	0.488	0.340	0.448	0.434	0.432
overall	0.389	0.426	0.457	0.380	0.420	0.407	0.410
Wald chi2(7)	140.45	147.92	148.06	136.89	140.98	139.09	142.60
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Regressions are estimated using panel data over the period 1996-2016 across 30 African countries. (.) - Denotes standard errors; [.] - Denotes *t* statistics; and *, **, *** - Mean significance at the 10% , 5% , 1% levels. Source: Authors estimates.

TABLE 6. RANDOM EFFECT MODELS: DIRECT TAX REGRESSIONS

Variable	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
Y	0.981***	1.276***	1.274***	1.271***	1.242***	1.272***	1.271***
	(0.26)	(0.25)	(0.25)	(0.25)	(0.25)	(0.26)	(0.25)
	[3.79]	[5.03]	[5.02]	[5.03]	[4.92]	[4.99]	[5.03]
Trade	0.009***	0.009***	0.009***	0.008**	0.009***	0.009***	0.09***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	[2.63]	[2.50]	[2.49]	[2.29]	[2.65]	[2.51]	[2.49]
π	0.014	0.011	0.010	0.009	0.011	0.010	0.010
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	[1.26]	[0.94]	[0.91]	[0.83]	[1.08]	[0.93]	[0.98]
Agr	-0.286	-0.053	-0.049	-0.024	-0.146	-0.55	-0.094
	(0.35)	(0.36)	(0.36)	(0.36)	(0.36)	(0.36)	(0.36)
	[-0.81]	[-0.15]	[-0.13]	[-0.07]	[-0.40]	[-0.15]	[-0.26]
Corr.	0.52***						
	(0.13)						
	[3.93]						
CC		0.073					
		(0.31)					
		[0.24]					
GE			0.022				
			(0.36)				
			[0.06]				
PS				0.338*			
				(0.18)			
				[1.90]			
RQ					0.766**		
					(0.36)		
					[2.10]		

TABLE 6. RANDOM EFFECT MODELS: DIRECT TAX REGRESSIONS

Variable	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
RL						0.076	
						(0.36)	
						[0.21]	
VA							0.434
							(0.29)
							[1.49]
Rate	-0.074***	-0.091***	-0.091***	-0.092***	-0.085***	-0.092***	-0.091***
	(0.02)	(0.15)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
	[-4.95]	[-6.63]	[-5.90]	[-6.09]	[-5.57]	[-6.00]	[-6.04]
Cons.	-1.704	-0.616	-0.624	-0.444	-0.664	-0.092	-0.598
	(2.72)	(2.79)	(2.79)	(2.78)	(2.78)	(2.70)	(2.79)
	[-0.63]	[-0.22]	[-0.22]	[-0.16]	[-0.24]	[0.81]	[-0.21]
No. of obs	345	348	348	348	348	348	348
No. of group	30	30	30	30	30	30	30
R-squared:							
within	0.241	0.217	0.217	0.225	0.227	0.217	0.223
between	0.295	0.301	0.300	0.286	0.312	0.300	0.307
overall	0.267	0.271	0.270	0.260	0.282	0.271	0.277
Wald chi2(6)	109.33	96.18	96.26	100.68	101.74	96.17	98.90
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Regressions are estimated using panel data over the period 1996-2016 across 30 African countries. (.) - Denotes standard errors; [.] - Denotes *t* statistics; and *, **, *** - Mean significance at the 10% , 5% , 1% levels. Source: Authors estimates.

TABLE 7. RANDOM EFFECT MODELS: INDIRECT TAX REGRESSIONS

Variable	Model 15	Model 16	Model 17	Model 18	Model 19	Model 20	Model 21
Y	0.752***	0.905***	0.821***	0.911***	0.825***	0.844***	0.910***
	(0.27)	(0.28)	(0.27)	(0.28)	(0.28)	(0.28)	(0.28)
	[2.75]	[3.22]	[3.04]	[3.23]	[3.00]	[3.00]	[3.24]
Trade	0.019***	0.021***	0.021***	0.020***	0.021***	0.021***	0.021***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	[3.67]	[3.88]	[4.03]	[3.71]	[3.83]	[3.89]	[3.83]
π	-0.017*	-0.012	-0.012	-0.015	-0.011	-0.013	-0.014
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	[-1.53]	[-0.94]	[-1.06]	[-1.24]	[-0.89]	[-1.09]	[-1.12]
Agr	-0.336	-0.302	-0.582*	-0.155	-0.352	-0.353	-0.286
	(0.38)	(0.41)	(0.39)	(0.42)	(0.40)	(0.41)	(0.42)
	[-0.87]	[-0.73]	[-1.49]	[-0.37]	[-0.89]	[-0.86]	[-0.69]
Corr.	0.461***						
	(0.14)						
	[3.20]						
CC		0.737**					
		(0.34)					
		[2.14]					
GE			2.140***				
			(0.38)				
			[5.69]				

TABLE 7. RANDOM EFFECT MODELS: INDIRECT TAX REGRESSIONS

Variable	Model 15	Model 16	Model 17	Model 18	Model 19	Model 20	Model 21
PS				0.212			
				(0.20)			
				[1.04]			
RQ					1.821***		
					(0.40)		
					[4.56]		
RL						1.030***	
						(0.40)	
						[2.59]	
VA							0.676**
							(0.33)
							[2.07]
Rate	-0.032*	-0.030*	-0.008	-0.033*	-0.023	-0.035	-0.032*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
	[-1.86]	[-1.65]	[-0.45]	[-1.79]	[-1.26]	[-1.26]	[-1.74]
Tariff	-0.020	-0.046**	-0.057**	-0.049**	-0.061***	-0.103***	-0.048**
	(0.023)	(0.23)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
	[-0.88]	[-1.98]	[-2.57]	[-2.12]	[-2.65]	[-3.12]	[-2.10]
Cons.	-2.227	-1.353	-1.568	-1.562	-1.071	-1.070	-1.293
	(2.94)	(3.17)	(3.02)	(3.19)	(3.14)	(3.14)	(3.17)
	[-0.76]	[-0.43]	[-0.52]	[-0.36]	[-0.34]	[-0.34]	[-0.41]
No. of obs	335	338	338	338	338	338	338
No. of group	30	30	30	30	30	30	30
Wald chi2(7)	76.84	57.73	92.10	53.19	77.68	61.22	56.94
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Regressions are estimated using panel data over the period 1996-2016 across 30 African countries. (.) - Denotes standard errors; [.] - Denotes t statistics; and *, **, *** - Mean significance at the 10% , 5% , 1% levels. Source: Authors estimates.

TABLE 8. RANDOM EFFECT MODELS: TRADE TAX REVENUE REGRESSIONS

Variable	Model 22	Model 23	Model 24	Model 25	Model 26	Model 27	Model 28
Y	-0.246*	-0.205	-0.203	-0.211	-0.205	-0.276*	-0.281*
	(0.15)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)
	[-1.60]	[-1.29]	[-1.28]	[-1.34]	[-1.30]	[-1.73]	[-1.79]
Trade	0.007*	0.009**	0.008*	0.007*	0.008*	0.008*	0.009**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	[1.68]	[2.00]	[1.78]	[1.58]	[1.69]	[1.84]	[1.95]
π	0.001*	0.013*	0.013*	0.018*	0.011*	0.015**	0.015**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	[0.09]	[1.79]	[1.78]	[2.48]	[1.47]	[1.99]	[2.10]
Agr	0.375	0.828***	0.778***	0.907***	0.691**	0.852***	0.844***
	(0.31)	(0.32)	(0.32)	(0.32)	(0.32)	(0.32)	(0.31)
	[1.19]	[2.59]	[2.41]	[2.87]	[2.16]	[2.68]	[2.68]
Corr.	0.070						
	(0.10)						
	[0.69]						
CC		0.393*					
		(0.24)					
		[1.65]					

TABLE 8. RANDOM EFFECT MODELS: TRADE TAX REVENUE REGRESSIONS

Variable	Model 22	Model 23	Model 24	Model 25	Model 26	Model 27	Model 28
GE			0.014***				
			(0.28)				
			[0.05]				
PS				0.560***			
				(0.15)			
				[3.78]			
RQ					0.745***		
					(0.29)		
					[2.56]		
RL						0.787***	
						(0.28)	
						[2.81]	
VA							1.004***
							(0.25)
							[4.08]
Tariff	0.089***	0.101***	0.101***	0.091***	0.096***	0.098***	0.105***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	[6.17]	[7.25]	[7.21]	[6.45]	[6.80]	[7.06]	[7.58]
Cons.	3.098*	1.104	1.130	1.167	1.213	1.809	1.780
	(1.82)	(1.89)	(1.89)	(1.87)	(1.88)	(1.89)	(1.87)
	[1.70]	[0.58]	[0.60]	[0.63]	[0.64]	[0.95]	[0.95]
No. of obs	462	494	494	494	494	494	494
No. of group	30	30	30	30	30	30	30
R-squared:							
within	0.167	0.226	0.227	0.239	0.245	0.233	0.245
between	0.007	0.002	0.011	0.004	0.013	0.001	0.002
overall	0.001	0.006	0.001	0.032	0.001	0.011	0.022
Wald chi2(7)	77.59	120.80	117.48	134.60	126.25	127.57	138.84
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Regressions are estimated using panel data over the period 1996-2016 across 30 African countries. (.) - Denotes standard errors; [.] - Denotes t statistics; and *, **, *** - Mean significance at the 10% , 5% , 1% levels.
Source: Authors estimates.

Moreover, lower tariffs reduce opportunity and incentive for evasion so compliance increases, and so domestic tax revenue may increase.

We also find that for total taxes the regression coefficient on per capita GDP is positive but weakly statistically significant and insignificant in some models. This suggests that, contrary to expectation, the tax to GDP ratio does not seem to increase significantly with economic development in Africa. The reason could be that the level of development experienced in African countries in the given short period of time may not have been enough to exert any effect on the tax revenue generating capacity. For direct taxes and indirect taxes, however, the coefficient on per capita GDP is significantly positive in all the random-effects regressions. This is in line with other studies that found that the capacity to collect and pay taxes increases with the level of development. A higher per-capita income reflecting a higher level of development is held to indicate a higher capacity to pay taxes as well as a greater capacity to levy and collect them. Unsurprisingly, the relationship between per capita GDP and trade tax revenue in African countries seems to be negative but weak. The usual explanation is that in low income countries with poor administrative capabilities trade taxes may be the easiest way for governments to raise revenue. Higher income countries tend to have a more monetized economy and better tax administration but less rely on trade taxes. This also means that in the early stages of

economic development, trade taxes are the major sources of government revenues since they are easier to collect and enforce than domestic taxes.

We find that openness (*trade*) has a strong positive effect on the total tax revenue, direct taxes and indirect taxes. One explanation for this result is that trade liberalization tends to broaden tax bases which in turn raise domestic tax revenues. The relationship between degree of openness and trade tax revenue is positive although it seems to be relatively weak. On one hand, trade-related taxes are easier to impose because the goods enter or leave the country at specified locations. On the other hand, reduction in tariffs tends to offset the increase in the ratio of imports and exports to GDP. As a result the positive effect of openness on trade taxes tends to be weak. Our results also suggest a negative and significant relationship between agriculture share and total tax revenue performance. Intuitively, since a large part of the agriculture sector is Africa is subsistence, then this sector is hard to tax. This relationship however, is not always significant for some specifications. Indeed, results show that there is no significant relationship between agriculture share and both direct taxes and indirect taxes. By contrast, agriculture share seems to have a positive impact on trade tax revenue in African countries. This is not surprising because agricultural imports far outweigh exports to the rest of the world and that on average, agricultural product account for a substantial share of the total trade for African countries. Thus, an increase in agriculture share tends to raise trade tax revenues.

Finally, in most specifications we find a strong negative relationship between inflation and total tax revenue performance. However, inflation has a weak positive relationship with trade tax revenue and that it has no significant relationship with both direct taxes and indirect taxes. The significantly negative relationship between inflation and the ratio of total tax to GDP is obvious a higher rate of inflation will decrease the effective rate of tax, the decrease being greater the longer the collection lag. Also, inflation distorts the measurement of the tax base.

5. Conclusions and policy implications

This paper analyzes the effect of institutional factors, structural factors and policy variables on total tax revenue, direct taxes, indirect taxes, and trade tax revenue performance by using a dataset which includes 30 African countries over the 1996-2016 period. A set of institutional, structural and policy variables, which can potentially influence tax revenues, are considered in the econometric analysis. These are important factors because an improved tax to GDP ratio in African can be achieved by using a combination of good governance, improved tax administration, good macroeconomic policies and other discretionary tax measures. Based on our results, we find relatively strong empirical support for this proposition. Corruption seems to have a significantly negative effect on total tax revenue. The effect of corruption is more significant in the case of indirect taxes than direct taxes. Intuitively, corruption affects tax administration, tax audits as well as the credibility of the institutions. In addition, when the level of corruption is high, tax payers can be motivated to enter the informal economy. Similarly, we find that the effect of government effectiveness, regulatory quality, rule of law as well as voice and accountability is more substantial in indirect taxes and trade taxes than in direct taxes and overall tax revenues. But political stability and absence of violence seems to have a more significant effect on trade taxes and direct taxes. Results also reveal a mixed effect of policy variables on tax revenue performance. On one hand trade taxes tend to increase with tariff rates while total tax revenues decline as tariff rate increases. On the other hand, tax rates tend to have a strong negative effect on direct taxes but they seem to exert no significant effect on total tax revenues and indirect taxes. Of the structural variables, trade openness is very important determinant of tax revenue generation in Africa. In fact, tax revenues in African countries respond more significantly to an increase in trade than the level of economic development. Moreover, our results

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suggest that the overall tax to GDP ratio is higher in a relatively smaller size of agriculture sector and more economically stable countries.

These results may have policy implications for governments. Undoubtedly, decreasing corruption and good governance in the public sector should be one of the key steps towards raising tax revenues in Africa. The fact that the effect of corruption is more evident in indirect taxes, the government should focus more on corruption in relation to indirect taxes such as VAT, excise duties and international trade taxes. Corruption can be reduced through improved tax administration and independent and efficient judicial system. The results suggest that tax revenues from trade taxes and other indirect taxes including VAT on imports and excise taxes could rise if corruption falls. Thus, building up customs administration should therefore be a high priority. Here, tax authorities should ensure efficient collection of tax revenue by strengthening internal control systems and making tax official aware of the problems of corruption through training and seminars. Other measures which are likely to reduce corruption and raise tax revenue include simplification of the tax system. The system should have clear rules, few rates, few exemptions, and readily determinable taxable bases. Equally important, increasing the openness of trade and reducing the agriculture share while increasing the share of other sectors, most notable, industrial sectors may increase the overall tax revenue in Africa.

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Appendix

TABLE 1A. FIXED EFFECT MODELS: TOTAL TAX REVENUE REGRESSIONS

Variable	Model 1A	Model 2A	Model 3A	Model 4A	Model 5A	Model 6A	Model 7A
Y	1.010**	0.726*	0.724*	0.728*	0.752*	0.745*	0.73*
	(0.45)	(0.42)	(0.42)	(0.42)	(0.42)	(0.42)	(0.42)
	[2.23]	[1.74]	[1.73]	[1.73]	[1.79]	[1.77]	[1.74]
Trade	0.076***	0.082***	0.081***	0.080***	0.080***	0.080***	0.081***
	(0.009)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	[8.62]	[9.69]	[9.57]	[9.41]	[9.42]	[9.48]	[9.58]
π	-0.046***	-0.043**	-0.046**	-0.048***	-0.046***	-0.047***	-0.046***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
	[-2.56]	[-2.41]	[-2.60]	[-2.72]	[-2.58]	[-2.65]	[-2.63]
Agr	-0.544	-0.584	-0.553	-0.653	-0.610	-0.608	-0.605
	(0.68)	(0.67)	(0.67)	(0.68)	(0.68)	(0.68)	(0.67)
	[-0.80]	[-0.87]	[-0.82]	[-0.97]	[-0.90]	[-0.89]	[-0.90]
Corr.	0.397*						
	(0.23)						
	[1.71]						
CC		1.096**					
		(0.51)					
		[2.14]					
GE			1.124*				
			(0.60)				
			[1.87]				
PS				0.162			
				(0.30)			
				[0.54]			
RQ					0.685		
					(0.61)		
					[1.12]		
RL						0.367	
						(0.61)	
						[0.60]	
VA							0.774*
							(0.49)
							[1.57]
Rate	-0.034	-0.039	-0.027	-0.037	-0.034	-0.036	-0.041
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
	[-1.16]	[-1.34]	[-0.91]	[-1.28]	[-1.16]	[-1.22]	[-1.39]
Tariff	-0.091***	-0.082***	-0.097***	-0.093***	-0.092***	-0.098***	-0.09***
	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.033)
	[-2.49]	[-2.45]	[-2.96]	[-2.76]	[-2.79]	[-2.96]	[-2.65]
Cons.	19.99***	19.52***	19.24***	19.74***	19.64***	19.56	19.61***
	(4.72)	(4.66)	(4.67)	(4.62)	(4.69)	(4.70)	(4.48)
	[4.24]	[4.19]	[4.12]	[4.27]	[4.19]	[4.17]	[4.19]
No. of obs	335	338	338	338	338	338	338
No of group	30	30	30	30	30	30	30
R-squared:							
within	0.290	0.295	0.293	0.285	0.287	0.285	0.290
between	0.328	0.390	0.421	0.304	0.369	0.348	0.368
overall	0.308	0.373	0.397	0.291	0.351	0.332	0.354
F-test all u_i=0	71.11	72.46	70.58	68.77	74.36	73.03	77.46
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Regressions are estimated using panel data over the period 1996-2016 across 30 African countries. (.) - Denotes standard errors; [.] - Denotes t statistics; and *, **, *** - Mean significance at the 10% , 5% , 1% levels.

Source: Authors estimates.

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TABLE 2A. FIXED EFFECT MODELS: DIRECT TAX REGRESSIONS

Variable	Model 8A	Model 9A	Model 10A	Model 11A	Model 12A	Model 13A	Model 14A
Y	0.984***	1.311***	1.312***	1.298***	1.280***	1.309***	1.307***
	(0.28)	(0.27)	(0.27)	(0.27)	(0.27)	(0.27)	(0.27)
	[3.58]	[4.91]	[4.92]	[4.89]	[4.81]	[4.88]	[4.92]
Trade	0.009***	0.009***	0.009***	0.008**	0.009***	0.009***	0.09***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	[2.53]	[2.54]	[2.54]	[2.21]	[2.65]	[2.55]	[2.56]
π	0.015	0.012	0.012	0.011	0.014	0.012	0.013
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	[1.37]	[1.11]	[1.07]	[0.98]	[1.25]	[1.10]	[1.16]
Agr	-0.340	-0.017	-0.026	-0.029	-0.068	-0.016	-0.009
	(0.41)	(0.41)	(0.41)	(0.41)	(0.41)	(0.42)	(0.41)
	[-0.83]	[-0.04]	[-0.06]	[-0.07]	[-0.17]	[-0.04]	[-0.02]
Corr.	0.52***						
	(0.14)						
	[3.78]						
CC		0.072					
		(0.32)					
		[0.22]					
GE			0.098				
			(0.40)				
			[0.26]				
PS				0.349*			
				(0.19)			
				[1.87]			
RQ					0.790**		
					(0.38)		
					[2.05]		
RL						0.056	
						(0.39)	
						[0.14]	
VA							0.434
							(0.29)
							[1.49]
Rate	-0.081***	-0.099***	-0.100***	-0.092***	-0.094***	-0.099***	-0.091***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
	[-4.91]	[-5.97]	[-5.92]	[-5.90]	[-5.61]	[-5.96]	[-6.04]
Cons.	-1.602	-0.401	-0.423	-0.394	-0.392	-0.393	-0.265
	(2.80)	(2.89)	(2.89)	(2.87)	(2.87)	(2.89)	(2.88)
	[-0.57]	[-0.14]	[-0.15]	[-0.14]	[-0.14]	[-0.14]	[-0.09]
No. of obs	345	348	348	348	348	348	348
No of group	30	30	30	30	30	30	30
R-squared:							
within	0.242	0.217	0.217	0.225	0.227	0.217	0.223
between	0.287	0.301	0.293	0.284	0.312	0.300	0.307
overall	0.260	0.271	0.264	0.259	0.281	0.271	0.277
F-test all u_i=0	64.77	61.20	58.09	63.24	61.83	61.00	61.97
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Regressions are estimated using panel data over the period 1996-2016 across 30 African countries. (.) - Denotes standard errors; [.] - Denotes t statistics; and *, **, *** - Mean significance at the 10% , 5% , 1% levels.

Source: Authors estimates.

TABLE 3A. FIXED EFFECT MODELS: INDIRECT TAX REGRESSIONS

Variable	Model 15A	Model 16A	Model 17A	Model 18A	Model 19A	Model 20A	Model 21A
Y	0.741***	0.911***	0.908***	0.902***	0.842***	0.870***	0.909***
	(0.29)	(0.30)	(0.30)	(0.30)	(0.29)	(0.30)	(0.30)
	[2.54]	[3.07]	[3.14]	[3.03]	[2.88]	[2.92]	[3.06]
Trade	0.020***	0.022***	0.022***	0.021***	0.020***	0.022***	0.022***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	[3.48]	[3.69]	[3.79]	[3.45]	[3.46]	[3.63]	[3.66]
π	-0.016*	-0.010	-0.010	-0.014	-0.010	-0.012	-0.012
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	[-1.41]	[-0.83]	[-0.83]	[-1.11]	[-0.71]	[-0.93]	[-0.96]
Agr	0.471	0.358	0.481	0.315	0.412	0.399	0.358
	(0.44)	(0.48)	(0.47)	(0.48)	(0.47)	(0.48)	(0.48)
	[1.07]	[0.75]	[1.03]	[0.66]	[0.88]	[0.83]	[0.75]
Corr.	0.445***						
	(0.15)						
	[2.96]						
CC		0.575*					
		(0.37)					
		[1.57]					
GE			1.847***				
			(0.42)				
			[4.45]				
PS				0.295			
				(0.21)			
				[1.39]			
RQ					1.582***		
					(0.43)		
					[3.72]		
RL						0.681*	
						(0.43)	
						[1.59]	
VA							0.603*
							(0.35)
							[1.72]
Rate	-0.036*	-0.037*	-0.018	-0.035*	-0.028	-0.033*	-0.038*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
	[-1.91]	[-1.76]	[-0.89]	[-1.70]	[-1.34]	[-1.56]	[-1.84]
Tariff	-0.021	-0.047**	-0.056**	-0.047**	-0.045**	-0.058***	-0.048**
	(0.02)	(0.24)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
	[-0.87]	[-1.98]	[-2.46]	[-2.01]	[-1.97]	[-2.48]	[-2.03]
Cons.	-2.198	-1.353	-1.673	-1.369	-0.882	-1.112	-1.216
	(3.04)	(3.32)	(3.23)	(3.32)	(3.26)	(3.32)	(3.32)
	[-0.72]	[-0.39]	[-0.52]	[-0.41]	[-0.27]	[-0.33]	[-0.37]
F-test all u_i=0	66.16	52.14	38.39	59.17	44.73	44.80	56.25
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Regressions are estimated using panel data over the period 1996-2016 across 30 African countries. (.) - Denotes standard errors; [.] - Denotes t statistics; and *, **, *** - Mean significance at the 10% , 5% , 1% levels.

Source: Authors estimates.

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TABLE 4A. FIXED EFFECT MODELS: TRADE TAX REVENUE REGRESSIONS

Variable	Model 22A	Model 23A	Model 24A	Model 25A	Model 26A	Model 27A	Model 28A
Y	-0.217	-0.195	-0.194	-0.202	-0.198	-0.249*	-0.262*
	(0.15)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)
	[-1.41]	[-1.24]	[-1.23]	[-1.30]	[-1.28]	[-1.57]	[-1.68]
Trade	0.004	0.004	0.002	0.003	0.003	0.004*	0.004
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
	[0.99]	[0.86]	[0.63]	[0.65]	[0.72]	[1.82]	[0.96]
π	0.000	0.013*	0.014*	0.018*	0.010*	0.015**	0.016**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	[0.10]	[1.89]	[1.88]	[2.44]	[1.45]	[2.05]	[2.17]
Agr	0.630*	1.275***	1.267***	1.342***	1.199**	1.275***	1.258***
	(0.35)	(0.36)	(0.36)	(0.36)	(0.36)	(0.36)	(0.36)
	[1.78]	[3.52]	[3.50]	[2.74]	[3.35]	[3.54]	[3.52]
Corr.	0.117						
	(0.10)						
	[1.14]						
CC		0.125					
		(0.25)					
		[0.51]					
GE			0.266				
			(0.29)				
			[0.91]				
PS				0.433***			
				(0.15)			
				[2.90]			
RQ					1.010***		
					(0.29)		
					[3.43]		
RL						0.579**	
						(0.29)	
						[1.98]	
VA							0.852***
							(0.26)
							[3.33]
Tariff	0.090***	0.097***	0.101***	0.090***	0.091***	0.096***	0.101***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	[6.15]	[6.81]	[7.21]	[6.28]	[6.38]	[6.79]	[7.19]
Cons.	-2.314	-0.165	-0.243	-0.070	-0.214	0.444	0.553
	(1.80)	(1.87)	(1.87)	(1.86)	(1.85)	(1.89)	(1.86)
	[-1.28]	[-0.09]	[-1.13]	[-0.04]	[-0.12]	[0.23]	[0.30]
No. of obs	462	494	494	494	494	494	494
No of group	30	30	30	30	30	30	30
F-test all u_i=0	77.92	64.93	70.00	60.33	70.82	66.65	67.96
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Regressions are estimated using panel data over the period 1996-2016 across 30 African countries. (.) - Denotes standard errors; [.] - Denotes t statistics; and *, **, *** - Mean significance at the 10% , 5% , 1% levels.

Source: Authors estimates.

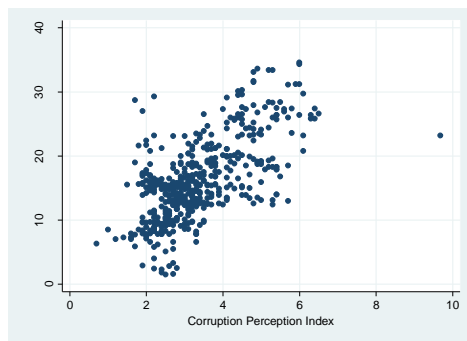FIGURE 1A. TAX REVENUE, PERCENT OF GDP AND CORRUPTION PERCEPTION INDEX IN AFRICA, 2010-2016

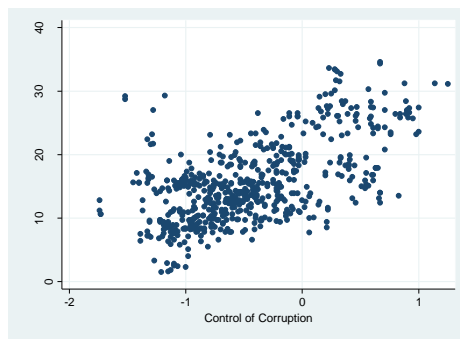FIGURE 2A. TAX REVENUE, PERCENT OF GDP AND CONTROL OF CORRUPTION IN AFRICA, 2010-2016

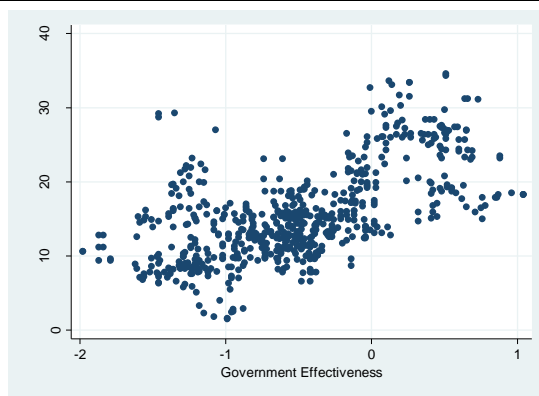FIGURE 3A. TAX REVENUE, PERCENT OF GDP AND GOVERNMENT EFFECTIVENESS IN AFRICA, 2010-2016

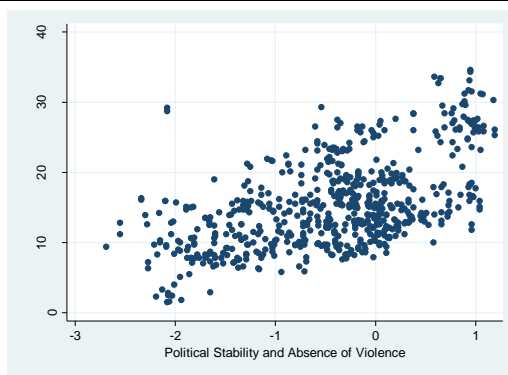FIGURE 4A. TAX REVENUE, PERCENT OF GDP AND POLITICAL STABILITY IN AFRICA, 2010-2016

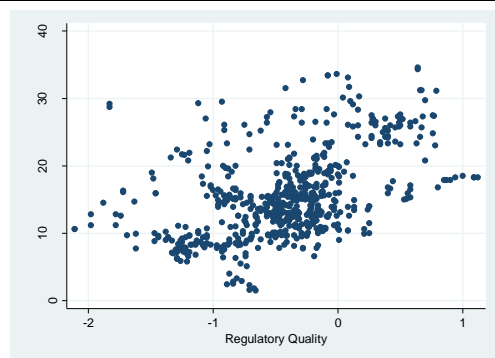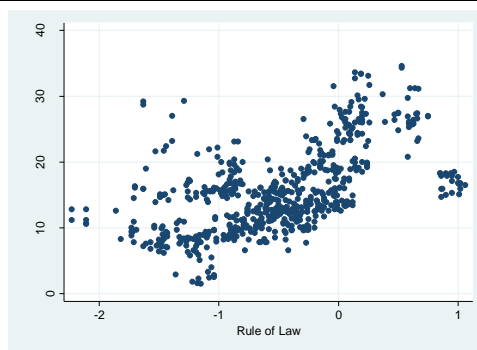FIGURE 5A. TAX REVENUE, PERCENT OF GDP AND REGULATORY QUALITY IN AFRICA, 2010-2016

FIGURE 6A. TAX REVENUE, PERCENT OF GDP AND RULE OF LAW IN AFRICA, 2010-2016

Source: Authors' estimates.

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FIGURE 7A. TAX REVENUE, PERCENT OF GDP AND VOICE AND ACCOUNTABILITY, 2010-2016
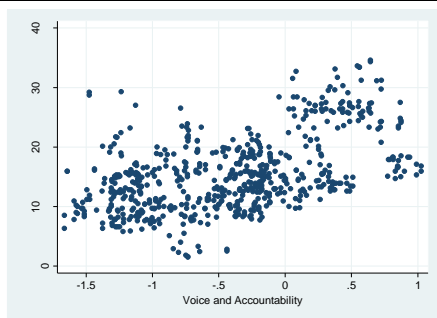
FIGURE 8A. TAX REVENUE, PERCENT OF GDP AND GDP PER CAPITA, 2010-2016
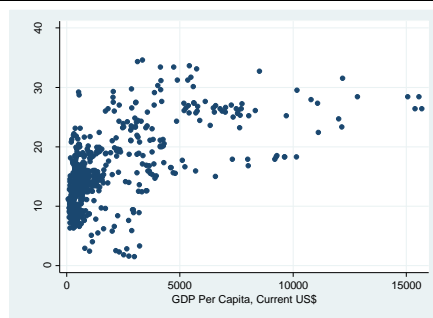
FIGURE 9A. TAX REVENUE, PERCENT OF GDP AND TRADE, 2010-2016
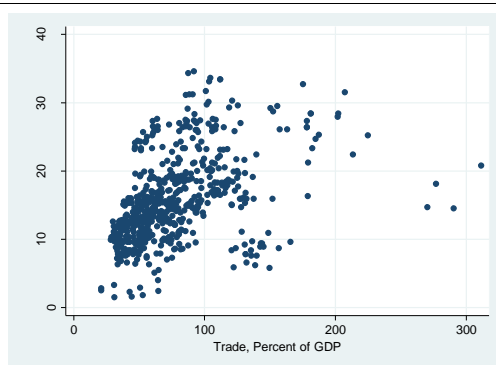
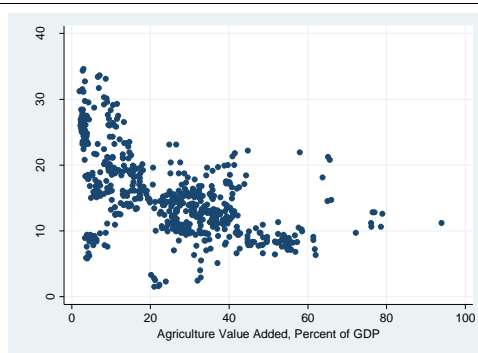FIGURE 10A. TAX REVENUE, PERCENT OF GDP AND AGRICULTURE IN AFRICA, 2010-2016

FIGURE 11A. TAX REVENUE, PERCENT OF GDP AND TAX RATE IN AFRICA, 2010-2016
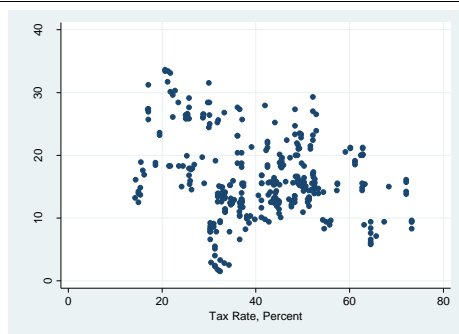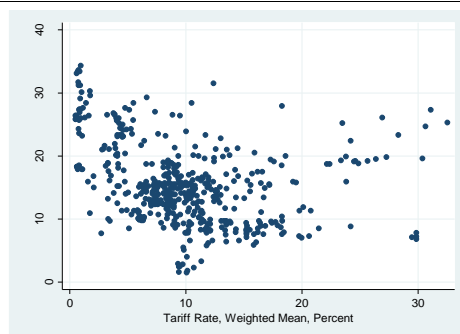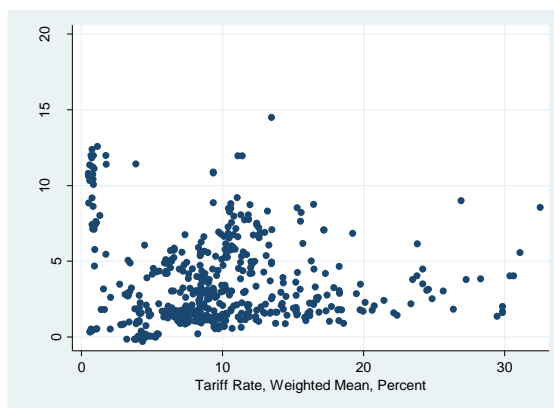
FIGURE 12A. TAX REVENUE, PERCENT OF GDP AND TARIFF RATE IN AFRICA, 2010-2016

Source: Authors' estimates.

FIGURE 13A. TRADE TAX REVENUE, PERCENT OF GDP AND
TARIFF RATE IN AFRICA, 2010-2016

Source: Authors' estimates.

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